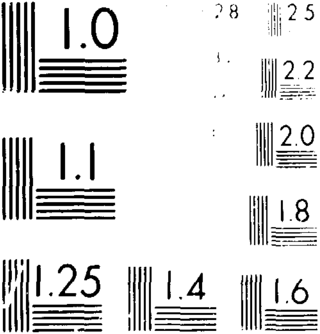
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12070

FIFTH UNIDC WORKSHOP

ON

FERTILIZER PLANT MAINTENANCE,

1982 .

HISTORICAL DEVELOPMENT OF CHEMIE LINZ AG

Start of erection in 1940, heaping up the area near the Danube for 2 - 4 meters with gravel from the port. Question of location: the new plant was situated as a neighbour of VÖEST because there was a surplus of coke oven gas.

The original name of our company was "Österreichische Stickstoffwerke AG" (translated: Austrian Nitrogen Plants Ltd.). Initially only nitrogen fertilizers have been produced. This old name was too complicable and too long for international usage. So we changed it to "CHEMIE LINZ AG" some years ago.

Original layout of our facilities:

1. extension step: 50 000 t N
2. extension step: 100 000 t N

Start of production - Primary N: October 1942
CAN : March 1943

In the year 1944 we had reached a production of 55 000 t primary N.

During the second world war our plant was bombarded by 800 bombs. From May 1945 to July 1946 production partly stood still due to damage and power supply. Until 1948 the former production was reached again. It was boosted strongly in the following years.

	1957	1967	1977
Production of primary N:	164 000 t/a	275 000 t/a	466 000 t/a

./2

The number of different products increased during the same time from 200 to 1 300.

The most important results of our chemical - technical investigations you will find in the Know How brochure of our enterprise.

The most significant erections:

1939	Foundation of the enterprise "Österreichische Stickstoffwerke AG" with a layout figure of 50 000 t N.
1943	Start-up as an enterprise producing only nitrogenous fertilizers
1944/45	800 bomb-hits, closing of the plant
1945/46	Reconstruction, installation of the departments investigation, development, sale and training.
1948	Foundation of pharmaceutical division and continous extension of all plants.
1953	Foundation of the production line for plant protective agents.
1954	Start of the plants "Gypsum Sulphuric Acid" and SSP.
1960	Start of organic production facilities (preplastics and plastics)
1975	Erection of the plant at ENNS (acrylonitril)

ORGANISATION OF CHEMIE LINZ AG.

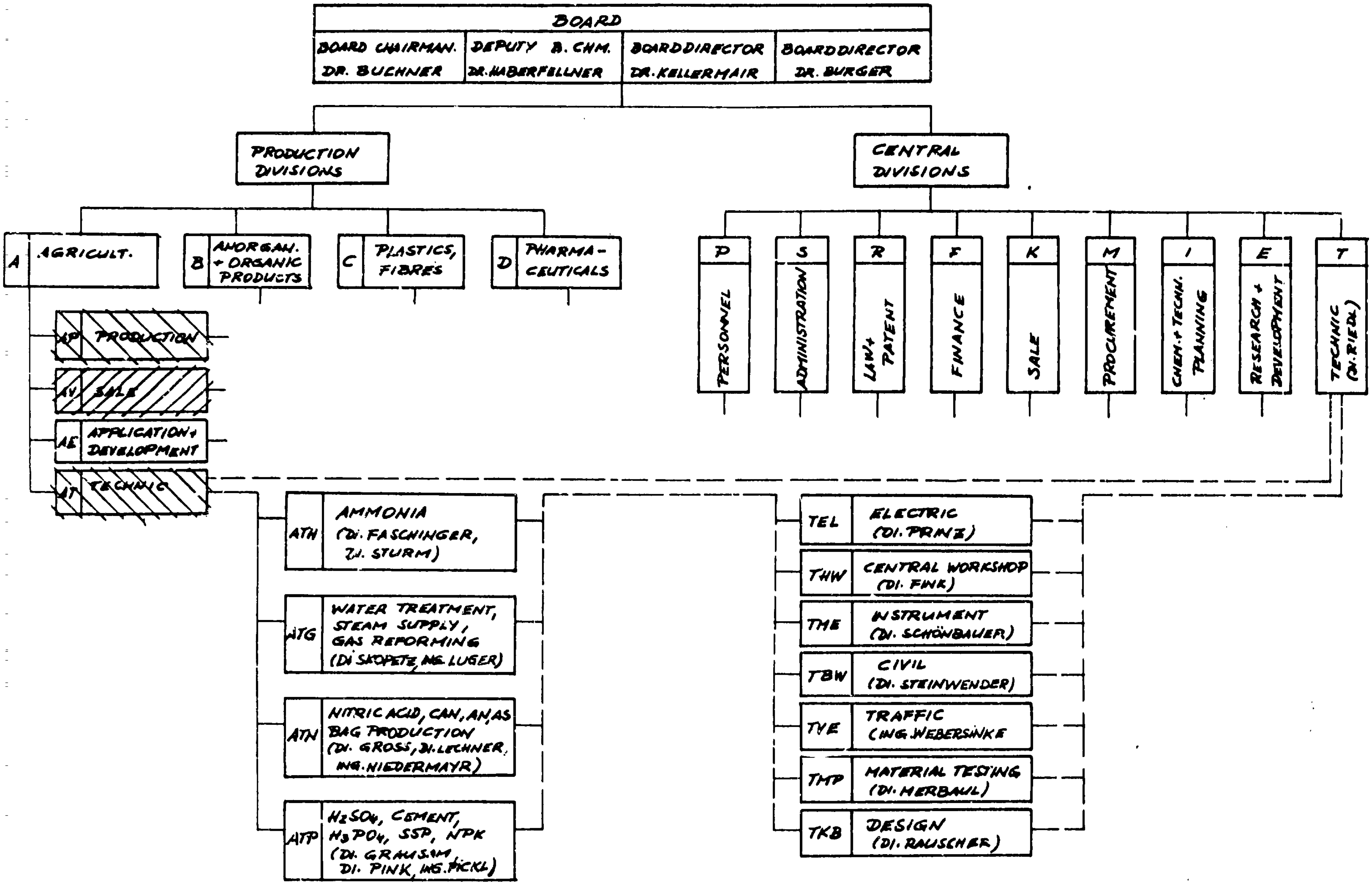


TABLE OF DEPARTMENTS YOU CAN VISIT DURING THE COURSE

ATH: Division A, technic, high pressure
Single train plant for NH_3-production, old ammonia synthesis plant, ammonia storage.

ATG: Division A, technic, gas preparation
Synthesis gas preparation from coke oven gas and natural gas, gas reforming plant, water supply for the whole company, boiler feed water treatment, oxygen plant.

ATN: Division A, technic, nitrogen fertilizers
Nitric acid, CAN, ammonium nitrate, ammonium sulphate, storage, bagging and shipping, plastic bags.

ATP: Division A, technic, phosphate fertilizers
Sulphuric acid and cement from gypsum, sulphur burning plant, single superphosphate, NPK, phosphoric acid, storage for fertilizers and raw materials, bagging and shipping.

BTH: Division B, technic, urea
Urea and melamine plant, storage, bagging

THW: Central technic, main workshop
Manufacture and repair of vessels, heat exchangers, pipes,...
Machining shop, repair of pumps, gears,.....

TEL: Central technic, electrical department
Planning of electrical equipment of new Chemie Linz plants,
electrical maintenance, balancing of rotors.

TME: Central technic, instrument department
Planning of instrumentation systems,
weighing systems, maintenance and repair.

TMP: Central technic, material testing
Recommendation concerning material selection for new and existing plants, check of welding seams, corrosion tests, ...

You will have also the opportunity to visit the following departments for a short time:

TBW: Central technic, civil department
Planning of new buildings and maintenance of buildings, streets, rails, sewerage. Insulation and painting group.

US: Safety department
Safety instructions, registration of accidents, fire brigade, safety means (masks, filters, respirators, ...)

TKB: Central technic, design
Coordination of all investments (new plants), improvements in existing plants together with production- and maintenance departments, working out of drawings and investment programs.

/3

LCS: (CHEMSERV CONSULTING) - a 100% subsidiary of Chemie Linz AG
Central planning, licenses
Licenses and Know How from Chemie Linz

GBR: Discussion with members of the works council.

MMV: Central division M (procurement)
Stores, computer system

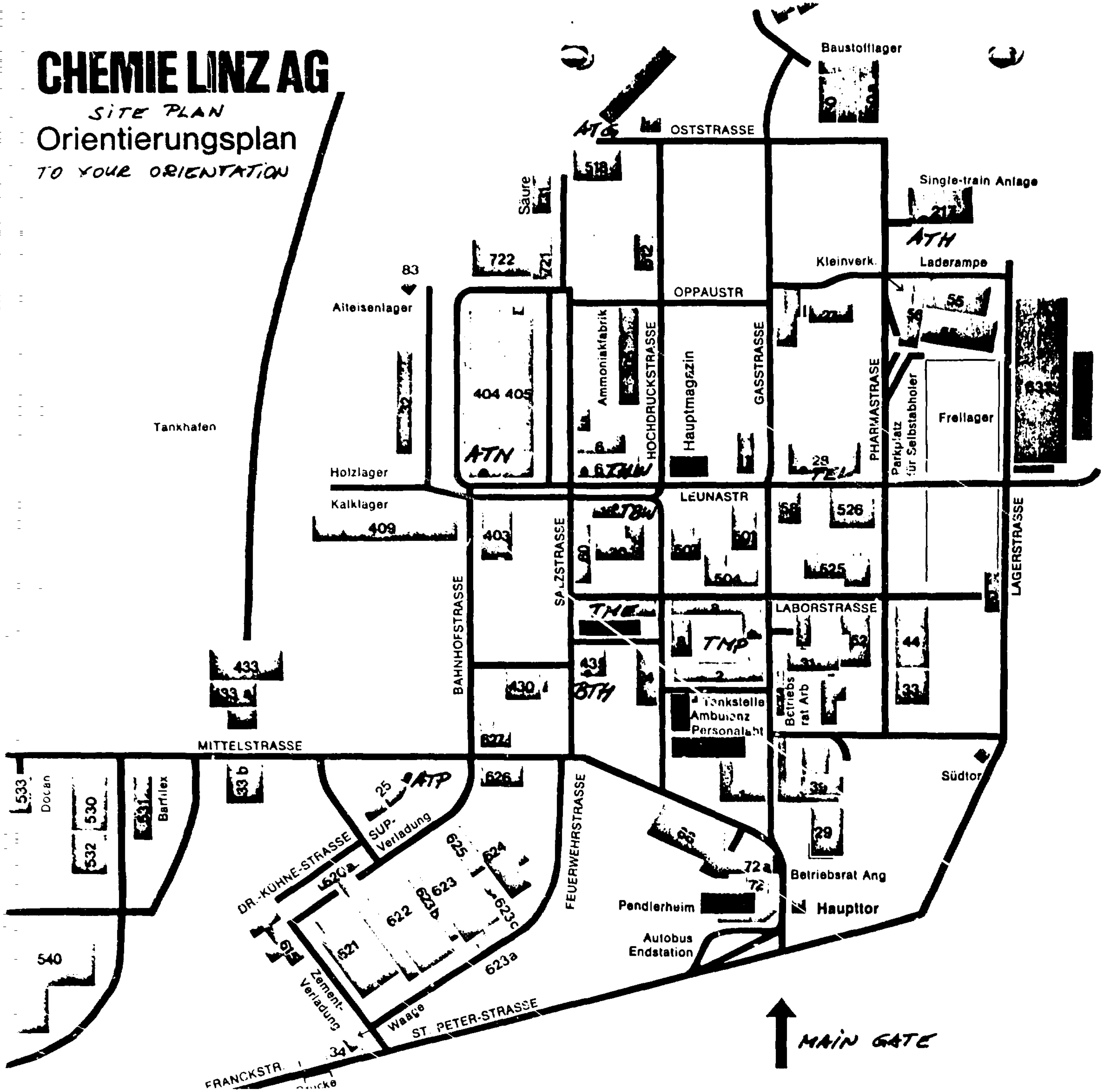
PAW: Central division P (personnel), training school
Training of apprentices, workers and employees in lectures and courses

CHEMIE LINZ AG

SITE PLAN

Orientierungsplan

TO YOUR ORIENTATION



MAIN GATE

Zur Beachtung!

Ein- und Ausfahrt an den Werkstoren nur nach Einweisung

Bei längerem Halten ist der Motor abzustellen

PASS THE GATE AFTER INSTRUCTION ONLY

Die zulässige Höchstgeschwindigkeit beträgt 15 km/h.

THE MAX SPEED IS 15 km/h

Rauchen ist im gesamten Werksgelände, mit Ausnahme besonders bezeichneter Bereiche verboten.

DON'T SMOKE IN THE AREA OF CL, EXCEPT IN THE SPECIALLY MARKED ROOMS.

Das Hantieren mit offenem Feuer ist verboten (Explosionsgefahr!)

DON'T HANDLE WITH FIRE (EXPLOSIONS)

DON'T PHOTOGRAPH

Fotografieren im Werk ist verboten.

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MECHANICAL JOBS FOR OPERATORS Unser Zeichen*) Blatt Tag

During start-up of a new plant normally we have some maintenance personnel in shift (1 or 2 shift locksmith). If the plant is in continuous operation there is no maintenance personnel in shift. For the complete plant of Chemie Linz only in two departments (ATN and ATP) each one shift locksmith is working. For example the single train ammonia plant, water treatment and also urea plant don't have a shift locksmith. If there is a trouble the operating people (production) can call the stand-by-service (on call service).

For every production department
1 chemical engineer or production foreman-
for every maintenance department
1 mechanical engineer or maintenance foreman and
2 locksmiths with good knowledge of the plant are on call for the time of one week after the normal working time and during weekend.

Since some years in Austria the profession "CHEMIEWERKER" (operator for chemical plants) can be learned. After the normal education at school (normal age of the person is 15 years) a young person can join e. g. Chemie Linz and can learn for 3 years this profession. During this education at school, workshops and different plants the person becomes familiar with small maintenance jobs. Therefore in Chemie Linz the operators are allowed to fulfill certain maintenance jobs under supervision of the production foreman and in responsibility of the production department.

/2

In the following maintenance jobs allowed for operators are pointed out:

Mechanical jobs allowed for operators in department ....

After order and instruction by the shift foreman the following jobs are performed by production side after relevant guidance by the maintenance side in the later mentioned units.
Beside the general precautions the following particular safety instructions have to be considered:

Pipes resp. pumps are to depressurize and to drain hand wheels of valves - if required - are to block, blinds have to be installed, switches for motors are to lock or fuses are to be removed by the electrical department. For jobs with aggressive mediums the common safety means (e.g. goggles, protective suits, rubber boots, gloves, etc.) have to be used. Flight divices or masks are to keep ready, also water in form of a flexible water tube. In case of escaping NO-, SO_2-, CO/CO_2- or other dangerous gases the working area has to be left immediately.
In principle all jobs are to be fulfilled in such a way that neither the worker nor its surrounding will become endangered.

For all jobs up today a work permit was required also in future a work permit is necessary (look to safety instruction no. 6 - maintenance jobs in the plant).

General instructions for all jobs

1. Don't use wrench extensions for tightening of screws.
2. Tighten nuts or flanges and lids crosswise and uniform.
3. Clean sealing surfaces before installation of new gaskets.

Treatment of gaskets before use:
For steam, cold water, hot water, air
sulphuric acid, lye : . . . mixture graphite + oil
Nitric acid, NPK-slurry, ammonia: silicon grease

4. Only use not damaged bolts of sufficient length in the required quality and use not damaged nuts. Grease them before use.
5. In the case of changing armatures pay attention to material pressure range and flow (arrow).
6. The general allowance to fulfill maintenance jobs is limited by nominal pressure 10.
7. Welding jobs are not allowed.
8. To erect scaffolds higher than 1,5 m is not allowed (call scaffolders).

Gasket material to be used:

Steam, water, condensate, cold gases, compressed air, lyes	Klingerit 400 UNIVERSAL (blue) or Klingerit red
Phosphoric acid	Rubber reinforced by fabric
Nitric acid	Klingerit 400 or Klingerit Acidit
Sulphuric acid 98 %	Klingerit red or Teflon
Sulphuric acid below 76 %, H_2SiF_6	Klingerit Acidit or Klingerit red
Oils, coating agents	Klingerit oilit or Klingerit red

Beside the already mentioned general jobs for every unit of the department particular jobs are listed up which are also allowed to be performed by production personnel:

/4

Some examples:

Bagging and shipping (units 620):

Greasing of vehicles (dumpers, fork lifts, wheel loaders)	WOWP
Bag welding machines: Turn or change of razor blades	
Clean the filters of the vacuum pump	
Equalize felt-disk	
Clean preheater and pre-pressing device (grease with silicon oil)	WOWP
Replace tubes	
Check and clean cooling water filters	
Adjust ammeter for heater	
Loading of accus	WOWP

Central raw material storage (unit 631):

Change armour plates on conveyor chutes	WWP
Repair small defects on belts	WWP
Change shear-bolts on reclaimers	WOWP
Replace grease nipples and grease tubes	WWP
Clean, oil pneumatic hammers	WOWP
Replace rubber aprons and belt cleaners	WWP

TYPE OF JOB	REMARK
Sealing of glands on valves and pumps up to PN 10, small jobs on steam-, condensate- and warm water-lines up to 7 bar	Tighten screws equally. Lantern rings should not touch the shaft. Be sure that all screws are in good condition. "Klinger" valves are allowed to seal only in closed position. (with work permit)
Remedy leakages on armatures (e.g. glands, flanges of pipes) immediately after depressurizing and drainage Change of small valves and armatures (e.g. condensate traps) up to ND 100 and up to an operating pressure of 10 bar.	Pay attention to general precautions, be sure that pipes are empty, wear protective clothes (with work permit).
Connection and disconnection of flexible tubes for compressed air, oil, water,acid as well as mounting of clamps.	Use tubes only if clamps are mounted . Pay attention that the right tube-couplings and reliable clamps are used (without work permit).
Setting and removal of small blinds (without groove) as well as connection and disconnection of corresponding pipes.	Pay attention to general precautions, depressurize and drain the pipes, use protective clothes. If electrical connections or earthings are to be disconnected inform electrical department before starting the job (with work permit).
Opening of lids for cleaning of vessels, hoppers, pipes and chutes. Provisional sealing of steam-,condensate-, acid and water-pipes by means of clamps.	Use required protective clothes (with work permit)
Connect and disconnect oil-, acid- and other wagons or tank-lorries without using of threaded clamps.	Pay attention to safety instruction no.23 - loading of wagons- and no.28 - safety in the field of shunting (without work permit)
Change of upper and return rollers on belt conveyors during standstill of the conveyor.	Jobs to be performed are only allowed during standstill. Pay attention to safety instr. no.24 - belt conveyors (with work permit)
Refill and adjust drop-oilers as well as supervision of existing central-lubrication devices for functioning. Refilling of grease pots.	Use only non contaminated grease of prescribed type. Exception: Central lubrication of filter in NPK-plant will be maintained by the maintenance personnel (without work permit).
Take care for all points to be lubricated e.g. nipples, grease boxes, oil droppers (on compressors). Exception: All closed lubrication systems (gear-boxes,...)	Look to lubrication chart. Exception: Grease nipples and grease boxes in NPK plant (without work permit)
Help for lubrication of running pan-conveyors by means of a motor-grease-press.	One man stands in sight-connection with the greaser on the emergency switch of the conveyor (with work permit)

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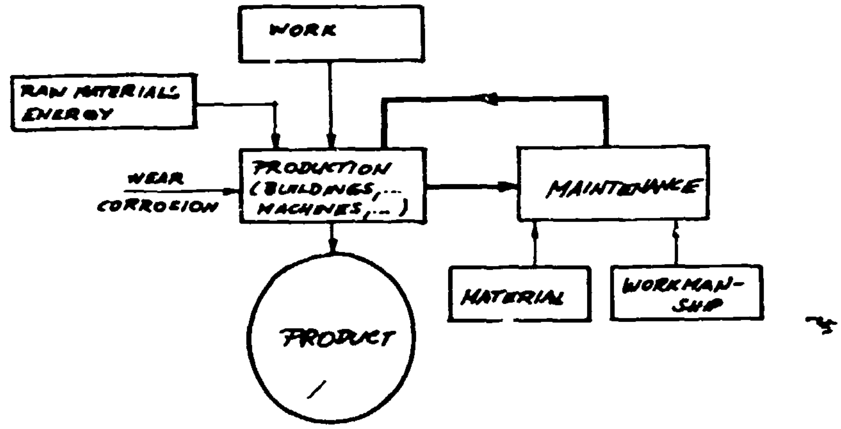
LECTURE

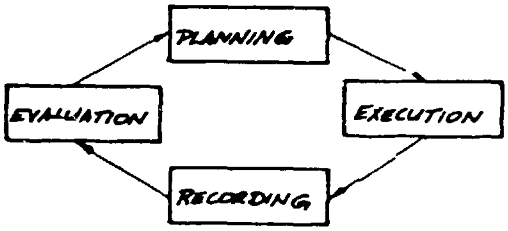
FUNDAMENTALS OF MAINTENANCE

1) Production and maintenance

Position of maintenance in a production process



2) The maintenance cycle



3) Some technical terms

Administration

Preventive maintenance

Corrective maintenance

Modification

Replacement

Direct preventive maintenance

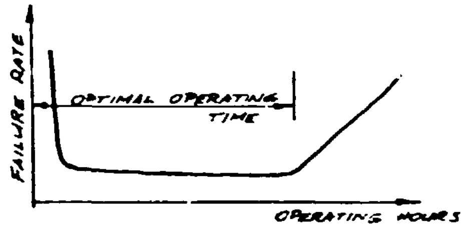
Indirect preventive maintenance

Subjective inspection

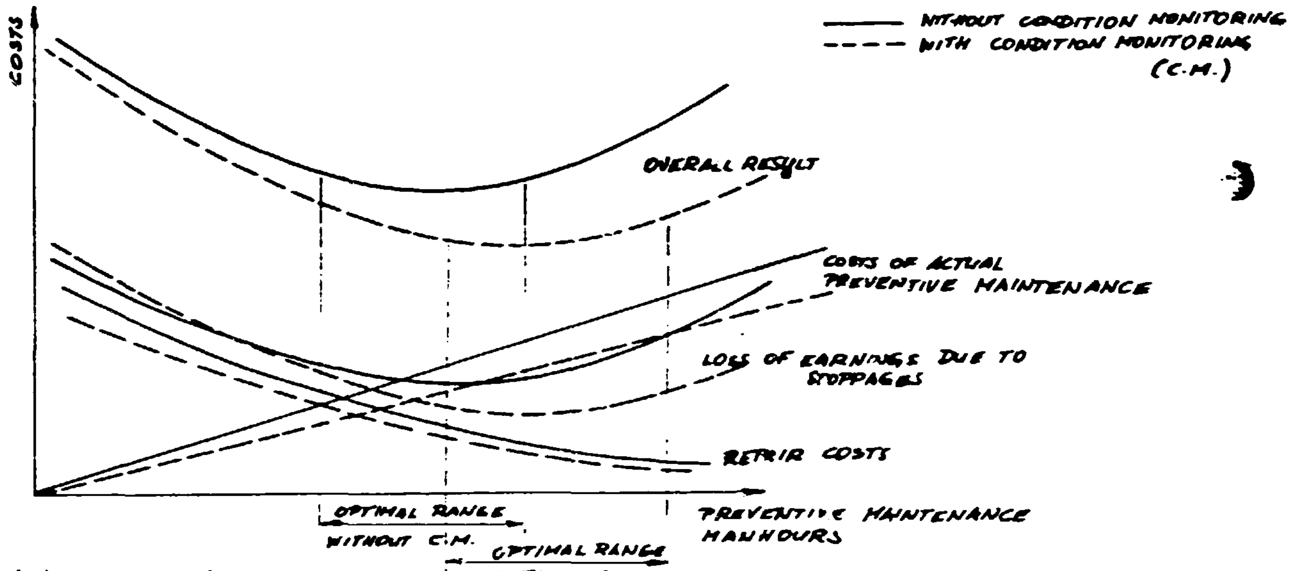
Objective inspection

Surveillance

Bath tub effect



4) The economic effects of preventive maintenance



5) Maintenance cost

Wage cost

Material cost

Administration cost

Purchased services

Conversion cost

Direct maintenance cost.

Indirect maintenance cost :

6) Maintenance in a production process

a) Operation — Duties of production department

b) Control

c) Care

d) Maintain

e) Check

f) Repair — Duties of maintenance department

7) Maintenance and company-intern organization

8) The man in the maintenance process

9) Wear - reason for maintenance

Wear

Corrosion

Fatigue

Ageing

Kinds of wear:

10) Wear- and corrosion-phenomenons

a) Even and scarred corrosion

b) Hole corrosion

c) Intercrystalline corrosion

d) Transcrystalline corrosion

e) Layer- corrosion

f) Bacterium corrosion

g) Crevice corrosion

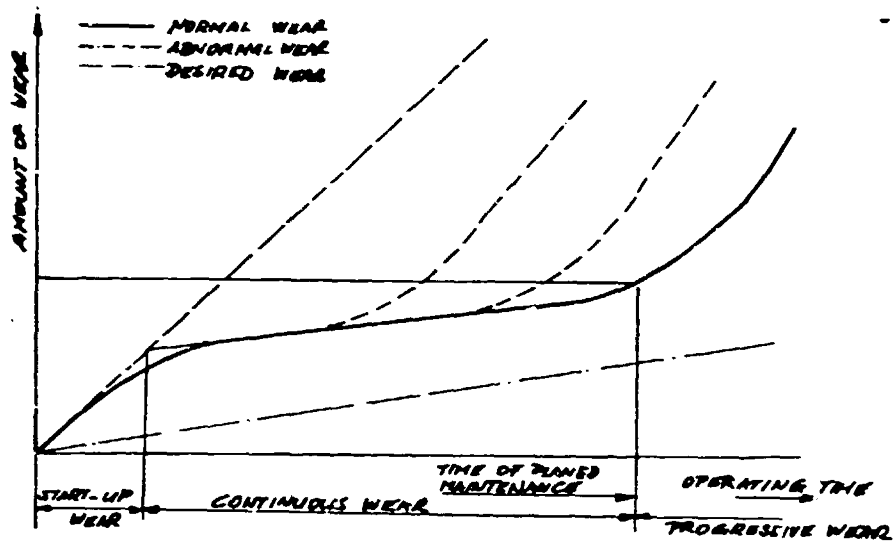
h) Fatigue

i) Ageing

k) Thermal influences

11) Types of faults

12) Registration of wear-processes



13) Defence of wear

14) a)Active and b) passive protection against corrosion

a) Avoidance of destruction

b) Building of a protective layer

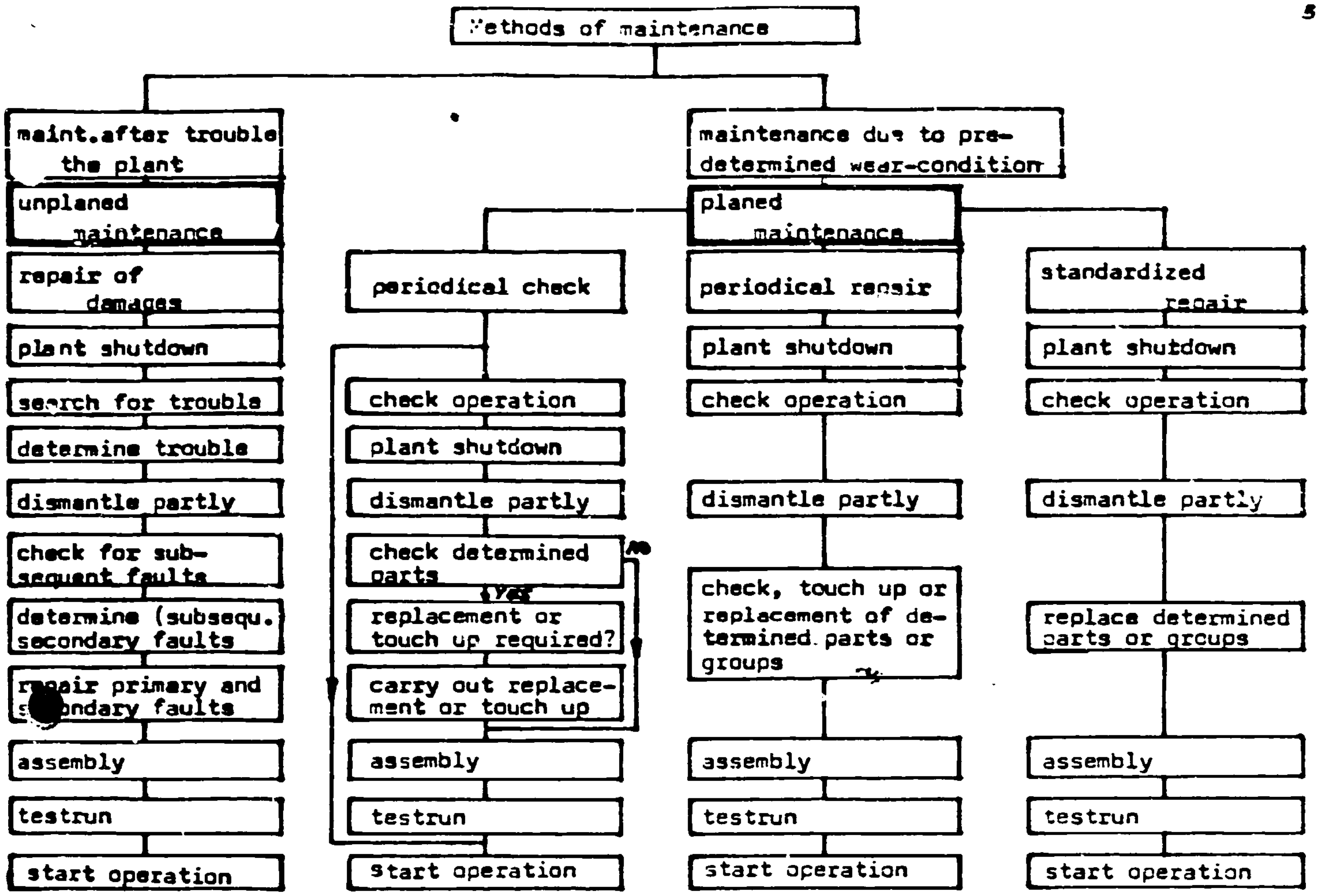
15) Technologie and methods of maintenance

- Maintenance process
  - Maintenance as a part of the production process
    - Control
    - Service
    - care
    - Methods:
      1) Work study
      2) Work organization
         a) Operation manual
         b) Care instruction
         c) Lubrication plans
  - Repair as an independent process
    - Check
    - Repair
    - Methods:
      1) Periodical check — planed
      2) Periodical repair — and
      3) Standard repair — preventive
      4) Average repair — unplaned

Operating people ← duties → Maintenance people

knowledge acout

technical [illegible], way of operation, trouble behaviour, wear behaviour, maintenance



16) Repairs

17) Maintenance schedule

18) Preparation of maintenance

19) Maintenance
Management - Planning - Realization

20) Demand for repairs

21) Investigation of repair material

22) Planning and account control of maintenance

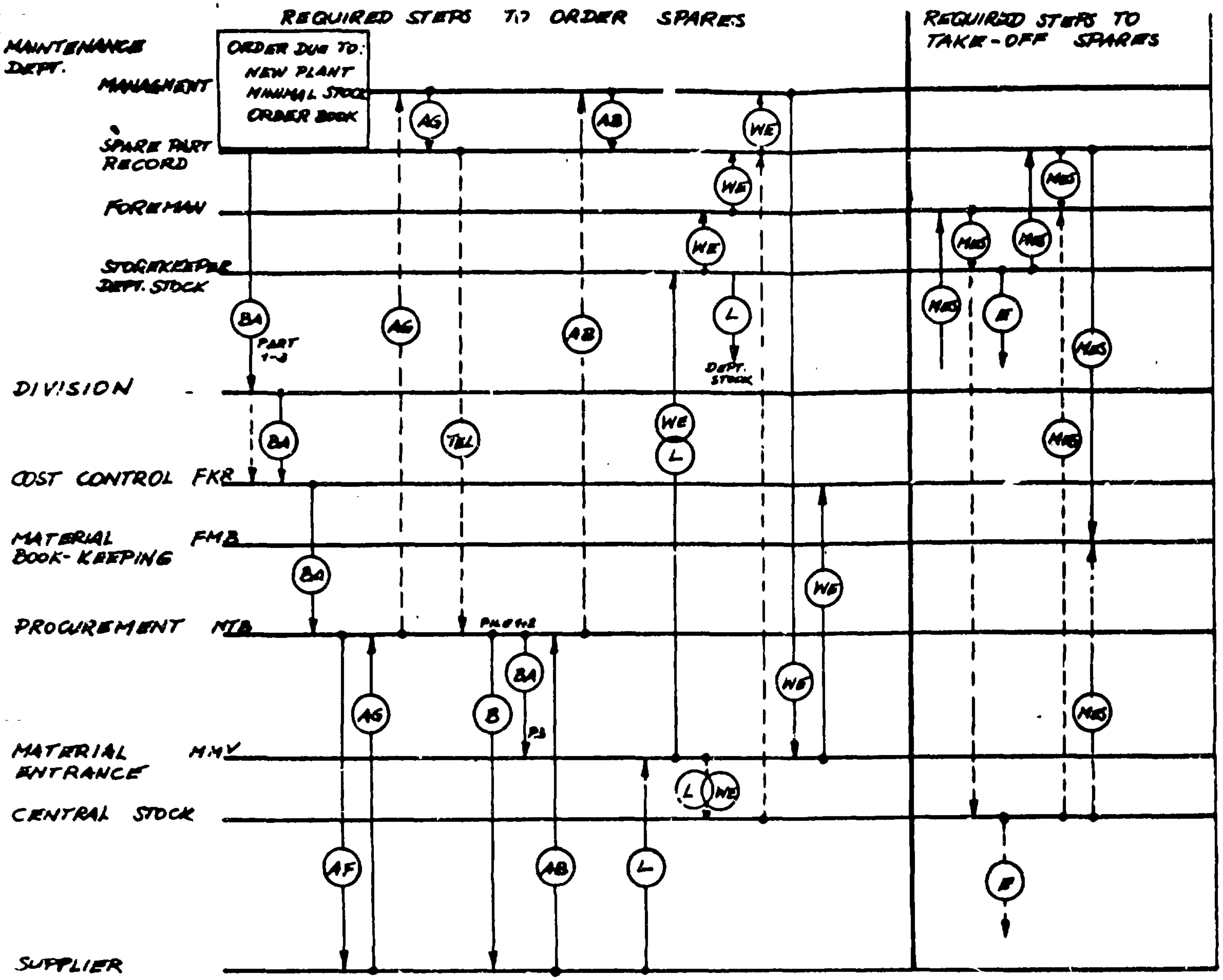
23) Specialization according to used machines

Buildings
Civil facilities (streets, sewage,...)
Vehicles
Hoists and conveyors
Machine tools
Tubes
Pumps, compressors, turbines,...

24) Surveillance and maintenance in chemical plants

25) Maintenance and pollution control

PROCEDURES FOR ORDERING SPARE PARTS IN CHEMIE LINZ AG



ABBREVIATIONS:

BB	BESTELLBUCH
	ORDER BOOK
ML	MINIMALER LAGERBEST.
	MINIMAL STOCK
BA	BEDARFSANMELDUNG
	DEMAND ORDER
AF	ANFRAGE
	INQUIRY
AG	ANGEBOT
	OFFER
TEL	TELEFONAT
	TELEFON-CALL
B	BESTELLUNG
	ORDER
AB	AUFTRAGSBESTÄTIGG.
	CONFIRMATION OF ORDER
L	LIEFERUNG
	DELIVERY
WE	WARENEINGANG
	MATERIAL ENTRANCE FORM
MES	MATERIALENTNAHMESCH.
	MATERIAL TAKE OFF FORM
E	ERSATZTEIL
	SPARE PART
EL	ERSATZTEILLAGER
	SPARE PART STOCK

ENCLOSURE: AF/BA/WE/MES

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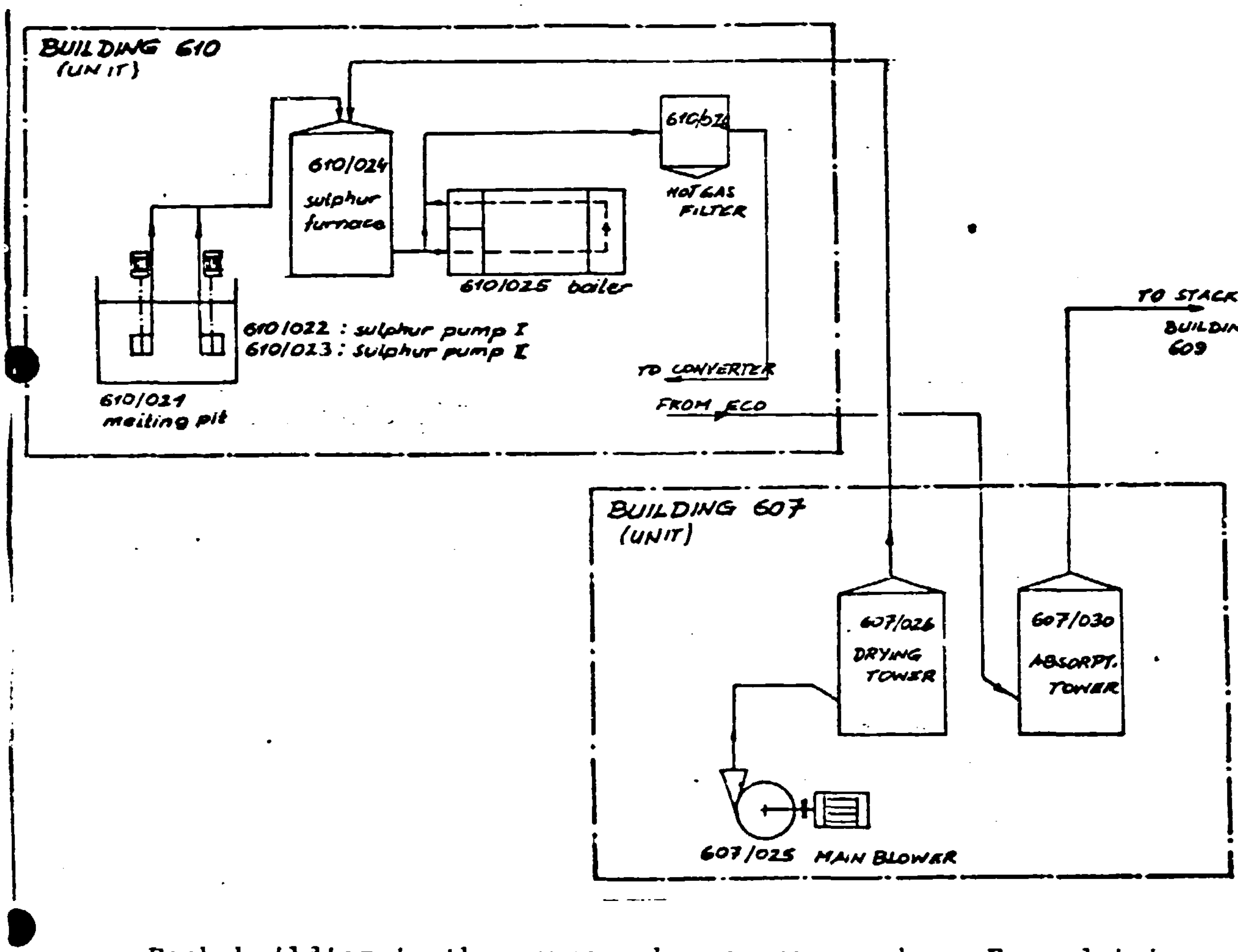
INVENTORY SYSTEM
of Chemie Linz

Unser Zeichen*) Blatt Tag



Each building in the company has an own number. For administration buildings the numbers 1 - 99 are reserved. For the different buildings in the plants the numbers 100 - 999 are in use. Each machine and apparatus has an apparatus-number (e.g. 610/024 - sulphur furnace of Monsanto plant). The first three figures mark the unit in which the machine is in action. The second three figures determine different machines in a certain unit (building). Electrical motors are separately numbered and inventoried by the electrical department. All machines and motors in the field and the replacements in the stock are marked with the apparatus number.

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Example for inventory record

610/021 Sulphur melting pit, 21.000 x 4.300 x 1.500 mm with coils and agitator.
Three phase current motor, 5,5 kW, 1 400 RPM, gear transmission to 84 RPM, motor-number 693970

610/022 Sulphur pump, vertical type, size 1 $\frac{1}{4}$, VSO - 861 - $\frac{1}{4}$, temperature of molten sulphur 135°C Fa. Lewis &Co
TPC-motor, 4,8kW, 2 870 RPM, motor-number 694200

610/023 Sulphur pump, equal with 610/022
TPC-motor 4,8 kW, 2 870 RPM, motor-number 694201

610/024 Sulphur furnace, vertical construction, 3130 Ø x 7750 high, steel shell, brick lined manufacturer Reisner & Wolf

610/025 Waste heat boiler 1 800 Ø x 7600 long, 225 m^2 surface, 16 kp/cm^2 steam pressure, insulated, registration number 2236,
boilerfeedwater-drum 1500 Ø x 5000 long, 10 m^3 volume

610/026 Hot gas filter ....

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Empfänger | Unser Zeichen*) | Blatt | Tag

SALARY SYSTEM - LEAVE

In Austria there is a collective agreement between the Federation of Trade Unions (labor unions) and the industry. In a distance of 1 to 2 years the two parties fix the wage increasing for a certain period.

In Chemie Linz AG there is a special system called "Sal ary regu lation".
Our salary is calculated as a sum of four groups:

1) Basic salary (BS)
   It depends on the position of the employee.
   The scale of basic salary is divided into 23 steps.

2) Seniority-value in percent of the basic salary (SV)

$$SV = \frac{67 \times \text{years of service with Chemie Linz}}{90 - \text{entry years (age)}}$$

3) Experience value (EV) in percent of the basic salary.
   This value is 1 % per CL-service-year up to a maximum of 18 %.

4) Personality-value (PV).
   It depends on the opinion of the superior and increases from 0 to 33,6 %.

Monthly salary: BS + SV + EV + PV

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Holiday (leave credit)

Up to 20 service years: 24 week-days (4 weeks) Mo - Sa
More than 20 service years: 30 week-days (5 weeks) Mo - Sa

The study-years are accounted in the service-years in the following amount:

Charge for Technical High School: 3 years (duration of school: 5 years)
Charge for Technical University: 5 years (duration: 5 - 8 years)

More than 25 Chemie Linz service-years: 30 actual working days (6 weeks).

Additional freetime

for marriage, birth of a child, removal, death of relations in the amount of 1 to 3 days.

Recreation leave in company own hostels

Every 21 months: Production and maintenance personnel in very dusty and dirty areas
27 months: Foremen and workers, laboratories
37 months: Employees in production offices
96 months: Employees in administration offices

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Empfänger | Unser Zeichen*) | Blatt | Tag

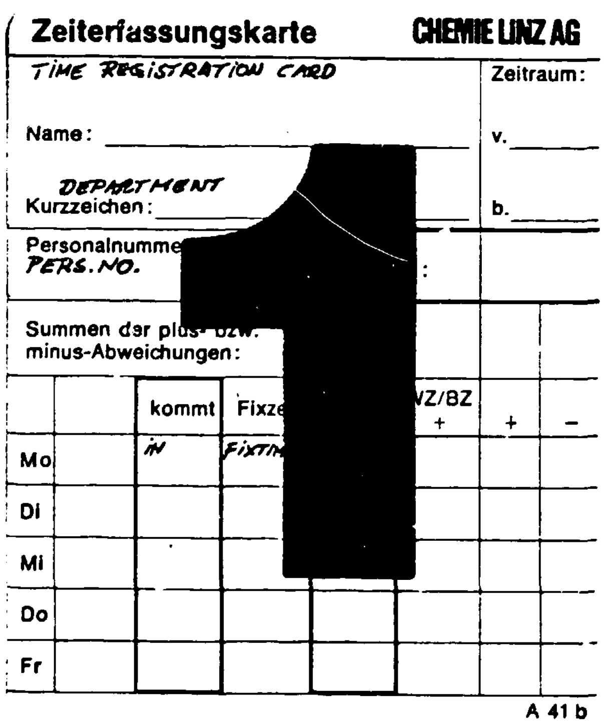
WORKING TIME

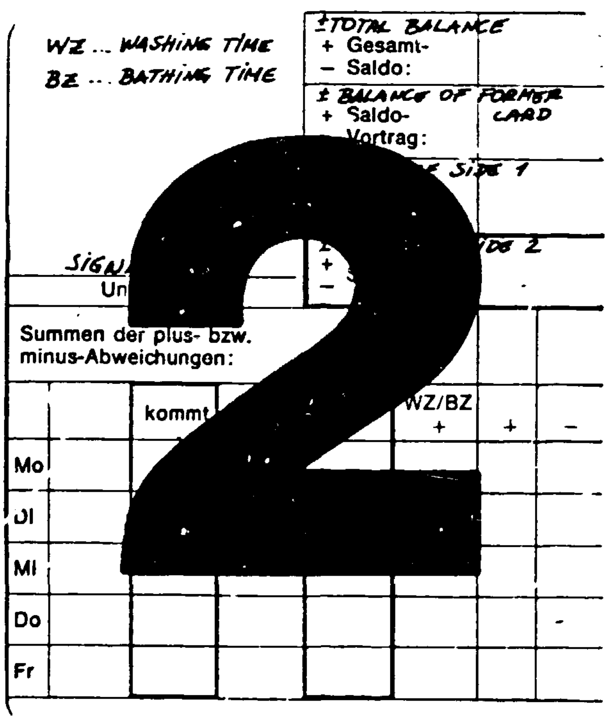
In Austria the general working time is 40 hours per week.

General shift:

Flexibleworking time: Start at morning 6.30 till 8.30 h
3/4 hour interruption for lunch
Close at afternoon
Mo - Thursd. 15.30 till 17.30 h
Friday 12.30 till 14.00 h

Recording of actual working time on "time registration cards".





The maximum plus- or minus-balance of one complete registration card is allowed with 10 hours. The employees of Chemie Linz can take two free noons or afternoons or one free day per month if they do not go across the 10 hours limit and if the superior gives his consent.

Shift system

Most of our plants are on stream 24 hours per day. For this production lines in the different departments there are 4 shift groups working 8 hours per day according to a shift table. These groups meet also the 40-hours-week with temporally fixed free-shifts.

Examples for different shift systems:

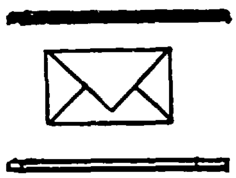
		A	B	C	D	
2 shift groups A,B	Monday - Friday	6-14	14-22	/	/	bagging loading
3 shift groups A,B,C	Monday - Friday	6-14	14-22	22-6	/	superphosphate
4 shift groups A,B,C,D	the whole week	6-14	14-22	22-6	FREE	most productions

SUGGESTION SYSTEM

In 1953 Chemie Linz AG has introduced a suggestion system.

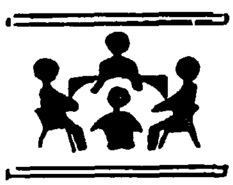
How to make a suggestion:

1) The idea:
Everybody can suggest. The office "Suggestion System" and the members of the works council will help composing a suggestion.

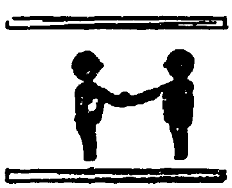


2) Presentation:
Possible via the superior, the office of suggestion system or the works council. One can also put the proposal into the "suggestion-letter-box".

3) Registration and examination:
The office checks the suggestion formally and asks for the opinion of one or more experts.



4) The decision:
Acceptance or rejection of suggestions is the duty of a "suggestion-commission".



5) Reward:
The experts calculate the annual savings and the suggestion-commission has to fix the reward.

6) Payment:
If the suggestion is positive the employee will get the reward together with the monthly salary.

We distinguish estimable and computable suggestions. Concerning an estimable proposal one can reward the suggestion with S 200,-- up to S 3.000,-- depending on the result of the valuation system.

Criterions in the valuation system:

Importance	important	negligible
Kind of solution	original	already used
Effect of the proposal	complete change......	insignificant change
Frequency of applicat.	often	single
Site of suggestion	own business	foreign business
Elaboration	practically tested ..	not tested
Realization cost	up to S 3.000,--	more than S 5.000,--

5. UNIDO WORKSHOP ON FERTILIZER PLANT MAINTENANCE (20.9. - 5.11.1982)
Chemie Linz - Questionnaire
Please fill out the questionnaire in block letters

Participant: Family name	
First name	
Nationality	
Date and place of birth	
Professional position in your company	
Company name	
Company address	
Residental address	

Production facilities of your company:

Product	Capacity t/day t/year	Process

Your particular interests:

What particular problems do you want to discuss with Chemie Linz experts ?

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Beside the legal rules and directions there exist some other SAFETY INSTRUCTIONS in the company of Chemie Linz

1) General instructions: Competence, foundation, smoking prohibition, alcohol prohibition, maximum speed inside the area of CL, first aid performance, safety advise,...
2) Information procedure on fire brigade actions and accidents
3) Operation of fire brigade
4) Alarm ways for the fire brigade
5) Safeguard services
6) <u>Maintenance business</u>
7) Local extinguishers
8) Use of protective hoods
9) Entering of vessels
10) Foreign company workers in the plant
11) Protective equipment and protection clothing
12) Safety instruction
13) <u>Scaffoldings, ladders</u>
14) Storage of burnable materials
15) Use of solvents
16) Radiation protection
17) <u>Portable electric hand tools (power tools)</u>
18) Directions and marks for safety work
19) Responsibility for repairs on pipeline-bridges
20) Bolt shooting devices
21) Directions for chemical labs
22) Apparatus, devices and equipments obligatory to revision
23) Loading works on waggons
24) Transporting tanks
25) Glass carboys (balloons)
26) Steel bottles
27) Pressure vessels
28) Safety in the field of railway
29) Showings round the plant
30) Vehicles without rails (fork lift trucks, ...)
31) Alarmplan for special departments
32) Fire protection in glue-plant
33) Report of industrial accidents
34) Transport of prussic acid

./2

Yearly control of all continual conveyors (belt-, chain-conveyors, ...) and notice of the inspection in a check-book.

Yearly earthing control on tanks for burnable materials.

Control of the lightning-rods in a distance of 2 years.

The items underlined we shall discuss in detail.

Erlaubnisschein für Instandsetzungsarbeiten

An 800897

(Nähere Bezeichnung, z. B. Rohrleitung, NH_3-Wasserabscheider usw.)

App. Nr. .... Bau, Ort ....

darf unter Einhaltung der üblichen Sicherheitsvorkehrungen **mit Feuer - im Inneren -** an Betriebseinrichtungen gearbeitet werden.

Besondere Schutzvorkehrungen:

Assistenzleistung der Feuerwehr

Freigabedatum: Uhrzeit:

Aussteller

Leiter des Verantwortungsbereiches bzw. dessen Beauftragter

Die besonderen Schutzvorkehrungen zur Kenntnis genommen

Datum

Der für die Arbeitsausführung Verantwortliche (Techn. Seite)

Probelauf schalten

Datum:

Uhrzeit:

Der für die Ausführung Verantwortliche

Arbeit beendet 800897

Datum:

Uhrzeit:

Der für die Arbeitsausführg. Verantwortliche

A 79

Erlaubnisschein für Instandsetzungsarbeiten

An 800897

(Nähere Bezeichnung, z. B. Rohrleitung, NH_3-Wasserabscheider usw.)

App. Nr. .... Bau, Ort ....

darf unter Einhaltung der üblichen Sicherheitsvorkehrungen **mit Feuer - im Inneren** - an Betriebseinrichtungen gearbeitet werden.

Besondere Schutzvorkehrungen:

Vor Arbeitsbeginn nächstliegenden Fluchtweg einprägen. Bei [illegible] oder bei Nitrosegasgeruch [illegible]

Assistenzleistung der Feuerwehr

Freigabedatum: Uhrzeit:

Aussteller	Leiter des Verantwortungsbereiches bzw. dessen Beauftragter

Die besonderen Schutzvorkehrungen zur Kenntnis genommen

Datum	Der für die Arbeitsausführung Verantwortliche (Techn. Seite)

Probelauf schalten

Datum:

Uhrzeit:

Der für die Ausführung Verantwortliche

Arbeit beendet 800897

Datum:

Uhrzeit:

Der für die Arbeitsausführg. Verantwortliche

A 79 c

Safety instruction 6

MAINTENANCE IN THE PLANT

All jobs in connection with maintenance, erection, servicing, manufacture etc. on or for equipments of plants are to be allowed by a person responsible for this plant before start of workmanship. This is done by a written "ALLOWANCE - SHEET" for repair works (see sheet A 79 b), signed by the responsible leader of the certain area or in charge of the leader by a person who is made responsible by the manager of the department.

The allowance sheet is valid only for <u>one certain</u> work.

Due to insignificance or littleness and if there is no risk performance of work is allowed without allowance paper. To fix such a work is the responsibility of ordering- (production foreman) and performing-office (maintenance foreman). The issuer of the allowance sheet and the performer of the work are responsible for using the preventation-means before and during the service work. On principle this allowance sheet shall be for all people concerned with the service job:

1. a memory aid
2. avoiding misunderstanding between ordering and performing side
3. exact determination of precautions
4. clear limited responsibility

The allowance paper has to be signed before work-performance by the technical side. The original (yellow) of the allowance sheet is kept by the work executing side, the copy (white) remains on the issuer.
If the repair is performed by personnel from other workshops (THW, TBW,...) the foreman of the other workshop get the allowance paper after instruction from the technical (maintenance) side of the plant and the other workshop confirm agreement to the ordered precautions by signature. Besides this special means of course all the specific instructions for the technical work must be observed. This specific instructions are not written on the allowance sheet.

After finishing the work the responsible person of the executing workshop fills out the tear-off-part of the yellow original sheet with time, date and signature and hand over this part to the issuer. The issuer sticks the tear-off-part to the white copy (specimen) of the allowance sheet.

Because there is a testrun necessary after finishing the repair the responsible maintenance man fills out the rubric "SWITCH TO TESTRUN" with time, date and sign it. The foreman of the plant workshop signs also this column and arranges with the production foreman the start of the machine. During testrun the allowance sheet (yellow) is on the production side.
After regular performance of testrun the allowance sheet comes back to the repair-foreman who signs the rubric "WORK FINISHED" and the tear-off-part is handed to the issuer in above described wise.
Can the repair not be finished on the same day one has to ask for extension of allowance. Therefore the issuer has to write a note on the yellow sheet with duplicating to the white copy.
As expedient for marking out of allowance sheets and fixing precautions there are provided special supplements in which the danger and the required precaution is mentioned.
Permanent allowance sheets for routine-works can be issued for a limited time of one year after consultation the safety engineer. The issue of required single-allowance sheets before performance of concerned work is done in own responsibility by the deputies of responsible person (foreman) based on the permanent allowance.
The observance of the ordered safety-instructions by the executing people is controlled by the competent supervisor.
Allowance sheets for entering of sewages and purification pits must be signed also by the safety department.

Safety instruction 13

SCAFFOLDINGS, LADDERS

For erection of scaffoldings during execution of civil-works the § 19 - 33 of the order about "prevention of workers and employees" is valid, further the standard "ÖNORM B 4007 - scaffoldings." § 35 - 37 and ÖNORM F 5120 concern ladders. Revision of ladders according safety instruction 20.

During erection and working of scaffoldings the following procedure is obligatory: Erection of various scaffolds is performed by civil department due to order-sheets (form A 99). The original of this sheet is sent to the civil department from the orderer, one copy together with the order for dismantling of the scaffold remains to the orderer and one copy goes to the safety engineer. The safety engineer has the possibility to preceive safety interests on time.

In all the cases that civil dept. has a permanent work order for building of scaffolds, the number of the permanent work order must be written on the order for building a scaffold. Therefore no separate work order is required. If there is no permanent work order by civil dept. beside the order for building a scaffold also a work order is required for accounting the workmanship. The sheets are arranged that both parts can be written as copies. Work order and scaffold order must be handed over to civil dept. The determination of workmanship in each case is to divide in: exact place, aim of the scaffold and required load capacity in kg.

./2

The orderer takes over the scaffold by signature on the concerning scaffold order (scaffold taken over). Care for the scaffold and to maintain it in a regular state till now is the duty of the orderer. He has to check continuously. He is not responsible for the faultless and regular erection which is the exclusive duty of the scaffolders. But taking over dept. is responsible for the faultless state of the scaffoldings.

To avoid the improper use of not ready scaffolds or such scaffolds not taken over, the civil dept. has to mark it by a plate "Don´t step to scaffold". If the scaffolds are taken over these plates are removed.

For the case that a scaffold is not used longer disassembling of the scaffold must be ordered with the sheets 3 - 5 of form A 99. Immediately after beginning disassembling the civil department fixes the plate "Don´t step to scaffold" on the scaffold. Afterwards the scaffold must be removed promptly.

Concerning wooden double-ladders according ÖNORM F 5120 instead of chains there must be used steel-ropes with a diameter of 4 mm to avoid moving of the two beams (look to safety instruction 20).

Safety instruction 17

MOVABLE ELECTRIC HAND TOOLS AND MOUNTING LAMPS

To fix the required precautions and for the interest of good co-operation with outdoor companies and workers from outdoor companies under observance of ÖVE - instructions E 1 and E 40 the following precautions are ordered:

Movable electric hand tools

1. For jobs in vessels, containers, tubes and similar small equipment of good conductive material and for jobs on such equipment with comparable narrow place conditions.
2. Jobs on metallic conductive points such as grids and steel-constructions.
3. Jobs on good conductive points (soil, concrete).
4. For jobs on poor conductive points such as workshops with dry and not metallic floors, offices, dry tile-floors.

Additional there is mentioned that disconnecting transformers must be located outside of the dangerous rooms and only the connection of one electric hand tool is allowed.

On supplement you can see different kinds of electric hand tools and the allowance of use.

● ..... ALLOWED

○ ..... ALSO POSSIBLE

X ..... NOT ALLOWED

TOOL:		WORK: IN VESSELS AND IN NARROW ROOM CONDITIONS	ON METALLIC CONDUCTIVE POINTS (GRIDS, STEEL CONSTR.)	ON GOOD CONDUCTIVE POINTS (SOIL, CONCRETE)	ON POOR CONDUCTIVE POINTS (WOOD ETC.)
LOW VOLTAGE 42 V	Werkzeug (TOOL) 42V — 42V Netz (NET)	●	●	●	●
ISOLATING TRANSFORMER + ELECTRIC HAND TOOL WITH TERMINAL OF PROTECTING WIRE AND VISIBLE LAYED STANDPOINT-CONNECTION	380 od. 220V — tragbar (PORTABLE) DISCONNECTING TRANSFORMER	●	●	○	○
ISOLATING TRANSFORMER + ELECTRIC HAND TOOL WITH PROTECTING WIRE TERMINAL	380 od. 220V — tragbar (PORTABLE)	X	X	●	○
ISOLATING TRANSFORMER + ELECTRIC HAND TOOL WITH PROTECTIVE INSULATION	380 od. 220V — tragbar (PORTABLE)	X	X	●	○
ELECTRIC HAND TOOL WITH PROTECTIVE INSULATION + FAULT CURRENT SWITCH	380 od. 220V — 380/220V FJ	X	●	●	○
ELECTRIC HAND TOOL WITH PROTECTING WIRE TERMINAL	380 od. 220V	X	X	X	●
ELECTRIC HAND TOOL WITH PROTECTIVE INSULATION	380 od. 220V	X	X	X	●
HANDLAMPS	42V — 42V Netz (NET)	●	●	●	●
ISOLATING TRANSFORMER + FIXED MOUNTED MOUNTING LAMPS 220V	220V	●	●	●	○
FIXED MOUNTED 220V-LAMPS WITH PROTECTIVE INSULATION + FAULT CURRENT SWITCH	220V — FJ	X	●	●	○
CONCRETE VIBRATORS: LOW VOLTAGE	42V — (NET) 42V-Netz	●	●	●	●
CONCRETE VIBRATORS: ISOLATING TRANSF.	380 od. 220V — tragbar (PORTABLE)	X	X	●	●

I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII

	Inhalt	Betriebsdruck	Probedruck
innen/ in den Rohren	ltr.	atü	atü
aussen/ um die Rohre	ltr.	atü	atü
Hersteller:			
Zeichnungs Nr.:			

Baujahr:		Heizfläche Geb.fläche		Kostenst.:	

Register Nr.
TÜV. Nr.
Fabriks Nr.
Apparate Nr.

REVISIONEN

E 806/1

Bemerkung:

REVISIONEN

Maschinen- und Apparatekartei

	Maschinen- und Apparatekartei	App. Nr.
Bau:	Maschine oder Apparat:	Bezeichnung:
Betrieb:	gehört zu:	

Programm Nr.:	Gesamtgewicht:	Gewicht des größten Teiles:
Lieferfirma:	Hauptabmessungen:	
	Konstruktionsdaten:	
Baujahr:		
Fabriks-Nr.:		
Besteller:		
Besteller Nr.:	Werkstoffe der Hauptteile:	
Bestelltag:		
Preis ab Werk ohne Montage:		
	Konstruktionsmäßig zulässige Belastungen, Drehzahlen, Drucke, Temperaturen:	
In Betrieb am:		

Revision	letzte am						Probedruck	
	nächste am							

Vorschriften für Schmierung und Kühlung:

Zugehörige Apparate, Maschinen, Sondereinrichtungen		Bau.-Nr.	Motortype	Leistung	Drehzahl	Spannung	Max. Strom
	Hauptantrieb						
	Reservemotor						

A 3

Zeichnungen			Beschreibung
Fremd-Nr.	Werks-Nr.	Bezeichnung	

Ersatzteillager

Kto. 35 . . .

Gegenstand :

Nummer

Lagerort

Zeichnungs-Nr.

Lieferfirma

Einheit :

Betrieb

Tag	Bestell-Nr.	Stück		Tag	Lieferer / Empfänger	Zugang	Abgang	Bestand

A 51 3

Tag	Lieferer Empfänger	Zugang	Abgang	Bestand	Tag	Lieferer / Empfänger	Zugang	Abgang	Bestand

I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII

TERMINKARTE
FÜR PRÜFUNGEN UND REVISIONEN

Bau-Nr.:

Magazin-Nr.:

Fach-Nr.:

Benützer:

Prüf-Intervall:

Hersteller:

Baujahr:

1. Sicherheitsventil-Nr.:
   Einbaustelle:

   Registernummer:

2. Prüf- bzw. revisionspfl. Gegenstand:

NW: Res. Vent. Nr.:

Abblasedruck:

max. Betr. Druck:

Probedruck:

Gew./Federbelastet:

Medium:

Prüfnummer:

Einbau am	Ausbau am	Prüfdatum	Unterschrift	Bemerkungen bzw. Prüfvermerke

E 442 b

Einbau am	Ausbau am	Prüfdatum	Unterschrift	Bemerkungen bzw. Prüfvermerke

	Ersatzteillager **Kto. 35 . . .**	Gegenstand :	**Nummer** Lagerort
Zeichnungs-Nr.			
Lieferfirma		Einheit :	Betrieb

Tag	Bestell-Nr.	Stück		Tag	Lieferer / Empfänger	Zugang	Abgang	Bestand

A 51/3

Tag	Lieferer / Empfänger	Zugang	Abgang	Bestand	Tag	Lieferer / Empfänger	Zugang	Abgang	Bestand

Revisions-Nr.:	**Reparaturkartei** Blatt	App.-Nr.:
Bau:	Maschine oder Apparat:	Bezeichnung:
Betrieb:	gehört zu:	

in Rep.	in Betrieb:	Durchgeführte Reparaturen:	Rep. Ber. vom:	WA-Nr.	Stunden	Kostenanfall		
						Lohn	Mat.	Gesamt:

A 44 a

in Rep.	in Betrieb:	Durchgeführte Reparaturen:	Rep. Ber. vom:	WA-N[illegible]	Stunden	Kostenanfall		
						Lohn	Mat.	Gesamt:

Leit-Nr.:

Nr.	Artikel	Nr.	Artikel	Nr.	Artikel	Nr.	Artikel
01×		26×		51×		76×	
02×		27×		52×		77×	
03×		28×		53×		78×	
04×		29×		54×		79×	
05×		30×		55×		80×	
06×		31×		56×		81×	
07×		32×		57×		82×	
08×		33×		58×		83×	
09×		34×		59×		84×	
10×		35×		60×		85×	
11×		36×		61×		86×	
12×		37×		62×		87×	
13×		38×		63×		88×	
14×		39×		64×		89×	
15×		40×		65×		90×	
16×		41×		66×		91×	
17×		42×		67×		92×	
18×		43×		68×		93×	
19×		44×		69×		94×	
20×		45×		70×		95×	
21×		46×		71×		96×	
22×		47×		72×		97×	
23×		48×		73×		98×	
24×		49×		74×		99×	
25×		50×		75×		*Fortsetzung unt. Leit-Nr.*	

Apparat: App.-Nr.: Ersatzteil- nummer:

Nr.	Artikel	Nr.	Artikel	Nr.	Artikel	Nr.	Artikel
01		26		51		76	
02		27		52		77	
03		28		53		78	
04		29		54		79	
05		30		55		80	
06		31		56		81	
07		32		57		82	
08		33		58		83	
09		34		59		84	
10		35		60		85	
11		36		61		86	
12		37		62		87	
13		38		63		88	
14		39		64		89	
15		40		65		90	
16		41		66		91	
17		42		67		92	
18		43		68		93	
19		44		69		94	
20		45		70		95	
21		46		71		96	
22		47		72		97	
23		48		73		98	
24		49		74		99	
25		50		75		*wenden !*	

A 5'·2

UNFALLANZEIGE

ACCIDENT NOTICE

... des Allgemeinen Sozialversicherungsgesetzes (ASVG), BGBl. Nr. 189/1955.)
... besteht bei Tod oder mehr als drei Tagen Krankenstand. Die Meldefrist beträgt fünf Tage!
Bitte drei Exemplare einsenden! Der weiße Durchschlag ist für Ihre Firma bestimmt.

1. Firma, Anschrift (Betriebsort), Postleitzahl, Art des Betriebes Company's address	2. Zahl der im Betrieb beschäftigt. Personen number of employees

3. ... und Vorname des Versehrten (in Blockschrift) Complete name of the disabled person	4. Versicherungsnummer insurancy n°.	5. geboren am date of birth
6. Anschrift address	7. Staatsangehörigkeit citizenship	8. Gastarbeiter foreign worker ja ☐ nein ☐
9. beschäftigt als ... im Betrieb seit ... Abteilung working as apprentice skilled trained unskilled Lehrling ☐ ausgelernt ☐ angelernt ☐ Hilfsarbeiter ☐	10. Fam. Stand familiy status	11. Anz. d. Kinder unter 18 Jahre number of children
13. ... und Dienststellung des zuständigen Vorgesetzten name and position of competent superior (superiors)	14. Vorgesehene(r) Arbeits- Beginn Ende forseen start of work	
15. Zuständige Krankenkasse, Kontonummer competent sick-fund	worker Arb. ☐ employee ☐	
16. Vorbeschädigung (Arbeitsunfall, Berufskrankheit, Wehrdienstbeschädigung, Invalidität, Opferfürsorge) mit Rentenbezug von previous injuries		
17. Unfallstelle im Betrieb (z.B. Standerbohrmaschine, Kran, Aufstellungsort und Fabrikationsnr.) place of accident in the plant	18. Wochentag / Datum / Uhrzeit des Unfalles weekday/date/time of accident	
19. Wenn nicht ident mit Betriebsanschrift: Genaue Anschrift der Unfallstelle (Ort, Straße, Hausnr., Bundesland) if not identical with company's address: exact address of accident place	20. Arbeit eingestellt am / Uhrzeit work finished date/time	
21. Verletzter Körperteil und Verletzungsart injured part of body and type of injury	22. tot dead yes ja ☐ no nein ☐	
23. In welches Krankenhaus eingeliefert? An welchem Tag? to which hospital taken? which day?	Erste Hilfe im Betrieb? first aid in the plant ja ☐ nein ☐	
25. Erstbehandelnder Arzt / derzeit behandelnder Arzt (Name und Adresse) first/today medical treating doctor?		
26. Schilderung des Unfallherganges, so daß sich jedermann ein klares Bild machen kann. (Arbeitsverrichtung und Unfallursache, eventuell Art der beteiligten Fahrzeuge) description of the accident - in simple words understanding for everyone		
27. Bei Wegunfällen: Von wo ist der Versehrte weggegangen? Wohin sollte er sich begeben? accidents on the way: way of the disabled person: from - to		
28. Unfallzeugen (Name, Anschrift) witness of the accident	29. Arbeit wieder aufgenommen am resumption of work	
30. Erhebung durch Polizei oder Gendarmerie? Dienststelle? inquiry of police?		
31. Welche Maßnahmen werden getroffen, um künftig ähnliche Unfälle zu vermeiden? Which measures will be taken to prevent such accidents in future .	32. Ort, Datum place and date CHEMIE LINZ AG Firmenstempel, firmenmäßige Zeichnung	

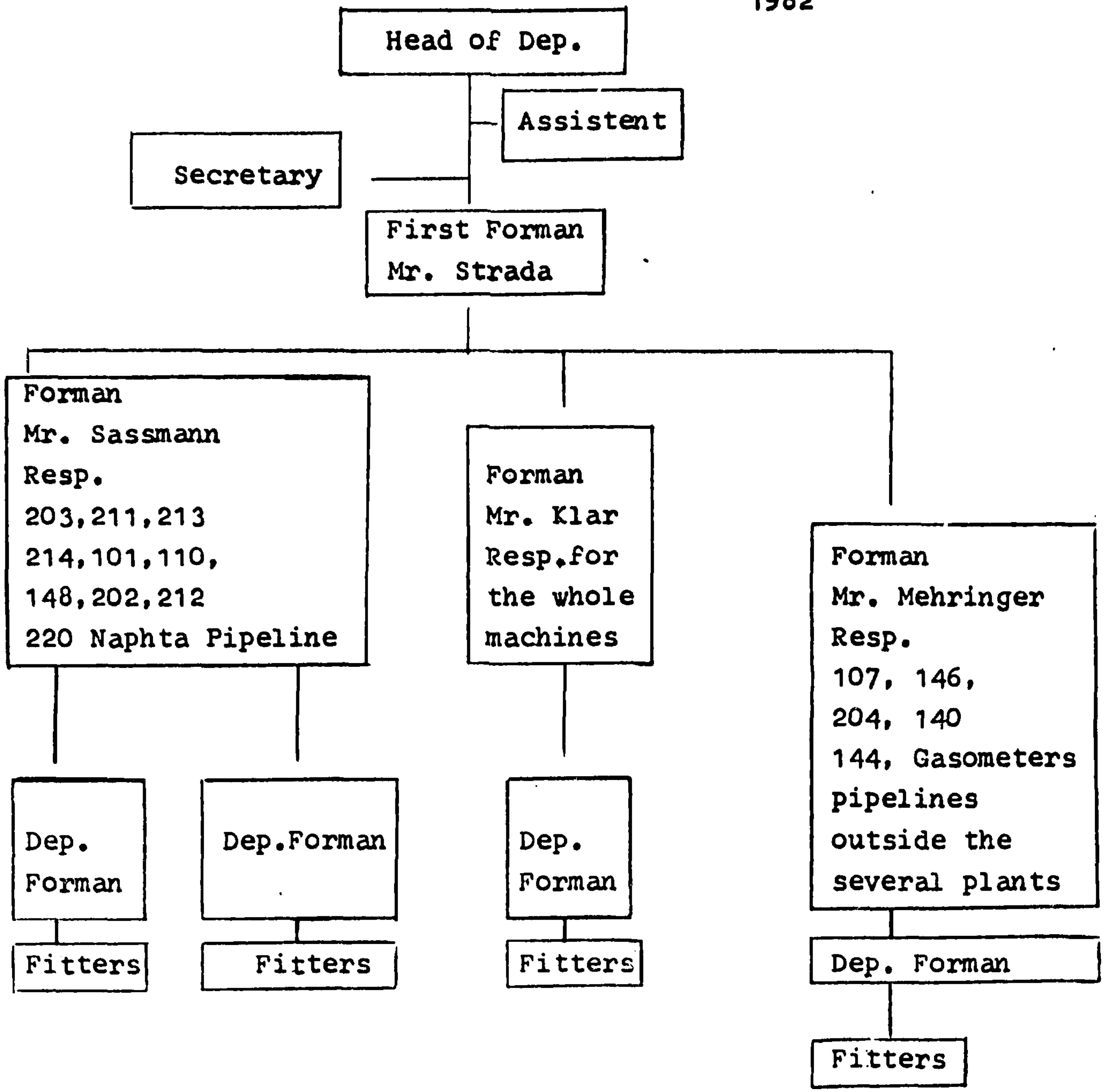
U – Nr.

Allgemeine Unfallversicherungsanstalt
GENERAL ... (COMPANY)
Landesstelle Linz, 4020 Linz
Blumauerplatz 1, Telefon (0732) 54 4 01

Dept. ATG
=========

Item	Instructor
1. Organization of dept. ATG	Skopetz
2. Responsibilities of dept. ATG	Skopetz
3. Daily routine work	Skopetz
4. Flowsheet cooling water supply	Luger
5. Flowsheet boiler feedwater plant	Luger
6. Flowsheet waste water neutralization	Luger
7. Cooling water return to Danube by elevation pumps	Skopetz
8. Flowsheet natural gas steam reforming	Luger
9. Maintenance to point 4,5 and 6	Skopetz
10. Maintenance to point 8	Skopetz
11. Special materials for the primary reformer	Luger
12. Demonstration pigtail-nipping	Workshop
13. Demonstration pressure filter flushing	Luger
14. Maintenance process air compressor	Skopetz
15. Inspection process air compressor	Skopetz
16. Pneumatically regulated suction valves	Luger
17. Piston rod sealing	Skopetz
18. Guide ring controlling	Skopetz
19. Used materials in boiler feedwater plant	Luger
20. Used materials in steam reforming plant	Skopetz
21. ATG-museum	

Organigram Dep. ATG 1982



Summary 34 Fitters
Summary Dep. ATG 46

2. Responsibilities of dept. ATG

The dept. ATG is responsible for the maintenance in the following plants:

107, 146	Old and new waterstation (river water and cooling water supply)
140	Chlorination station for well water (0,7 - 0,8 mg Cl/h H_2O)
144	Horizontal pumps for well water
204	Air dividing plant (2 units, each 1 700 Nm^3/h O_2), compressed air supply
204 a, b	Bottling of oxygen and compressed air
206, 209	N_2-gasometers (2 000 m^3, 500 m^3)
207	O_2-gasometer (10 000 m^3)
208	Cracked gas (N_2 + H_2)- holder (25 000 m^3)
R.Br.	Pipe bridges
RN	Network of pipes, piping of: KOG, natural gas, heating gas, cracked gas, steam 25, 20, 7, 2 bar, compressed air, river-, well-, hot (90°C)-, warm (40°C)-, drinking-water, boiler feed water, condensate, oxygen.

Machines, compressors and pumps in dept.-urea (except standard pumps).

212	Battery (block) of bottles for high-pressure N_2
202	Old gas dividing plant (reforming plant)
220	Naphtha and Orthoxylol tanks and pump stations (tank farm)

./2

Pipelines for naphtha and orthoxylol

101, 211	Natural gas pressure reducing stations
110	Old boiler house (2 units, each 12 t/h steam 25 bar)
110 a, b	Contact mud circulation reactors (flocculators)
203	Boiler feed water treatment
213	Naphtha intermediate storages
214	Naphtha - steam - reforming plant (ICI-plant)
148	Waste water neutralization

Dept. ATG has to organize all planned shut downs for these plants and also for the several machines (routine overhaul). ATG is on this way responsible for the maintenance cost in all plants also for the cost of foreign departments working in a. m. plants.

Resp. for programs, spare parts.

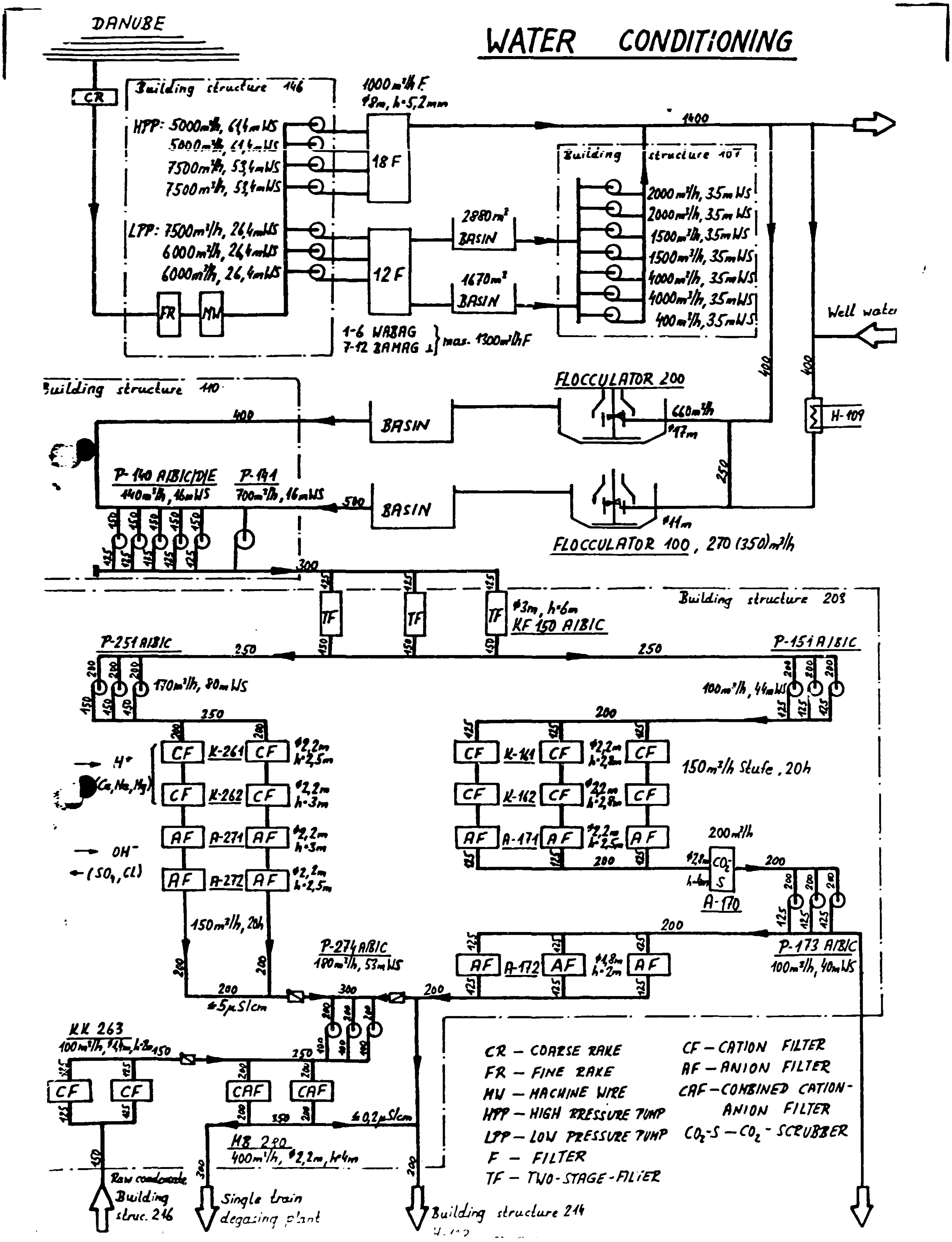
3. <u>Daily routine work</u>

Maintenance philosophy

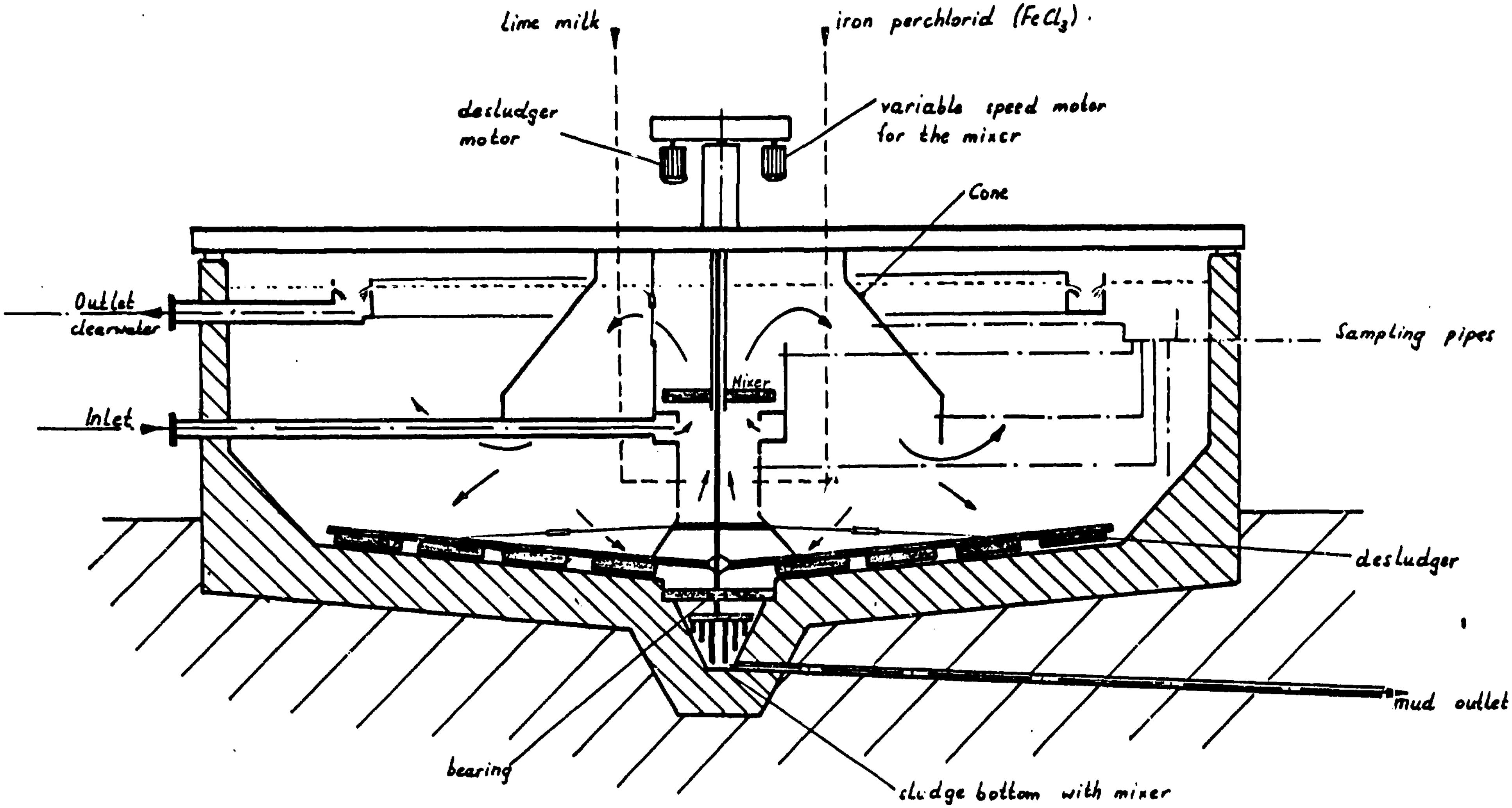
D A N U B E   W A T E R

pH	8
Conductivity	263×10^{-6} S/cm (S=Siemens $1S=\frac{1A}{1V}=\frac{1}{1\Omega}$)
CO_2 - free	2,0 mg/l
O_2	6,7 mg/l
Alkalinity	2,55 mval/l
Hardness	$8{,}6^{o}$dH = 153,9 ppm = 3,1 mval/l
Carbonate hardness	$7{,}1^{o}$dH = 127,1 ppm = 2,5 mval/l
Not-carbonate hardness	$1{,}5^{o}$dH = 26,8 ppm = 0,6 mval/l
MgO	19,4 mg/l
CaO	58,8 mg/l
Solid residue from evaporation (105°C)	214 mg/l
Solid residue on ignition (650°C)	122 mg/l
$KMnO_4$	19 mg/l (max.30 mg/l)
Fe	0,31 mg/l
SiO_2	3,9 mg/l
HCO_3	156 mg/l
NO_2	0,08 mg/l
NO_3	14 mg/l
Cl	9 mg/l
SO_4	29 mg/l
P_2O_5	0,19 mg/l
NH_4	0,12 mg/l
Na	6,6 mg/l
K	4,0 mg/l
Suspendid sticks max.	12 mg/l (for short time max. 200 mg/l)
average	3 - 4 mg/l
Fouling factor of waterside: by tube temp. of cooling water side	$\leq 50°C = 2 \times 10^{-4} \frac{m^2h°C}{Kcal}$ $> 50°C = 4 \times 10^{-4} \frac{m^2h°C}{Kcal}$
Temperature winter	1°C
summer	20°C
Temperature rise of return water	10°C

WATER CONDITIONING



FLOCCULATOR



KSU - Reactor (Flocculator)

The "Contact-Mud-Circulation-Reactor" is especially used for conditioning of surface water which must be cleared of suspended matter, colouring substances, organic dirts and carbon. Furthermore good results are attained in other fields of water treatment, especially at deironing, demanganition, deacidifying, deoiling, sterilizing (degerminating), removing of disagreeable odour- or flavour substances, but also algas and float lime. In the water treating process many of these effects are to be attained simultanously.

General technical data

Capacity:	5 - 3 000 m³/h (per unit)
Turn-around time: (dwell time)	about 60 - 90 minutes
Internal circulation:	3 - 5X quantity of flow (Capacity)
Saving of chemicals:	30 - 40% compared to conventional plants
Speed of climb-up:	appr. 3 - 5 m/h
Transparence in cleaned water:	often 1,5 - 2,0 m
Turbidity content in discharged water:	10 mg/l, often 3 - 5 mg/l
Rate of blow down:	0,5 - 1,0 % of capacity
Mud content:	15 - 25 g solid matter/l (97,5 - 98,5% water)

Function

First the untreated water flows into the cylindric middle-part and is there mixed with recycled deposite products and chemicals. The rising stream is produced by a speed regulated mixer which works like a circulation pump. This mixer makes a good mixture of all components: raw water, chemicals and chemically activ mud. By help of the contact effect of mud the formation of flakes begins immediately, increasing then quickly. After having passed the mixing zone water comes into the reaction zone and changes its streaming direction. In this zone all chemical reactions happen whereby the flakes grow and grow.

./2

Then a part of the water comes into the ascending pipe, while the other part streams to the outern parts of the reactor. On the bottom edge of the lower cylindric part of the big cone a sharp seperating zone is formed between mud and clear water. Mud particles sink to the bottom, clear water rises to the surface. In the outern area of the big cone the climbing speed goes slower and therefore even small mud-particles cannot rise. The clear, conditioned water flows into a top collecting channel (grouve). By a slowly turning desludger the sunken mud is transported into the slim pit and is then further thickened. An automatic valve remove the mud from the reactor in intervals.

O p e r a t i o n

The characteristic feature of the KSU-reactor is the internal circulation; a quantity of 3 - 5 times of the capacity flow is circulated in the mixing and flocculent zone. In this cycle a lot of activ mud is carried along, so that each particle of raw water often touches mud and chemicals. The particles of slim work as crystal centers on which products of precipitation settle down directly. This principle of so called "contact mud circulation" is the real reason for the surprisingly good conditioning effect. Good working of the reactor can be seen on the sharp seperating zone between muddy water and rising clear water, further on the quick sinking process of old dereacted mud.

./3

Total demineralization / Fundamental principles

Since long time it is known, that salts dissolved in water dissociate more or less into their components, that means intoions. Common salt, (kitchen salt) for example, dissociates to the positive sodium ion and the negative chlorine ion. By this dissociation water is electrically conductive and so it is possible to separate cations and anions by direct current. Nearly all salts dissolved in water dissociate so in cations and anions and the most important of them can be put in order as to be seen in the following scheme:

cations	anions		
Ca	$(HCO_3)_2$	K	H
Mg	$(HCO_3)_2$		
Ca	SO_4	N	
Mg	SO_4		
Ca	Cl_2		
Mg	Cl_2		
Na	Cl	neutral salts	
Na_2	SO_4		
Na_2	SiO_3		
K	= carbonate hardness		
N	= not-carbonate hardness		
K + N = H	= total hardness		

Not all ions are equally good absorbed or delivered by ion exchangers. A very good exchanging is given between cations and hydrogen ions and between anions and hydroxyl ions. Polyvalent ions of heavy metals, like iron and maganese are first taken up by cations, followed vy alkaline earths, like calcium and magnesium and at last potassium and sodium. A cation exchanger which is loaded with these ions is regenerated by acid. In this process the cations are pushed away by the hydrogen ion of the acid. According to the law of mass action (Guldberg and Waage ´s law) a surplus of acid is necessary (opposite to the theoretical quantity) for finishing the regeneration. The same is current for the regeneration of anion exchangers by sodium hydroxide solution. If ion exchange substance is exhausted the ion most difficult to be exchanged will break through first. It is sodium at the cation exchanger and it is silicic acid at the anion exchanger.

The ions which are able to be exchanged are not only on the surface of the grains of the exchange resin but also inside (interior). That means that exchanging reactions need a certain minimum time, to obtain relations between quantity of water, speed of filter process and quantity of exchange resin.

Variations are possible like strongly acidic and slightly acidic cation exchanger or strongly basic and slightly basic anion exchanger. Slightly acidic cation exchangers can be regenerated without a surplus of acid and slightly basic anion exchangers without a surplus of sodium hydroxide (caustic soda). In a combined employment of "slight"- and "strong"- exchangers it is possible to further use the surplus of chemicals which is absolutely necessary for the "strong"- excha..gers for the regenerations of the "slight"- exchangers. By this a lot of chemicals can be saved. So it is more economic.

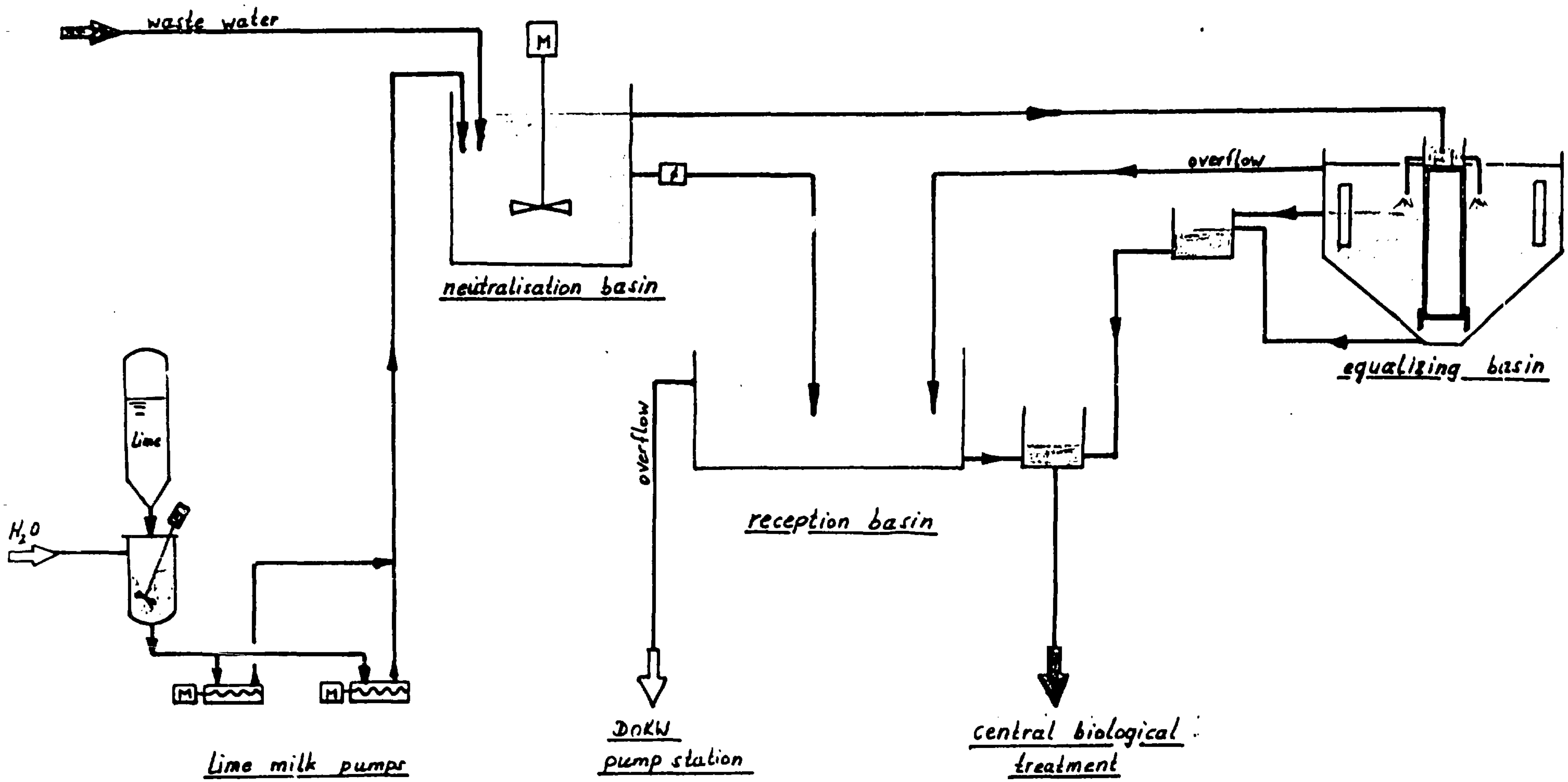
The combination of a contact mud circulation reactor with sand filters and a total desalization (demineralization) enlarges the economical possibilities of application of total demineralization plants, especially of plants with large hourly capacities.

Total demineralization / Process

Such a plant consists of cation and anion exchangers which must be regenerated when the substance (resin) is exhausted. The regeneration process lasts 4 - 6 hours. In this time the plant is working with another row. So it is necessary to have at least two rows of apparates. Further it is a great advantage to have clear water reservoirs (vessils) at the end of the plant for short time requirements of 3 - 4 hours, e.g. for small repairs or short troubles.

Mixed bed filters are situated only in the last stage; they are considered to be safety devices. The water treatment should be finished before mixed bed filters. They have only the function to catch or to kill irregularities or natural "slippage". By this working safety (reliability) of the plant is increased, and for pre-inserted filter groups costs in demensioning of all apparatus (filters) and operating expenses can be saved because these apparatuses can be fully loaded without risk.

WASTE WATER NEUTRALISATION



Organic waste water system

In our factory are two different waste water systems. One is the normal cooling water return systems and the other one is water contaminated with organics. This contaminated water we have to collect in a special channel system with several pump stationes and fan stations for the air supply in the tube systems. This system falls into a neutralisation basin. There we have to neutralize the waste water to a pH in the range from 6 to 8 (The average should be about pH 7).
The pH from the waste water coming from the different departments should minimum pH 4. After neutralisation with lime milk and mixing the neutralized water is running in a equalising basin.After equalising the water goes to the central biological treatment in Asten (Near the power station Abwinden-Asten).

By exceeding the pH limits in the neutralisation basin a butterfly valve opens automatically and the waste water runs to a reception basin.

HISTORY OF N_p - PRODUKTION (ATG)

N_p .... parts of N in NH_3 (14 Mol N + 3 Mol H = 17 Mol NH_3)

Spring 1940: Begin of raising the terrain about 2 - 4 m.
Autumn 1942: Starting of production on basic KOG.
(1 unit for desulphuration, 3 units for gas dividing and 3 for CO-conversion).
1944: Output 55 000 t N_p/a
1944/1945: to about 800 bombs from allied airforces exploded in Chemie Linz-area and plants
May 1945: -
July 1946: No production as neither KOG nor energy were available
1948: Output from 1944 was reached again
↓ Production increase
1965: to 237 000 t N_p /a or 718 t/d max.
(3 units for desulphuration, 6 for gas dividing and 7 for CO-conversion)
1966: Start up Naphtha-Steam-Reforming plant.
↓ Increase
1974: to about 320 000 t N_p/a.
1979: to about 520 000 t N_p/a.
1980: to about 480 000 t N_p/a.

NAPHTHA - STEAM - REFORMING - PLANT (ICI-PROCESS)

General:

Engineered by Humphreys & Glasgow, London, 1964 - 1966; erected by ourselves. Laying out: 300 T Np/d (365 t NH_3/d) at a pressure of 28 bar (max. 31 bar). Beyond of ICI licence (our risk) we increased the working pressure (inlet prim. reformer) to 38 bar and the daily output to 420 t Np (510 t/d NH_3). We had bought machines, apparatus and pipes qualified for the higher pressure.

Feedstock:

1966 (start-up) - 1976 Naphtha (strait run benzines) since 1976 natural-gas.

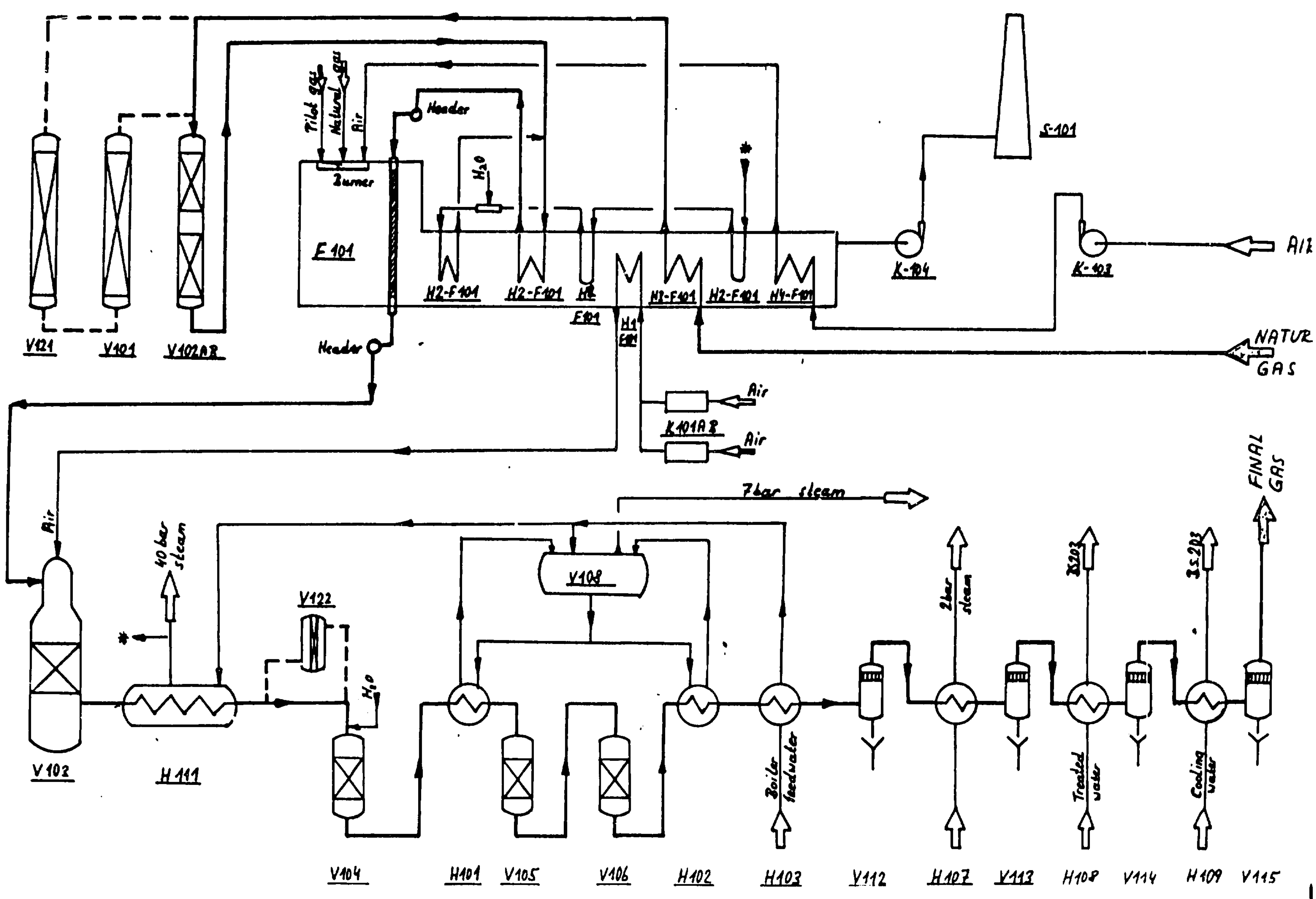
Maintenance:

	hours	material cost (mill. AS)
1974	21 000	1,3
1975 general overhaul	56 000	7,4
1976	24 000	1,6
1977 general overhaul	46 000	4,2
1978	16 000	1,6
1979	21 000	0,8
1980	49 000	0,1
81	16 000	0,9

On stream days:

1974	363
1975 gen. overh.	324
1976	366
1977 gen. overh.	325
1978 intended 3 days-shut down during Single-train-shut down for welding piping - connectiens between both plants.	362
1979	365

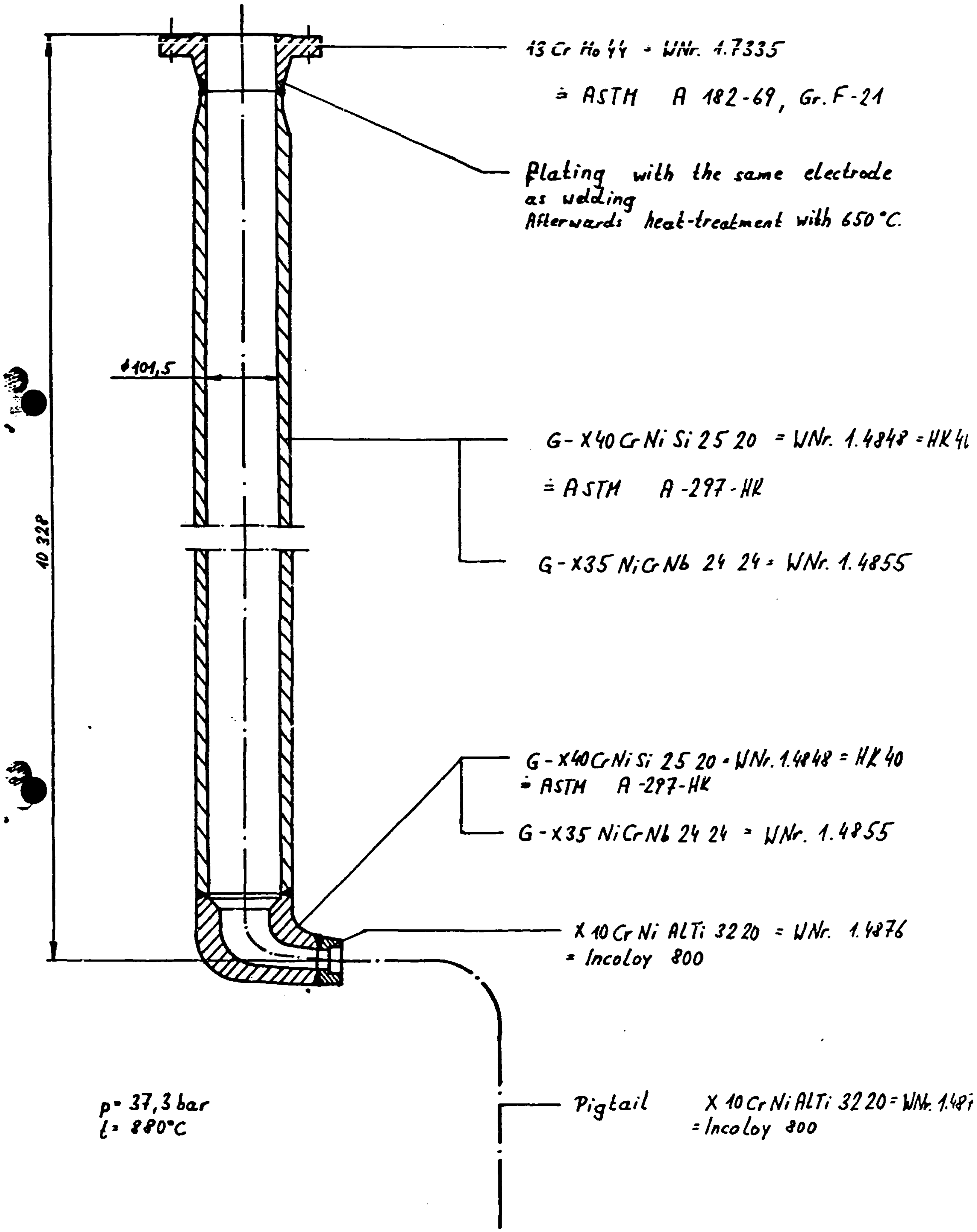
NATURAL GAS STEAM REFORMING



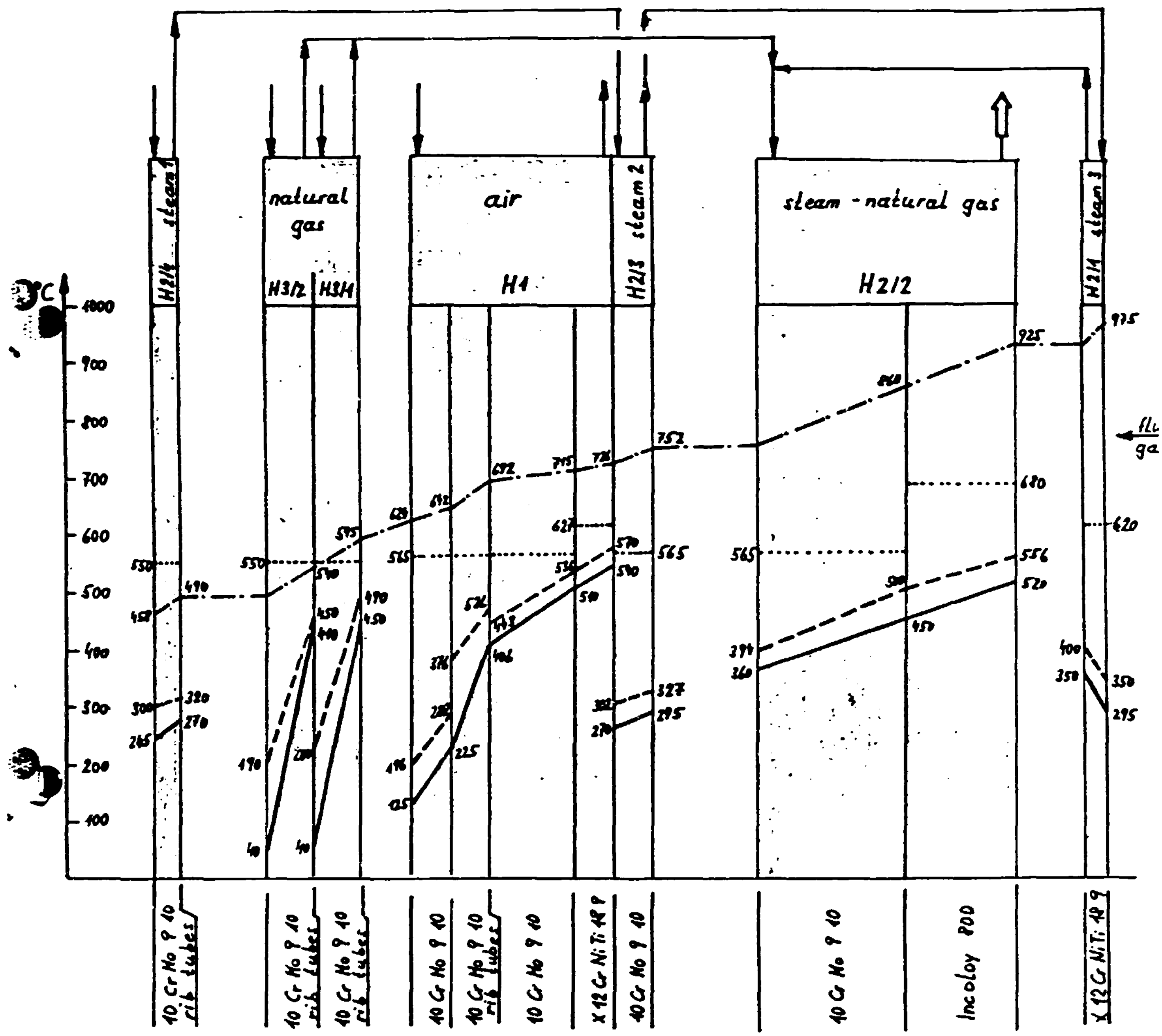
F - 101	Primary reformer
H 1 - F 101	Process air heater
H 2 - F 101	Heater for steam
H 3 - F 101	Natural gas heater
H 4 - F 101	Combustion air heater
K - 101 A/B	Air compressor
K - 103	Combustion air fan
K - 104	Flue gas fan
S - 101	Stack
*V - 101	Primary desulphurizer
V - 102 A/B	Secondary desulphurizer
V - 103	Secondary reformer
V - 104	Primary CO-converter
V - 105	Sulphur catch vessel
V - 106	Secondary CO-converter
V - 108	Steam drum
V - 112, 113, 114, 115	Gas-separator
*V - 121	Carbon catch vessel
*V - 122	Potassium catch vessel
H - 101	Waste heat boiler
H - 102	Waste heat boiler
H - 103	Boiler feedwater
H - 107	2 bar steamboiler
H - 108	Treated water cooler
H - 109	Raw water cooler
H - 111	Waste heat boiler

* Only by naphtha steam reforming in action.

FURNACE TUBE



CONVECTION ZONE



—— product temperature

– – – tube temperature

–·–·– flue gas temperature

·········· max. allowable tube temperature

1. Furnace Tube

a. G - X 40 Cr Ni Si 25 20 = W.Nr. 1.4848 = ASTM A - 297 - HK

Approximate analysis: C~0,4%, Cr~25%, Ni~20%, Si~2,5%
Melting point: 1400 °C
Working temperature: 800 - 950 °C
Weldability: Good
Thermal expansion between 20 °C and 1000 °C: $19{,}0\ 10^{-6}$ m/m °C
Heat conductivity (20 °C): 0,147 J/cm s °C
Tensile strength σ_B (20 °C): 440 N/mm2
Yield point $\sigma_{0,2}$ (20 °C): 245 N/mm2

b. G - X 35 Ni Nb 2424 = W.Nr. 1.4855

Approximate analysis: C~0,35%, Ni~24%, Cr~24%
Melting point: 1350 °C
Working temperature: 850 - 1000 °C
Weldability: Good
Thermal expansion between 20 °C and 1000 °C: $19{,}6 \cdot 10^{-6}$ m/m °C
Heat conductivity (20 °C): (~0,148 J/cm s °C)
Tensile strength σ_B (20 °C): 440 N/mm2
Yield point $\sigma_{0,2}$ (20 °C): 245 N/mm2

c. X 10 Cr Ni AlTi 3220 = W.Nr. 1.4876 = Incoloy 800

Approximate analysis: C~0,1%, Cr~32%, Ni~20%, Al ≤ 0,6%, Ti ≤ 0,6%
Melting point : 1350 °C
Resistant on air to: 1150 °C
Weldability: Good
Thermal expansion between 20 °C and 1 000 °C: $18{,}7 \cdot 10^{-6}$ m/m °C
Heat conductivity (20 °C): 0,097 J/cm s °C
Tensile strength σ_B (20 °C): 540 N/mm2
Yield point $\sigma_{0,2}$ (20 °C): 245 N/mm2

d. 13 Cr Mo 44 = W.Nr. 1.7335 = ASTM A 182-69, Gr. F-12

Approximate analysis: C ~ 0,13%, Cr~1%, Mo~0,4%
Working temperature: max. 530 °C
Tensile strength σ_B (20 °C): 440 N/mm2
Yield point $\sigma_{0,2}$ (20 °C): 275 N/mm2

2. Convection Zone

a. 10 Cr Mo 9 10 = W.Nr. 1.7380 = ASTM A 199-Gr. T 22

Approximate analysis: C $\leq$ 0,1%, Cr $\sim$ 2%, Mo $\sim$ 1%
Working temperature: max. 530 ^{o}C
Tensile strength σ_B(20 ^{o}C): 440 N/mm2
Yield point $\sigma_{0,2}$(20 ^{o}C): 265 N/mm2

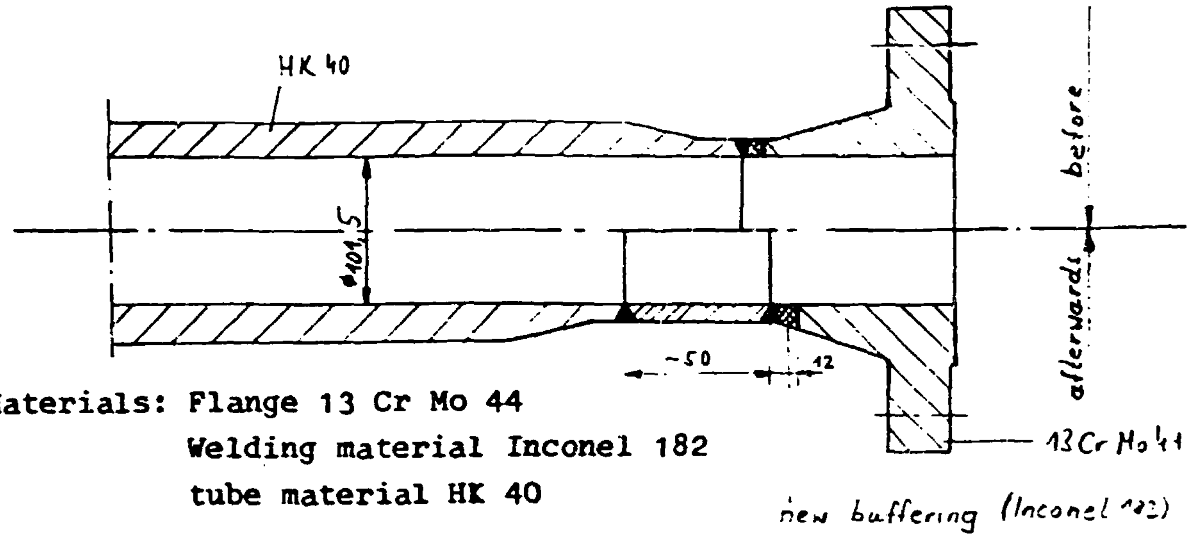
b. X 12 Cr Ni Ti 18 9 = W.Nr. 1.4878 = Austenitic steel Cr Ni 150:17/4 N 634 (H32)

Approximate analysis: C $\leq$ 0,12%, Cr $\sim$ 18%, Ni $\sim$ 9%, Ti $\geq$ 4 x C
Resistant on air to: 800 ^{o}C
Weldability: Good
Thermal expansion between 20 ^{o}C and 800 ^{o}C: 19,0 $\cdot$ 10^{-6} m/m ^{o}C
Heat conductivity (20 ^{o}C): 0,147 J/cm s ^{o}C
Tensile strength σ_B (20 ^{o}C): 490 N/mm2
Yield point $\sigma_{0,2}$(20 ^{o}C): 245 N/mm2

c. X 10CrNiAlTi 3220 = W.Nr. 1.4876 = Incoloy 800

see 1 c.

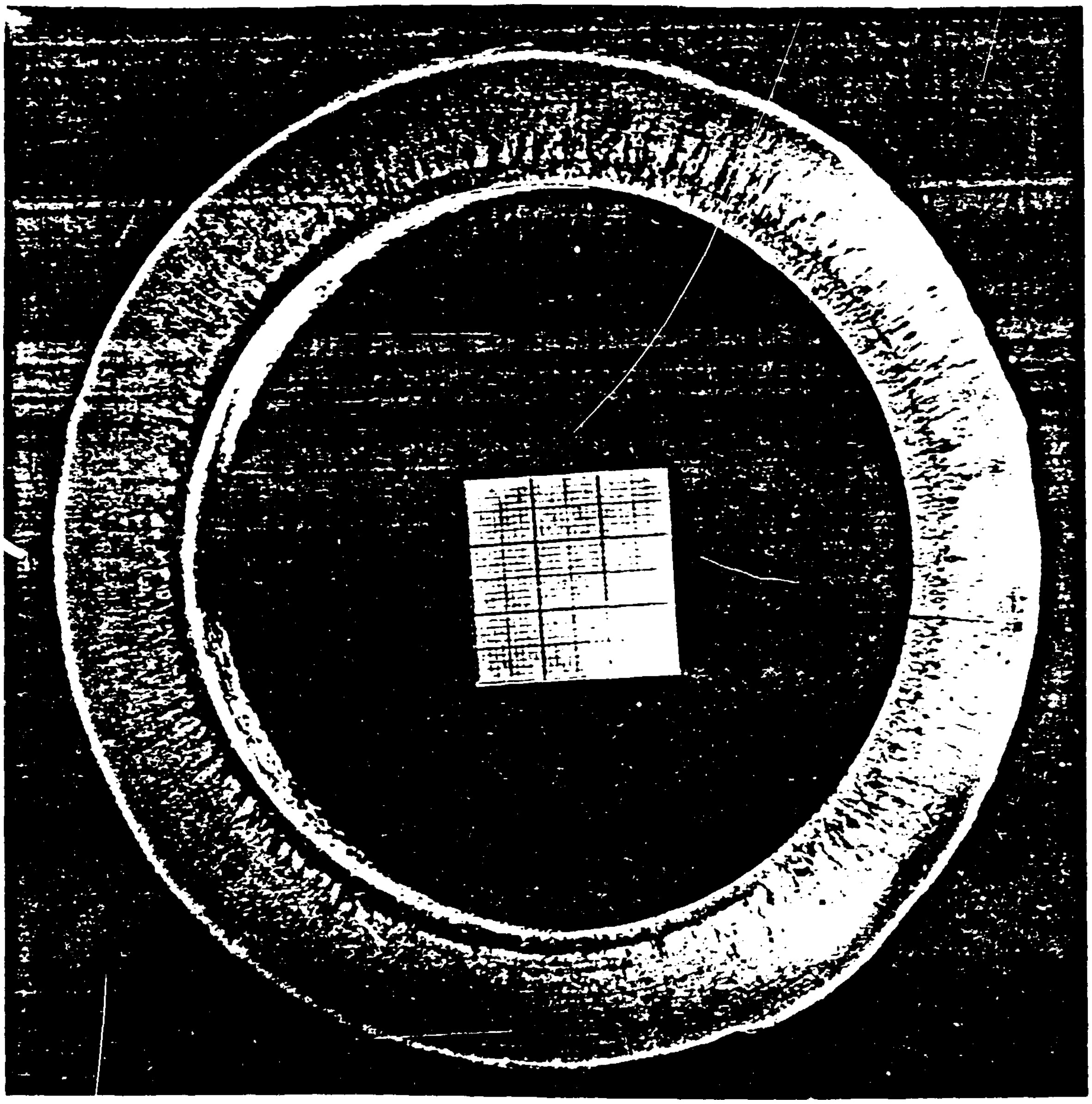
Welding procedure for furnace tubes after stress corrosion:

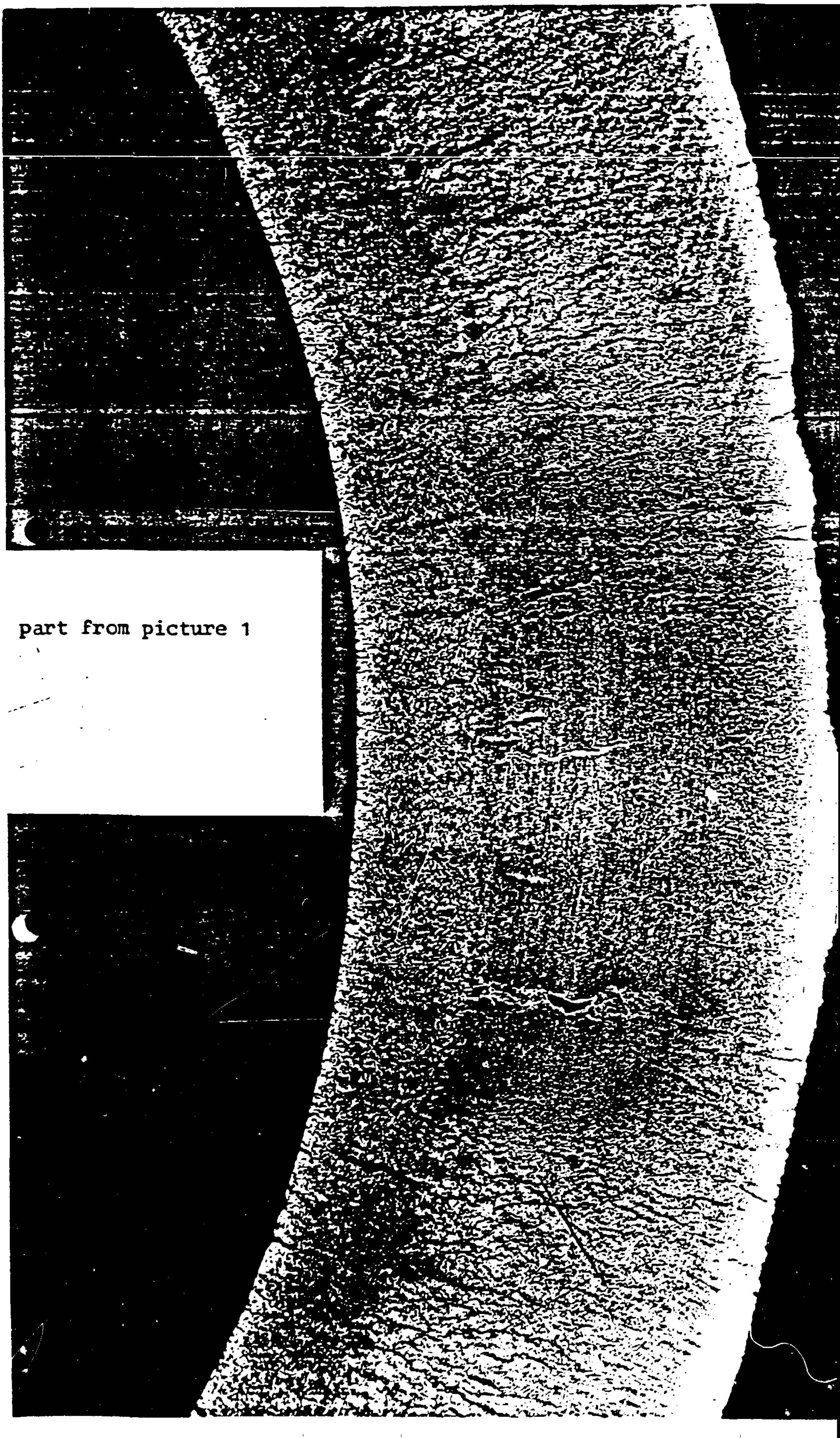


Materials: Flange 13 Cr Mo 44
Welding material Inconel 182
tube material HK 40

1. Cut the flange
2. Turn the flange for buffering
3. New buffering (material: Inconel 182)
   minimum 12 mm
4. Buffering turn to wall-thikness.
   The front is to cut under 90°.
5. x - ray test - quality is IIW-black.
6. Heat the flange for half an hour at 700°C - cooling to 300°C, in the oven, rest in air.
7. Turn the weld - phase.
8. Dye penetrant test of the buffering.
9. Dye penetrant test of the tube end.
10. Cut the failers and turn the weld - phase.
11. Dye penetrant test this weld phase.
12. Weld the flange
    look to the lenght - tolerance
    Welding: Ground Inconel 182, rest with Böhler Fox NiCr70 Nb.
    By heating to 70°C avoide condensate rise.
13. Dye penetrant test the ground of welding.
14. " " " " top layer.
15. X-ray test quality IIW-black
16. Attention at the transport - tubes are brittled!

Furnace Tube after 34 500 running hours included 10 000 hours uncooled





part from picture 1

Oxidation on the outside

Oxidation on the inside

BLANKING-OFF REFORMER TUBES DURING PLANT OPERATION

B. ESTRUCH

1. Introduction

When a reformer tube bursts during service the loss of gas through the leak is not necessarily intolerable but the leaking gas ignites inside the furnace and causes overheating of the surroundings. To prevent damage to the refractory and to the neighbouring tubes, it is necessary to isolate the failed tube.

To achieve this either the design must make provision for shutting off any individual tube or, if simple welded up connections are used the whole unit must be shut down and cooled so that the failed tube can be cut out and replaced, or the connections plugged by welding.

Because the outlet pigtails usually operate in the region 700 - 800°C, and no valves are known that could be fitted in each pigtail, and because at any rate the expense and complication of fitting them in the design would be considerable, an all welded design is normally adopted. Initially, when an overheated tube leaked the furnace had to be taken off line losing some 36 hours production. This represented a serious loss of output. Apart from that in reformer plants built for the production of town gas the manufacturing authority is under legal compulsion to maintain a minimum gas pressure and it could hardly afford to shut down a furnace even for only 30 hours hould a tube fail during a period of peak demand. Consideration was, therefore given to methods of blanking-off leaking tubes which would not necessitate shutting the plant down.

2. Background

It has been standard practice for many years to squeeze mild steel pipes on gas and water service when it had become necessary to isolate a line and a number of devices are commercially available for this pupose. However the application of gross plastic deformation to pressure equipment containing hot inflammable gases had not been considered. The commercially available apparatus for low temperature service are hydraulically operated which is an advantage but their frame has to be dismantled and then reassembled on to the pipe to be squeezed. This would have been perhaps acceptable for inlet pigtails where the temperature is around 400°C, but the manipulation
involved would not be acceptable in the proximity of the hot outlet pigtails (700-800°C). For that reason a G clamp squeezer was designed so that the unit could be placed onto the pigtail where it runs horizontally adjacent to the reformer tube (Clark and Elmes Paper 2, Fig. 2) and all that was required in the way of preparation was t remove the lagging on this section.

3. G. Clamp Squeezer

Details of the squeezer are given in the drawing in Fig. 1 and the photograph of Fig. 2. It is driven by a short 6 ton hydraulic ram, manufactured by Epco Flexi-Force.

The main advantages of this design are:

(1) The G shape of the frame reduces manipulation near the pipes before squeezing to hanging the device onto a horizontal part of the pigtail.

(2) It is connected to the pump by means of a pressure hose of convenient length so that the operator is at a safe distance while the tube is being squeezed. It is relevant to mention here that in the event of a pigtail cracking while being squeezed, Billingham experience has shown that the fire that results

from a pigtail failure does not cause significant damage.

(3) Should any accident happen to the hydraulic ram, to the hose or to the pump the quantity of oil involved is very small (1-2 pints).

(4) After squeezing the jaws can be fastened together by means of screws to form a permanent clamp to prevent the internal pressure opening up the squeezed pipe. The G clamp and hydraulic ram can then be removed by simply letting the jaws slide off along the guides shown in the drawing.

(5) The jaws are kept in position by means of ball catches while the clamp is being hung while pressure is being applied.

(6) Two lateral sheet metal pieces locate the clamp jaws on the pipe and are crushed away as the squeezing operation is in progress.

4. Laboratory Tests

Although from the above considerations it appeared that blanking-off reformer tubes by flattening the inlet and outlet pigtails could be achieved with reasonable safety it was decided to carry out some preliminary tests on a laboratory scale.

In order to simulate plant conditions a test rig was arranged in which a length of pipe could be electrically heated by making it an integral part of a circuit connected to a low voltage high current sousce. One of the ends of the tube was blanked-off and the other connected to a 275 p.s.i.g. steam line. Provision for measuring the steam pressure and for measuring and controlling the temperature during the tests was made. Samples of both Incoloy and

Cr-Mo pipe were tested. The clamp itself was tested under a 7 ton load without it showing any permanent set.

4.1 Incoloy Pigtails

Two samples of extruded Incoloy DS tubing, 1.11/32 in. o.d. x 8 s. w. g. as used for the fabrication of the outlet pigtails were used for the trials. One sample was ex-stores but was aged for 72 hours at 800°C in order to bring it into a condition nearer to that of the pipes after service. The second sample was cut from an actual pigtail which had failed due to the presence of manufacturing defects after a few months in service.

These samples were heated to 800°C before squeezing. During the first test as the jaws touched the tube, the temperature dropped quite considerably but by insulating the ends of the pipe the temperature drop was eventually reduced to about only 20°C.

In all, eight trials were performed. The results were completely satisfactory except in one case, when a number of small cracks developed on the outside of the pipe but no leak occurred. This cracking was not thought to be significant because the trial was done on a part of the pipe which had been overheated to nearly melting point during the initial attempts to adjust the temperature. Figure 3 shows the general appearance of the tube and Figure 4 a cross section through one of the flattered parts.

4.2 Cr-Mo Pigtails

The tests were done at 400°C on a length of 1% Cr-Mo steel pipe 13/16 in o.d. x 5/32 in. wall as used for the inlet pigtails. At this temperature the tube was too strong for the squeezer and a perfect flattening could not be achieved. In order to increase the stress on the pipe the width of the jaw faces of the clamp was reduced from 1/2 in. to 1/8 in. but then the ductility of the material was insufficient and the tube wall sheared. It was found possible to avoid this by carrying out the operation in two stages. In the first a set of jaws with 1/2 in. wide and slightly curved faces was used. This spread the deformation over a large area but still left a gap between the two wall faces. A second pair of jaws with faces 1/8 in. wide and semi-circular cross section was used to close the gap. To achieve this the load had to be increased to 8,5 tons. The clamp withstood this overload well. Figures 5 and 6 show the results of the tests.

During the tests it was found that the original jaws in 18/8/Ti were too soft and yielded appreciably during operation. This was prevented by protecting the jaw faces with welded inserts of heat treated FV520 (B) steel whose yield strength is about three times higher than that of 18/8/Ti steel.

5. Plant Experience

The pigtail squeezer has been used successfully on several occasions to isolate leaking reformer tubes. Squeezing the inlet pigtails has proved to be as easy in the plant as it was in the preliminary trials.

On the other hand with outlet pigtails trouble has been experienced on the three or four occasions owing to cracks forming during the operation. It appears that the difficulties are due to a combination of the following factors:

(1) Embrittlement during service. It is known that the ductility of Incoloy DS decreases with time due to an age hardening process. The use of Incoloy 800 which is now readily available and reputed to be less prone to embrittlement during service will probably improve matters.

(2) Decrease in temperature. As soon as the flow of hot gas through the pigtail is restricted the metal temperature begins to fail and so does its ductility. The more quickly the operation is completed the less likely it is for trouble to occur. The possibility of increasing locally the temperature of the outlet pigtail prior to squeezing is also being considered.

(3) The occasional presence of score marks on the surface and stringers of inclusions inside the pipe wall which facilitate the initiation and propagation of cracks.

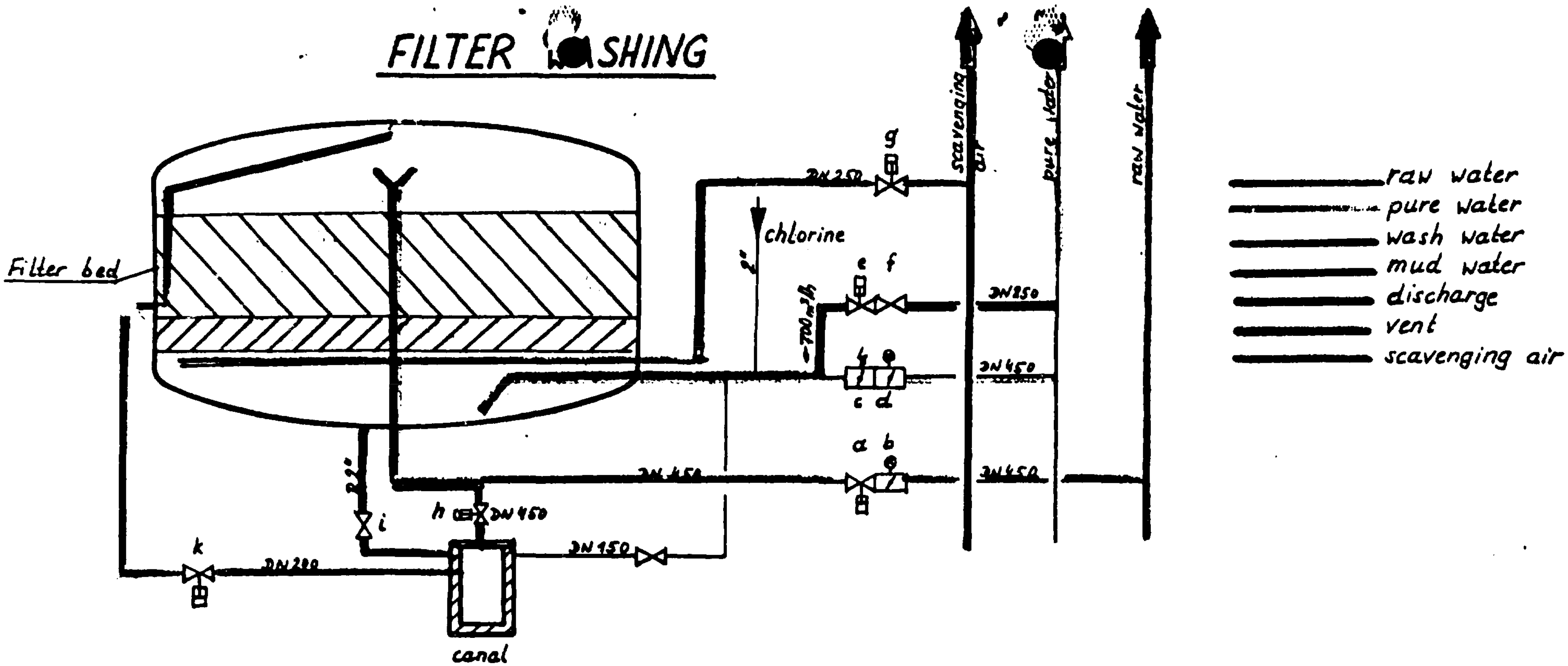
In spite of these occasional difficulties it has always been possible to blank-off the failed reformer tube. Even after cracks have appeared in the pigtail its flattening has been achieved at a second attempt.

The use of screwed on jaws to maintain the pigtail gas tight has proved necessary. Whenever the jaws have been removed the leakage of gas from the reformer tube has been seen to increase gradually becoming excessive after some time. A second application of the squeezer and permanent clamping of the pigtail has been sufficient to reduce the leakage to a negligible amount.

Conclusion:

Blanking-off failed reformer tubes without having to shut the plant down, by squeezing the inlet and outlet pigtails at a temperature and under pressure, has been a complete success. So far no untoward incidents have occurred and provided adequate care is taken, the isolation of the failed tube can be achieved without danger to the operating personnel or to the plant.

FILTER WASHING

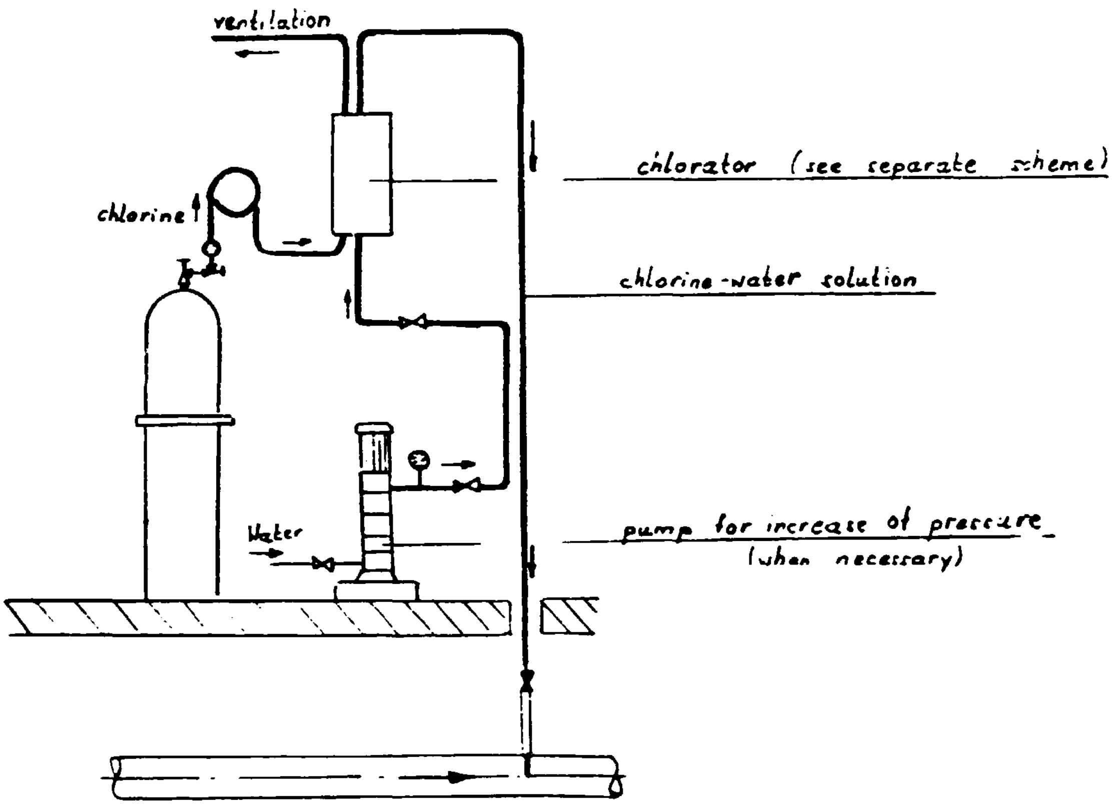


Filter :

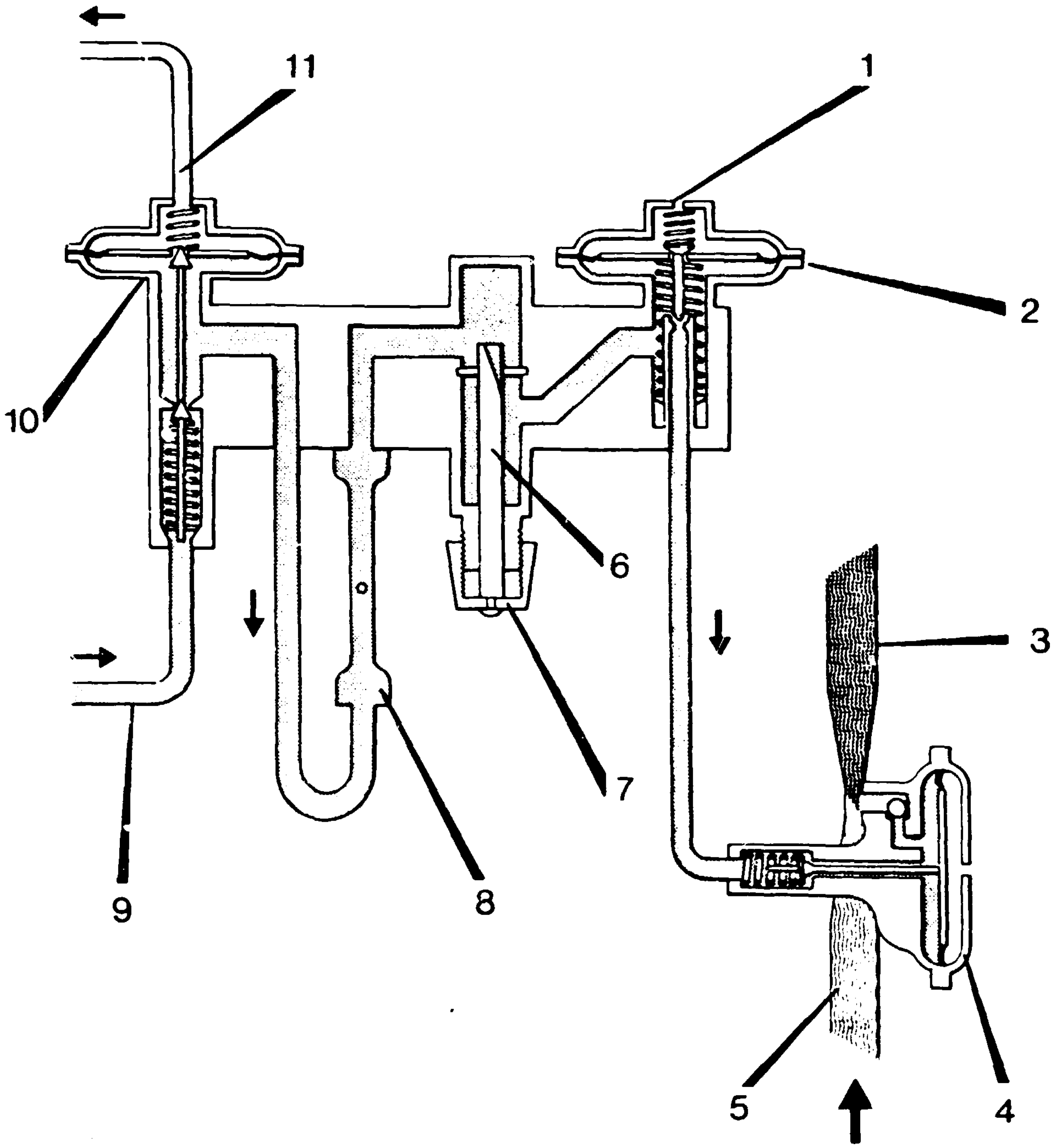
ø 8000 mm
h = 5200 mm
V = 240 m³
Q = 1000 m³/h H_2O
p = 6 barü

		open	closed
1) discharge	1 minute	i, k	a, b, c, d, e, f, g, h
2) air	2 minutes	g, k	a, b, c, d, e, f, h, i
3) air + water	11 —"—	e, f, g, h, k	a, b, c, d, i
4) air + water + chlorine	4 —"—	e, f, g, h, k, + chlorine	a, b, c, d, i
5) water	3 —"—	e, f, h, k	a, b, c, d, g, i
6) fill up with water	4 —"—	e, f, k	a, b, c, d, g, h, i
	25 minutes		
to filter		a, b, c, d	e, f, g, h, i, k

Chlorination



1	Compensation hole
2	Vacuum regulate valve
3	Chlorine - water solution
4	Injector
5	Water
6,7	Adjustable V-nozzle
8	Volumenometer
9	Chlorine inlet
10	Chlorine gas reduce valve
11	Ventilation



Wasser / Water / L'eau
Gas / Gaz
Lösung / Solution

Fig. 8 – Durchfluß-Schema

C H L O R I N A T I O N

The injector builds a vacuum for suction chlorine gas and mixing with water. The ball and the membrane prevent a flow back of the water into the chlorine installation when the solution outlet is closed or stopped up. For a good function of the injector it is necessary that the pressure before the chlorine inlet is very high against the back pressure.

The chlorine gas comes with pressure to the chlorine pressure reducing valve. There the pressure will be reduced below the atmospheric pressure because this valve opens only when the injector builds a vacuum. If gas comes into the valve without vacuum conditions, the membrane will lift up and the gas escapes through the vent pipe.
The chlorine flows from the pressure reducing valve through a volumenometer to an adjustable V-nozzle which regulates the chlorine gas capacity. After that is situated a vacuum regulates valve for building a suitable vacuum.
When the chlorine is empty of shut off the vacuum regulate valve closes. If the throttle is not enough the membrane will take off by the vacuum and air will enter. Through that the vacuum will be satiated.

Inspection of machinery of stage 2 and 3 - compressor east

Steps:

1. Measurement of guide rings at all of the 4 cylinders.

2. Cleaning of cooling rooms of all cylinders.

3. T. Inspect the position of piston rod with frame level (at upper and bottom dead center). The crosshead must be pressed on the running surface.

4. Remove piston and piston rod. To inspect or to flush (to level) the surface in the mainshop.

5. Remove bush, inspecting by TMP and build in again. Measurement over cross at upper and bottom dead center, inspection with frame level. Inspection must be done with valves fitted.

6. Measurement of clearance of crosshead.

7. Remove bolt of crosshead. Inspection of state of fit.

8. Remove crosshead and inspect in mainshop. (T. flush the furnace)

9. Remove balancing weight.

10. Remove side rod.

11. Measurement of breathing (swelling) of crankshaft.

12. Measurement of clearance of connecting rod bearing (big-end bearing). Measurement of 2 Ø (crank pin [stud] crank eye)

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Empfänger — 2 Unser Zeichen*) Blatt Tag

13. If modification of clearance is necessary, bolts must be fitted according to settled (defined) extension.

14. Both bearing bushes (pillows) must be fixed in the casing!

15. Points 3 - 13 are equally for both stages.

16. After measuring of swelling of both stages, remove main bearings n°. 2, 3, 4 and 5.

17. Removing main bearing
    a. Measurement of clearance
    b. Notice lenght of bolts in fixed state
    c. Notice lenght of bolts in loosen (unscrew) state
    d. Remove pillows. The crankshaft must be lifted by hydrantic tool the half of the clearance.
    e. Inspection of pillows by TMP
    f. Inspection of bearing necks (journals) by TMP

18. Replace main bearings

19. At both stages: like point 11.

20. Measurement of guideway of crosshead (Ø and II) of both stages.

21. Measurement of cylinder.

22. Replace side rod.

23. Replace crosshead.

24. Replace air packing, oil packing and piston (without rings!) Measurement of state of piston (clearance between piston and bush). Distance on the side on which the crosshead slides.
    1,[illegible] - 1,8 mm on the second stage and
    1,4 - 1,5 mm at the third stage from the piston.

./3

25. Testing the state of piston rod with frame level.

26. Finish assembling; measurement of dead space.

27. Cleaning of: airfilter, oilfilter, oil tub (tank), steam traps, nerve, oil fitting. Tightness test of air coolers.

28. Test run

29. Inspection by TMP
    a. Screws and threads
    b. Crosshead
    c. Pillows
    d. Bearing necks (journals)
    e. All antifatique shafts of screws
    f. Shoulder of bushes
    g. Ribs of cylinder covers (tops)
    h. Ribs of cylinders
    i. Shoulder of cylinders
       (connection between cylinder and casing)

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Empfanger | Unser Zeichen*) | Blatt | Tag

BROCHURE:

"N I P P I N G O F P I G T A I L S"

handed over.

*)Bei Bezugsnachrichten
bitte dieses Zeichen anführen!

A 11/18

B-136

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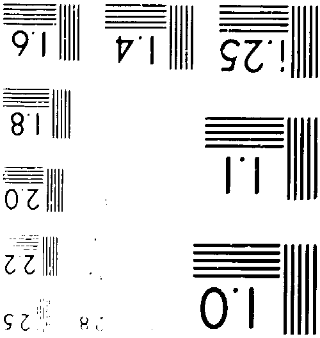


BROCHURES:

"HOERBIGER - Stepless Capacity Control System",
"FRANCE, Compressor Packing, Piston and Rider Rings",

handed over.

Adsorption-Safety-Loop in LINDE's air separation plant

From main condenser liquid oxygen comes to a pump which delivers it alternatively to one of two adsorption vessels filled with gel. Then liquid oxygen flows back to the main condenser. By this liquid O_2 is permanently in circulation through an adsorption apparatus. It holds back (adsorbs)98% of acethylene and propylene (propene). All hydrocarbons not adsorbed, like ethene, propane and so on somewhat enrich in the fluid.

By permanent taking out of the adsorption safety loop 1% of O_2-production and by evaporation of this rate the remaining hydrocarbons are removed from the separation column (main condenser) for the most part.

The adsorption vessel has a service life of 8 days. After this time filling must be regenerated and the circualtion happens through the other vessel. The content of acethylene in the main condenser is limited with 0,1 ppm. Analysis are made daily. By reasons of safety hot nitrogen (with a pressure of 5 bar) is used as regeneration medium.

BOILER FEED WATER TREATMENT - LIST OF MATERIALS

Parts of plant	Materials
Sand filters with fittings and piping	Carbon steel ASTM: A 283-C, with internal painting Tubes: A 53-A Valves: grey iron A 126 - class B
Ion-exchangers with fittings and piping	C-steel: RST. 37.2., internal rubber coated or stainless steel) Vessels: C-steel A 264, grade 6 367 clad. Tube: A 53-A, austenicic CrNi steel Valves: A 126 - class B, austenicic CrNi castings
Pumps in the area of ion-exchangers	A 126, class B, internal rubber coated or stainless steel, AISI 316 CB
H_2SO_4 (76%)-dosing pumps and f. and pipes	PVC Teflon
Na(OH) (50%)-dosing pumps with f. and p.	PVC
$FeCL_3$-dosing pump	PVC
Flocculator	Carbon steel, normal steel with painting

STEAM REFORMING PLANT - LIST OF MATERIALS

Parts of plant	Materials
Furnace tube	G-X 35Ni Cr Nb 24 24, n° 4855 G-X 40CrNiSi 25 20, n°. 4848 HK 40, ASTM A-297, 25 Cr/20 Ni
Outlet header	Centrifugal and static castings: 37 Ni/18 Cr Wrought fittings: Incoloy Alloy 800
Outlet pigtails	Incoloy 800, n°. 4876 Incolloy Alloy 800
V 103 - secondary ref.	Shell: ASTM: A 105 GII (P1), A 212 Gr. B Flange: ASTM: A 515-60 Bolts: ASTM: A 320 grade L7, A193, gr. B 16
H 111 - Waste Heat Boiler	Shell: A 105 Gr. I (P1) Tubes: A 335 Gr. P11 Flange: A 387 Gr. B P4
V - 104 -primary CO-converter	Shell: A 204 Gr. B, ASTM: A 335 Gr. P1 Flange: A 204 Gr. A
HH 101 - waste heat boiler	Shell: ASTM - A 515 - 60 Tubes: ASTM-A 106 Gr. B

STEAM REFORMING PLANT - LIST OF MATERIALS

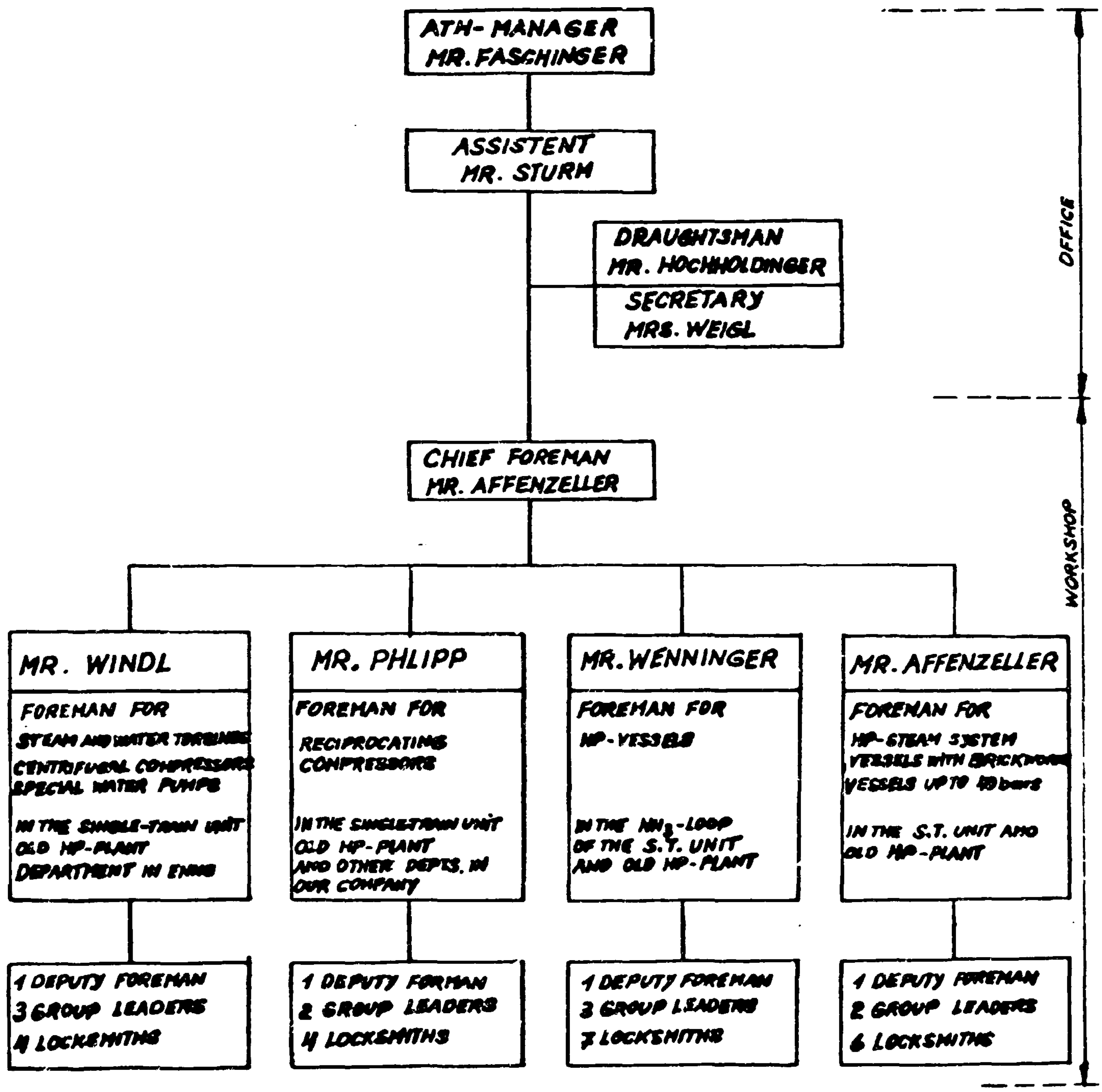
Apparatuses in convect.zone	Materials
Heater for steam $H_{2/1}F$ 101	Austenitic steel CrNi ISO: 17/4 N634 (H 32) ASTM: A 199 Gr. T 22 (P5), A 335-P22
Heater for steam $H_{2/4}F101$ Heater for steam $H_{2/2}F101$ and natural gas	ASTM: A 199 gr. T22 (P5) A 335-P22 ASTM: A199 gr. T22 (P5), A 335-P22 Austenitic steel CrNi, ISO: 17/4 N634, Incoloy 800
Process air heater H_1F 101 natural gas heater $H_{3/2}F$ 101	ASTM: A199 gr. T22 (P5), A335 -P22, austenitic CrNi steel ISO: 17/4 N634 (H 32) ASTM: A A199 gr. T22 (P5), A335-P22

STEAM REFORMING PLANT - LIST OF MATERIALS

Apparatuses	Materials
V 105 sulphur catch vessel	Shell: ASTM: A 212, gr. B; A 105 gr. II P1 Flange: ASTM: A 105 gr. I Bolts: ASTM: A 194 gr. 4
V 106 secondary CO converter	Shell: ASTM: A 212 gr. B, A 105 gr. II P 1 Flange: ASTM: A 105 - I Bolts: ASTM: A 194 gr. 4
H 102 waste heat boiler III	Shell: ASTM: A 515 gr. 60 Tubes: ASTM: A 210 gr. A-1
H 103 boiler feedwater	Shell: ASTM: A 515, gr .60 Tubes: ISO: R683 T 13/23a - ASTM A 240 gr. TP 316 (P8)
V 112, V 113, V 114, V 115 gas separator	Shell: ASTM: A 105 gr. I P1 Demister: ASTM:A 240 gr. TP 316 (P8)

ORGANISATION DEPT. ATH

A .... DIVISION A (AGRICULTURE CHEMICALS)
T..... TECHNIC
H.... HIGH PRESSURE PLANT



THE FOREMEN ARE ALLOCATED TO THE CERTAIN JOBS
THE WORKERS - IF NECESSARY - ONE CAN SHIFT BETWEEN THE
4 FOREMAN-GROUPS

RESPONSIBILITY OF DEPT. ATH

Maintenance of the existing ammonia single-train unit and old HP-plant in the best way (good performance, low costs, short time).

Improvement and rationalization of the different facilities and processes.
Preventing of accidents.
Controll of maintenance costs.
Working out of shutdown programs.
Co-operation with different departments concerning expansion of existing and installation of new plants.
Good contact with production people and some central departments (central work-shop, electrical dept., instrument dept., civil dept., design, safety,....)

Stand - by service from Friday to Monday:

1 engineer or foreman
2 locksmiths

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Empfänger | Unser Zeichen*) | Blatt | Tag

HISTORY OF AMMONIA PRODUCTION-PLANT (ATH)

1942: Starting of ammonia-production 75 000 jato N with 4 units, each with 80 to N/day.

1966: Expansion to 300 000 to N/year

1975: STARTING of ammonia single-train unit, 290 t/year
Lay out: 200 000 to N/year
1978: 242 000 to N/year, also we had a general revision for 6 weeks 320 t/year

Due to good operation and good maintenance the percental running time of all our facilities is very high.

(100 % = 365 days per year)

p.e.: Reciprocating compressors 99,5 %
General revision every 45 000 hours = 5 years

Single-Train-Unit
Maintenance

Lay out of the unit: 240 000 t/year NH_3 resp. 850 to/day NH_3
Feb. 1975: Start up of ammonia-production.

Production figures:

1975	200 000 t/year NH_3
1976	262 000 " "
1977	290 000 " "
1978	294 000 " "
1979	334 000 " "
1980	291 000 " "

daily production now: 1 000 t/day NH_3

For maintenance we needed:

	hours	material (Mio ÖS)
1975	117 000	11,2
1976	84 000	5,0
1977	60 000	7,1
1978	108 000 *	10,0 *
1979	40 000	1,6
1980	90 500 **	4,8 **

*) 1978 was the first general revision
**) 1980 a revision for changing catalyst in primary reformer
For this revisions we needed:

*)	67 000	7,0
**)	50 000	3,0

The investment costs for the single-train-unit was about 500 Mio ÖS in 1974.

On stream days:

	Syn. gas production	NH_3-production
1975	280 days	217 days
1976	317 "	294 "
1977	335 "	321 "
1978	326 "	313 "
1979	362 "	355 "
1980	328 "	310 "

Development of Syngas-Compressors of Single-train-Plants

In the first Single-train-plants, designed by Kellog there were used syngas-centrifugal compressors which were developed by Clark. The pressure in ammonia reactor was fixed with ca. 160 bars. To reach such a pressure Clark has designed compressors with two cases. The speed was approx. 10 000 rpm.

Improving the efficiency of ammonia synthesis made it necessary to increase the pressure in the ammonia synthesis. Nuovo Pignone, BBC, Cooper-Bessemer and Clark designed compressors which reached a pressure of 320 bars.

One of the problems of high speed centrifugal compressors is their low weight, compared for example with receprocating compressors.

The pipelines to and from the compressor have large diameters, there is existing high pressure.

Therefore it is very important to prevent forces of reaction delivering to the compressor. This also is a very important point for steam-turbines. The reaction force of steam pipelines is - caused by the high temperature of steam (500°C) - very large. In our plant we did not make good experience with pipeline carrier with springs because the reaction force of the spring depends on the spring-constant.

So we concepted carriers held by weights. This kind of carrying pipelines needs more place, the advantage is to have constant forces delivered to the pipelines.

Experience in Sealing the 4th Stage of the Syngas-Compressor

After having operated our syngas-compressor half a year we had to switch off the compressor because the oil-consumption increased. Removing the seals we noticed that the seals on recycle-side were o. k. but on syngas-suction-side the high-pressure sealring was demaged. The white metal was melted and the O-ring was brittled.

Enclosure 1 shows how the seal-consumption increases.
In enclosure 2 the operation conditions of the seals are shown.
A drawing of the seals with dimensions shown in enclosure 3.

In enclosure 2 it is obvious that on 7. 9., 9. 9. and 12 9. the seal-oil-temperature TI 6025 had increased.

Except of this temperature any other disturbance was noticed. The result of the analysis of the residuals found on the seal ring in the case of the compressor and in the automatic oil-separator was that the residuals were no coke-products of the oil.

The residuals (zincdithiophosphate) are caused by connection of oil with ammonia at the existing high pressure.

After having repaired the compressor we had a seal consumption between 1 and 5 litres per day.

The brittled O-ring material was viton. But viton is not resistant against ammonia and we changed it to Silikon with success.

To avoid an arise of zincdithiophosphate Nuovo Pignone had made following arrangement:

./2

1. To install a connection between syngas-discharge and balance-gas.

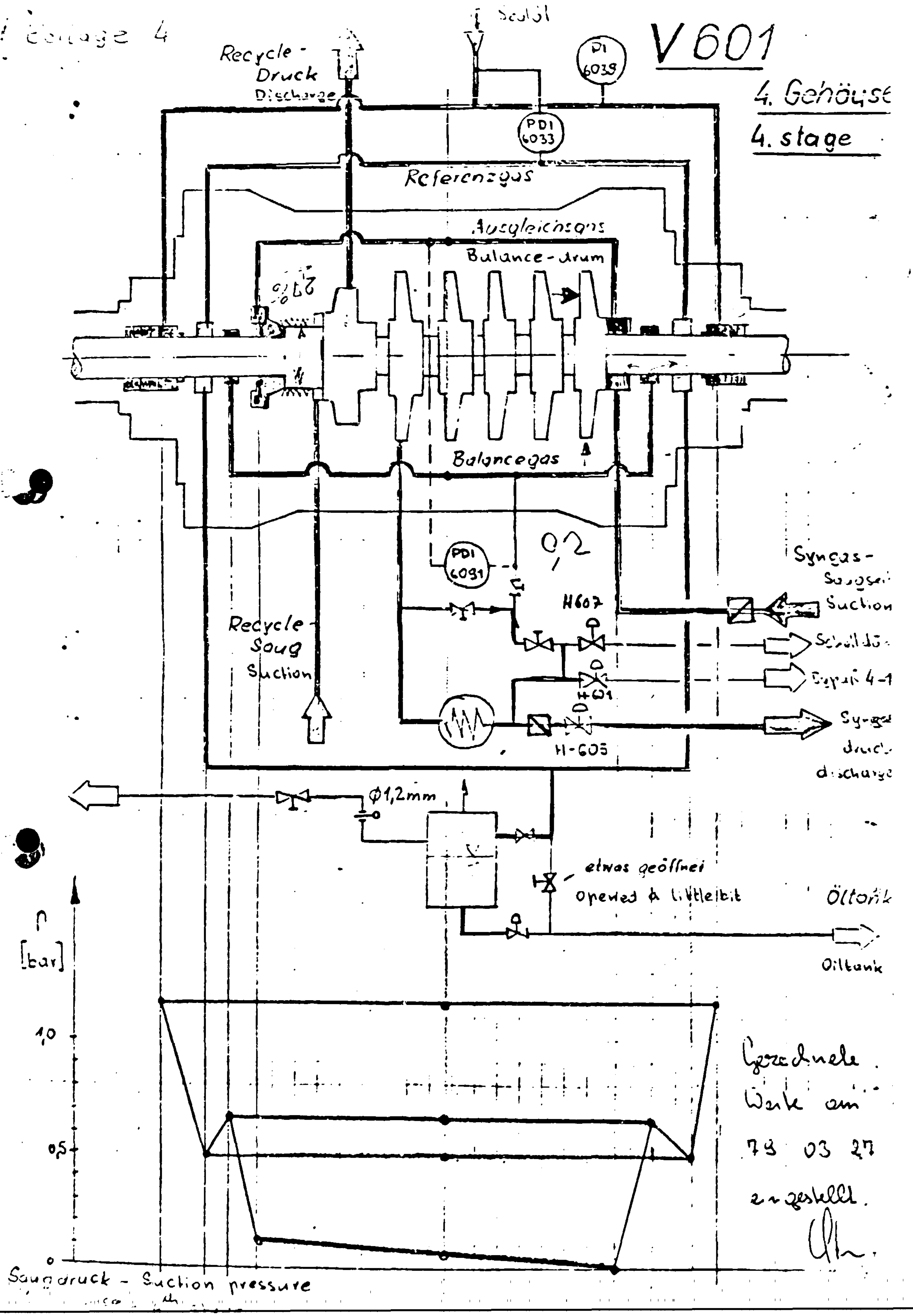
2. The pressure in the balance-gas should be held about 0,5 - 1 bar higher than the syngas suction pressure. Through this improvement the pressure of ammonia in Reference-pipe is reduced.

After having installed this connection-pipe we did not have any difficulties with the seals of the 4th case. It is to take care that the Quenchgas in the commection-pipe has a temperature lying higher than the dewing point of the gas.

If the temperature is below dewing point the labyrinths could be demaged by erosion.

The arrangement of the Quenchgas-pipe can be seen in enclosure 4.

Beilage 4


V601
4. Gehäuse
4. stage
Recycle-
Druck
Discharge
PI
6038
PDI
6033
Referenzgas
Ausgleichsgas
Balance-drum
Balancegas
PDI
6031
0,2
H607
Recycle-
Saug
Suction
Syngas-
Suction
H601
H-605
Syngas
discharge
Ø1,2mm
etwas geöffnet
opened a little bit
Öltank
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p
[bar]
1,0
0,5
0
Saugdruck - Suction pressure
Gezeichnete Werte am 79 03 27 erstellt.

Technical Experience in the Benfield System

1. Low-Pressure-Pumps P 401/402 for Benfield Solution

Starting our plant we noticed that the low-pressure-pumps developed a noise. We suspected the reason for this noise to be cavitation.

Although we checked the pump in presence of an expert of Worthington we could not find any indication of cavitation.

We insisted on the warranty to be prolonged for one more year by Worthington.

Worthington's expert agreed to it and explained the noticed noise with circulation.

Before the prolonged time of warranty was elapsed we checked the impeller once again very exactly but there was not found an indication of cavilation.

When we had to change the sealrings three months later we noticed the first indications of cavilation - the back of the blades were bitten.

Steps for solving this problem

a) Welding the bitten surface with electrodes consisting of hardfacing alloy.

b) Introduction of 3 - 4 m^3/h nitrogen into the suction pipe of the pumps.
   - We have two low pressure pumps for Benfield solution.

./2

In the suction pipe of one of these pumps there are two ellow pipes. At this pump we found cavitation only on one side of the double flooted impeller.

The suction side of the second pump is connected with a T-part of the main suction pipeline.

At this pump we indicated avitation on both sides of the impeller after only 4 200 working hours.

Our engineering firm, Fa. Uhde, found out that the noise of the pump disappeared by operating the pump with 115 % of the normal flow capacity.

By reducing the flow capacity the noise increased. This syptom also was an indication that the noise was caused by circulation.

2. <u>High-Pressure-Pumps P 403/404</u>

By washing and cleaning of our plant during t start-up the seals were contaminated with dirt. So to change this part from time to time.

Having started the plant it was not necessary to change the packings for about one year. But after this time we had a lot of problems with the Pacific-seals. Sometimes we had to change the rings already after one week.

We found out that we got spare rings from Pacific that were not flat and full of cracks.

Till this time the sealrings were greased with Benfield solution. Having such a lot of problems with seals we changes the medium for greasing the sealrings and used condensate with a temperature of 65 - 70°C. Condensate of such a temperature is more qualified for greasing seals than Benfield solution.

The pressure of the condensate has to be a little bit higher than the suction pressure of the pump.

To make this improvement it was necessary to install a condensate cooler and a controlling system.

Since we are operating with this modification the seals have to be changed approximately once a year.

3. Efficiency of the CO_2-Removal-System

After having started our plant we did not obtain the efficiency of gas purification guaranteed by Uhde. After a lot of difficult examinations we found out that the bad distribution of potassium carbonate solution was the reason for our problems.

By installing leading plates we improved the distribution of Benfield solution to the ceramic intalox.

The efficiency of purification increased after this modification.

Finally we installed two redistributers in our absorber and reached the design efficiency.

Operating Instruction V 103

for a vertical, double working reciprocazing compressor, with two cranks, compressing gas in two single stages.

The operator must be well instructed about the function of the compressor.

A) Design Dates

Media:	natural gas
Flow rate:	37 000 Nm^3/h
Suction pressure:	20,9 barü, can be variated
Discharge pressure:	46 barü
Speed:	495 U/min
Controlling system:	automatic reverse flow regulation to 50 % of design gas flow.

B) Starting up of the Compressor

1. Inform the central commando station of our company about the start up of the com pressor. Between two starts it is necessary to wait 20 minutes after the first start because during start of the motor coils are heated.

2. Open the cooling water main valve and also valves for the cooling system of the different parts of the comressor. (steal packings, cylinders, oil-cooler).

3. Check level of oiltank. If oil temperature is below 10 °C, it is necessary to heat up with steam.

4. Start auxiliary oil Pump and check oil pressure. (minimum 2 barü)

./2

5. Open valves in suction pipeline and in bypass pipeline. Check the suction pressure. With regard to the rate of suction pressure see point C 1.

6. Drain the condensate separators F 103 and F 104 (separator in front of the compressor and after bypass-cooler).

7. Open valves in discharge pipeline.

8. Start the motor and observe the oil-pressure.

9. Switch off the auxiliary oil pump and check the oil pressure once again.

10. If everything is o.k. the compressor is charged by slowly closing the bypass-valve and by means of the reverse flow controlling system.

C) Operation of the Machine

1. It is very important to take care that the difference in pressure between discharge and suction is not higher than 27,4 bars.

   Therefore it is necessary to adjust the discharge pressure in dependance of the suction pressure. For example: if the discharge pressure is 44 barü the suction pressure may be 16,6 barü as minimum.

The suction pressure should not be less than 8,8 barü, in this case the maximal discharge pressure is 36,2 barü. The suction pressure should not be higher than 27 barü, it is important that this maximum pressure is not reached.

2. Following points have to be checked periodically and must be written in a operating book for instance every hour:
   a) Suction pressure (Safety valve is set at 30 barü)
      Discharge pressure ("   "   " " " 46 barü)
   b) Oil pressure after cleaner
   c) Oil temperature after oil cooler
   d) Temperature of discharge
   e) "   " compressor bearings
   f) "   " motor
   g) "   " motor coil
   h) "   " cooling air to the motor
   i) "   " cooling air from the motor
   j) current consumption of the motor.

3. During the inspection round every two hours following points are to be checked:
   a) Seal packings for tightness
   b) Draining of separator F 103 and F 104
   c) Compressor for knocking, grumling and unusual noise of the valves.
   d) Level of the oil tank.

4. Cooling water flow rate is to be adjusted not to pass a maximum temperatura of 45 °C outlet.

./4

5. The compressor is to be switched cff immediately if
   a) a bearing or a seal packing is overheating or if a swal packing is leaky.
   b) pressure of lube-oil is less tham 1,5 barü
   c) suddenly a knocking noise is heard or if the valves operate not properly
   d) a safety valve does not close after blowing up.

<u>D) Switching off the Compressor</u>

1. Switch off the motor
2. Close valves in discharge pipeline
3. Close calces in suction pipeline
4. Close cooling water main valve
5. If necessary, purge compressor with nitrogen.

<u>E) General Maintenance</u>

Crankcase is filled with oil, type Mobil oil extra heavy with a viscosety of 60 - 83 c St at 50 °C temperature.
Oil leakages have to be compensated with the same oil type.
If the compressor does not operate for a longer periode, the compressor must be turned by hand once a day.
Before doing that the auxiliary oilpump has to be switched on.

D A T A V 103

Important: The difference in pressure between suction and discharge may not higher than 27,4 bars.

	Pos. Nr.	Operate range	Alarm/shut down
Suction pressure	PIALLHSL 120	see paint C 1	High: 18/10 barü low: 28/- barü
Discharge pressure	PIAHHSH 119	max. 44 barü	45/52 barü
Temperature of discharge	TIAH 110 TIAH 116	max. 110 °C	130/- °C
Oil pressure after cleaner	PIALISL 113	2 - 3 - 4,2 barü	2/1,5 barü
Instrument air pressure	PIALSL 221	7 - 7,5 barü	4/4 barü
Oil temperature after cooler	TIALH 113	25 - 40 °C	low: 18/- °C High: 50/- °C
Temperature of compressor bearing east	TIAHHSH 107	45 - 65 °C	70/80 °C
Temperature of compressor bearing west	TIAH 111	60 - 70 °C	75/80 °C
Temperature of cooling air to the motor	TIAH 101	5 - 35 °C	40/- °C
Temperature of cooling air from the motor	TIAH 102	25 - 60 °C	65/- °C
Temperature of motor bearing	TIAH 106	40 - 65 °C	70/- °C
Temperature of motor coils	TRAH 104	60 - 90 °C	105/- °C

Drawing up a Program of a General-Revision of a Single-Train

1. Operating our plant all technical defects and leakings are registered in a booklet. These defects do not make it necessary to turn off our plant but during the next standing all these defects must be repaired.

2. The technical department puts up the program for the revisions of tanks, boilers, coolers, etc. which have to be done.

   In a discussion with the TÜV (technical inspection department) and the material testing department there is fixed the class of inspection.

   The technical department is also responsible for the inspection of the machines. Generally there is to say that a machine which operates normally should not be opened.

Before deciding to open a machine or not two considerations should be done:

a) By measuring the efficiency it is possible to recognize a defect or a wear for example on the labyrinths or on the balance drum.

b) Comparing the operate dates with the dates after first starting up the machine there also can be drawn conclusions about condition of the machine.

   Therefore it is very important to register all dates that are taken after first start-up very exactly.

The particular works which have to be done are ordered in groups (from 100 to 700, see enclosure).

Every work must be valuated in regard to length and to the number of required workers by a foreman. Afterwards there must be made a time-table which shows the number of the necessary and disposable workers.

GROUP 100

<u>O - 101</u> Heater for heating naphtha or natural gas.
Open and close manhole cover.
Inspection of the protect iron-bars of the burners.

<u>W - 101</u> Nitrogen preheater
Open lid for official inspection.

G R O U P   2 0 0

W - 202 II, W - 208 III, W - 210 Superheater for high pressure steam.

Pressure check.

W - 207 Superheater for medium pressure steam.

Pressure check.

W - 209, W - 211 Heater for process air.

Pressure check.

V - 202, V - 203 Combustion air blower, flue gas blower. Cut out the shaft-cover-sheet for oil level inspection glass and for grease nipples. Inspection of the guide blade-bearings.

O - 201 Primary reformer
Open two of the collector pipe-covers, check and close.
Open manholes, inspect chamotte cover.
Clean flue-gas-channel.

O - 204 Additional heating for waste-gas
Open manholes, inspect chamotte cover.

./2

O - 202	Additional vessel Inspection and cleaming of inside. Repair combustion air heat-exchanger (no. 4 is blocking) Inspect wall at inspection hole. Clear lubrication pipes.

Combustion air and waste gas duct

Inspection and cleaning

B - 210	Mixing station for steam and natural gas. Inside inspection and check natural gas baffle.
W - 215	Water preheater Remove heat-change pipelines for inside inspection.
B - 208	Relieftank Open handholes, blind off, official inspection.
B - 203	Degasifier tank Widen passage for L-206 (Level controller) Check shower (System Stork) and change T-parts.
B - 209	Instrument air tank Inspection and cleaning of tank and level controller.

./3

<u>P - 207, P - 208</u>	BFW-pumps Clean filter, P - 208: Change flange of valve for minimum load pipeline.
<u>T - 203</u>	Turbine for P - 207 Repair oil-leakage of clutch-cover. Change insulation
<u>B - 212</u>	Natural gas mixing station. Remove and inside inspection.
<u>K - 201</u>	Secundary reformer Open for changing air nozzle.
<u>W - 201</u>	Process gas heat exchanger Open both manhole covers. (Gasket ot the hot manhole is not tight) Cleaning and inside inspection.
<u>W - 203</u>	BFW-preheater Change pipe bundle, inside inspection. Change drain valve. Installing test-blades.
<u>B - 201</u>	Steam boiler Open and inside inspection. Pressure check (pressure check also for no. 4083 and 4162 - support system)
<u>T - 201</u>	Turbine for process air compressor

./4

Inspection of the rotor. Repair oil leakage of the compressor-side clutch cover.

Repair seal packing of control-valve and the leakage of the pipeline for the pressure-indicator of the injector; the idling-device does not function properly

W - 204	Condenser for T - 201 Open flange and inside inspection. Repair cooling-water pipe to the condenser.
V - 201	Process air compressor Check low-pressure and high-pressure rotor. Gearbox-side high pressure rotor bearing is leaking. Clean air-cooling of low-pressure compressor. Change cooling-water valve for 4^{th} stage. Check non return-valve.
W - 214	Process-air-cooler Inside inspection, also for condensed water tank and level controller.
T - 202	Turbine for generator Repair seal box of steam entrance valve.
T - 204	Back-pressure-turbine for generator. Repair seal box of steam valve.

G R O U P   3 0 0

W - 301	Gas heat-exchanger Pressure check. Repair leaky head-gasket.
K - 301	NT- CO- converter Official inspection, manholes to be opened in service. Change nozzle for condensate
W - 302, W - 303	BFW-preheater Official inspection. Repair baffle T - 310
K - 302	Low temperature-converter Open manholes to change catalyst. Official inspection.

GROUP 400

K-401 Absorber
Open manholes, remove ceramic intalox and inspect inside. Install redistributers. Revision of the level controller.

F-403 Lye separator
Open for official inspection. Revision of the level controller.

W-401 Steam generator
Open for official inspection (inside revision and pressure check)

W-402 BFW-preheater
Remove heat-exchanger. Pressure check (2 x)

W-403 Reboiler
Open for official inspection (inside and pressure check)

W-404 Benfield solution air cooler
Remove distribution pipe, pressure test.

W-408 BFW-cooler
Remove bundle (inside inspection)

B-404 Relieftank
Open manholes for cleaning and inspection.

F-401 Condensate separator
Open manholes for cleaning and inside inspection.

./2

F-402	Condensate separator Open manholes for cleaning and inside inspection. Change draining valve. Official inspection of level controller.
F-406	Lye double filter Inside inspection. Grinding 4-way valves. Change valve in the pipeline to the filter (valve case is corroded)
K-402	Desorber Open manholes for inside inspection and cleaning. Repair corroded pipeline to P-405. Install PV/H-411 and PV/H-412 in CO_2-pipeline system
F-407	Injector Control injector nozzles and valves.
W-406	BFW-preheater Change pipelines of BFW-system.
T-401	Benfield solution turbine Seal bearings of guide-blades. Change pipelines for greasing seals with condensate of T-401 and high-pressure lye-pump P-403.

G R O U P   5 0 0

K - 501	Methane generator Open manhoJes for inside revision
F - 501	Condensate separator Open manholes for inside revision and also revision for level controller.
W - 501	Gas - gas heat exchanger Remove heat-exchanger for official inspection and pressure check.
W - 502	Boiler Open for cleaning and inside revision
W - 503, W - 504	Final gas cooler Open for cleaning and official inspection. Welde in a valve in cooling-water-pipeline.

GROUP 600

T - 601 Syngas-turbine
Inspection of cendensation-turbine-rotor and of the condenser.
Repair decreased cooling water pipe.
Check start-up equipment and adjust it.
Change prepared oil pipelines.

V - 601 Syngas-compressor
Inspection of bearings, seal-system and rotors of case 1 - 4.
Install capacity flow measuring nozzles in balance-drum-pipes of stage 2 and 3 (F-6006 and F-6007)
Change gas-cooler
Official inspection of separator F - 606 (also level controller), F - 601, F - 602, F - 603, F - 605, seal oil tanks no. 4054-4057, level controllers 4156 and 4157, and separators 4208, 4058 and 4059.
Install valves in seal-oil pressure pipes of seal-oil pumps.
Change oil-filters and cleaning oil-heaters.
Change one of the oil-cooler bundles and clean the other one.

O - 701 Start-up-heater
Inspect supports, pressure check

./2

W - 701	Waste-heat-boiler Open "Brettschneider" gasket. Official inspection,pressure check.
W - 708	BFW-preheater Open "Brettschneider" gasket (seal ring is leak) Official inspection, pressure check.
B - 701	NH_3-expansion-tank. Open tank for cleaning and official inspection.
B - 706	Mixing-station Remove for inside inspection.
F - 701	NH_3-separator Open lids and remove pipelines to the separator. Clean and inside inspection.
F - 702	NH_3-separator Open lids and remove pipelines. Clean and inside inspection.
W - 703	Gas-cooler Remove elbows of two of the five coolers. Pressure check on this coolers.
W - 704	Gas-gas-heat-exchanger Open flanges and remove bundle. Cleaning and inside inspection.
W - 705	Freezer Remove flanges for inside inspection.

General Description Materials For:

Application	Code			Composition [%]								
	Mat. No.	Internat. Code		C	Si	Mn	Cr	Mo	Ni	V	Ti	
(0-40 bar up to 100°C)	1,0305	St 35,8										
High pressure steam lines 40 ÷ 125 bar (from 400-525°C)	1,7335	13 CrMo 44		0,10% 0,18	0,15% 0,35	0,40% 0,70	0,70% 1,00	0,40% 0,50				
High pressure syn. gas 0-325 bar (up to 300°C)	1,0305	St 35,8										
0-35 bar (from 300-450°C)	1,5415	15 Mo 3		≤ 0,17	≤ 0,35	> 0,40						P,S max. 0,05
0-35 bar (from 450-515°C)	1,7335	13 CrMo 44										
Primary reformer Tubes	--	GX 40 NiCrNb 3324	36 x Type Pompey France	0,35% 0,45	max. 1,5	max. 1,5	23% 27					
pigtails	1,5415	15 Mo 3										
collector system	1,5415			0,12 ÷ 0,20	0,15 ÷ 0,35	0,50 ÷ 0,70		0,25 ÷ 0,35				P,S max. 0,03%
lines for brickwork	–	X 10 NiCrAlTi 3320	Incoloy 800									
Desulphur reactors shell	1,7335	13 CrMo 44										
Secondary reformer shell	1,5415	15 Mo3										
lines for brickwork		X 10 NiCrAlTi 3320	Incoloy 800	0,03	0,50	0,10	21,5		34		0,6	0,75 Cu 0,30 Al
Steam waste recovering boiler tubes		15 Mo 3/Inconel 600										
tube plate	1,7335	13 CrMo 44	BHW 35									P,S max. 0,025
shell	1,8807	13 MnNiMo 54	Type Boveiy	≤ ·16	0,10 ÷ 0,60	1,00 ÷ 1,60	0,20 ÷ 0,40	0,60 ÷ 1,20				
shield												
ferules		X 10 NiCrAlTi 3320	Incoloy 800									
lines for brickwork												
Meth. reactor shell	1,7335	13 CrMo 44										
Ammonia converter shell		ATMNiMoV (hydrogen resistant)	Type VOEST	0,15	0,33	1,40		0,47	0,66	0,12		
basket	1,4550	X 10 CrNiMoNb 1812		≤ 0,10	≤ 1,00	≤ 2,0	17,0 ÷ 19,0		9 ÷ 11		> 5x C	Nb > 8xC
High temperature converter	1,7335	13 CrMo 44										
Low temperature converter												
[illegible] pressure syn. gas 325 bar 380 ÷ 400°C	1,7779	[illegible] 50 20 CrMo V [illegible]	Type VOEST N 9	max 0,21 0,17 ÷	0,30 ÷ 0,50 0,15	~ 1,20 0,30 ÷	3,0 ÷	0,5 ÷		0,45 ÷		P,S max. 0,040%

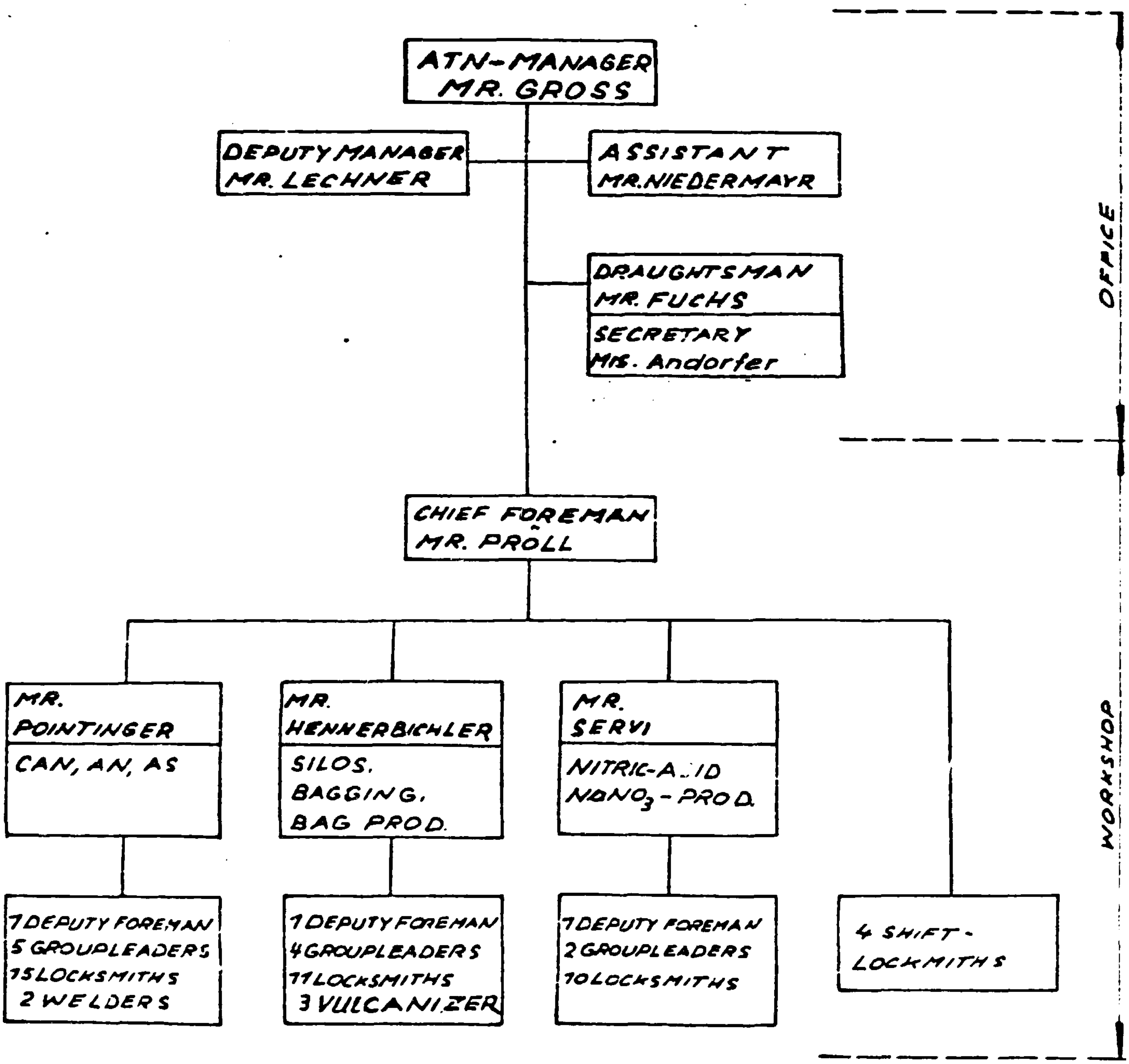
Main-materials used in Single-train-unit

	CODE			COMPOSITION [%]								APPLICATION
		internat.										

		CODE			COMPOSITION [%]									APPLICATION
		Mat. Nr.	internat. code		C	Si	Mn	Cr	Mo	Ni	V	Ti		examples
Normal-steel	HEAT RESISTANT	1.0305	St. 35.8		≤0,17	≤0.35	≤0,40						P,S max. 0,05	water-,gas-and steampipelines up to 300°C
		1.0425	H II		≤0,20	≤0,35	≤0,50						-"-	shell for Desorber, Absorber
		1.5415	15 Mo 3		0,12% 0,20	0,15% 0,35	0,50% 0,70		0,25% 0,35				P,S m. 0,04	shell for secondary-reformer
		1.7335	13Cr Mo44		0,10% 0,18	0,15% 0,35	0,40% 0,70	0,70% 1,00	0,40% 0,50				-"-	pipes in waste-heat-system up to 550°C
		1.7380	10Cr Mo910		≤0,15	0,15% 0,50	0,40% 0,60	2,00% 2,5	0,90% 1,10					desulphur-reactors shell for waste-heat boiler
		1.7709	21Cr MoV57		0,17% 0,25	0,15% 0,35	0,35% 0,85	1,20% 1,50	0,65% 0,80		0,25% 0,35			bolts up to 550°C
HIGH ALLOYED STEEL	HYDROGEN-RESISTANT	1.7779	20Cr MoV135	N9	0,17% 0,23	0,15% 0,35	0,30% 0,50	3,00% 3,3	0,50% 0,60		0,45% 0,55			pipelines in ammonia-synthese
				ATMNiMoV (T.Voest)	0,15	0,33	1,40		0,47	0,66	0,12			shell for ammonia converter
	STAINLESS-STEEL	1.4541	x10CrNiTi189	SAS 2	≤0,10	≤1,0	≤2,0	17% 19		9% 19,5		5x %C		pipes and vessels for corrosive mediums lines for brickwork
			x10NiCrALTi 3320	Incoloy 800	0,03	0,5	0,7	21,5		34		0,6	0,75Cu 0,30Al	
STEEL CASTING		1.0619	GS-C25		0,80	0,40	0,65	≤0,03						cases of nophtha - pumps
		1.4027	G-X25Cr14		0,14	0,24	0,49	13,2		0,97				cases of boiling water pumps
		1.4552	G-X7CrNiNb 189		0,065	1,30	1,35	18,9		9,44			Nb 0,68	cases of Benfield - pumps

ORGANISATION DEPT. ATN

A.....DIVISION A (AGRICULTURAL CHEMICALS)
T.....TECHNIC
N.....NITRATE PLANTS



THE FORMEN ARE ALLOCATED TO THE CERTAIN PLANTS.
THE WORKERS - IF NECERSSARY - MAY BE SHIFTED BETWEEN THE 3 FOREMAN-GROUPS.

RESPONSIBILITY OF ATN

1. Improve & ensure safety of operators & equipment.

2. Maintenance of plant to assure high productivity.

3. Improvement of existing equipment & process (together with APN) toward higher productivity, lower production & maintenance costs.

4. Costcontrol of maintenance activities.

5. Liaison with other departments of Chemie Linz to co-ordinate interdepartmental work (main workshop, instrumentation, etc.)

6. Assist public organizations to cope with disasters. (chemical spills on roads etc.)

On - Call Service

from Friday 14.00 to Monday 6.00

1 engineer of foreman
1 mechanic - (only in areas without shift-mechanics!)

Shut down of plants

Caused by limited manpower generally only one plant may be shut-down for overhaul.

p.e.: 1) AC plant Enns
shut-down April 23rd, 1979
duration: 1 week

2) Nitric Acid plant
shut-down May 2nd, 1979
duration: 1 week

3) Urea plant
May 12th till May 23rd, 1979

4) Single train
unscheduled shut-down for one **day** only

Manpower normally allocated to individual plants is sufficient only for normal maintenance. For shut-downs the group must be increased in size.

p.e.: Nitric Acid plant shut-down

normal maintenance crew	(group Servi)	13 men
plus from ATN	(group Hennerbichler)	8 "
" " "	(group Pointinger)	8 "
" " THW	(central workshop)	20 "

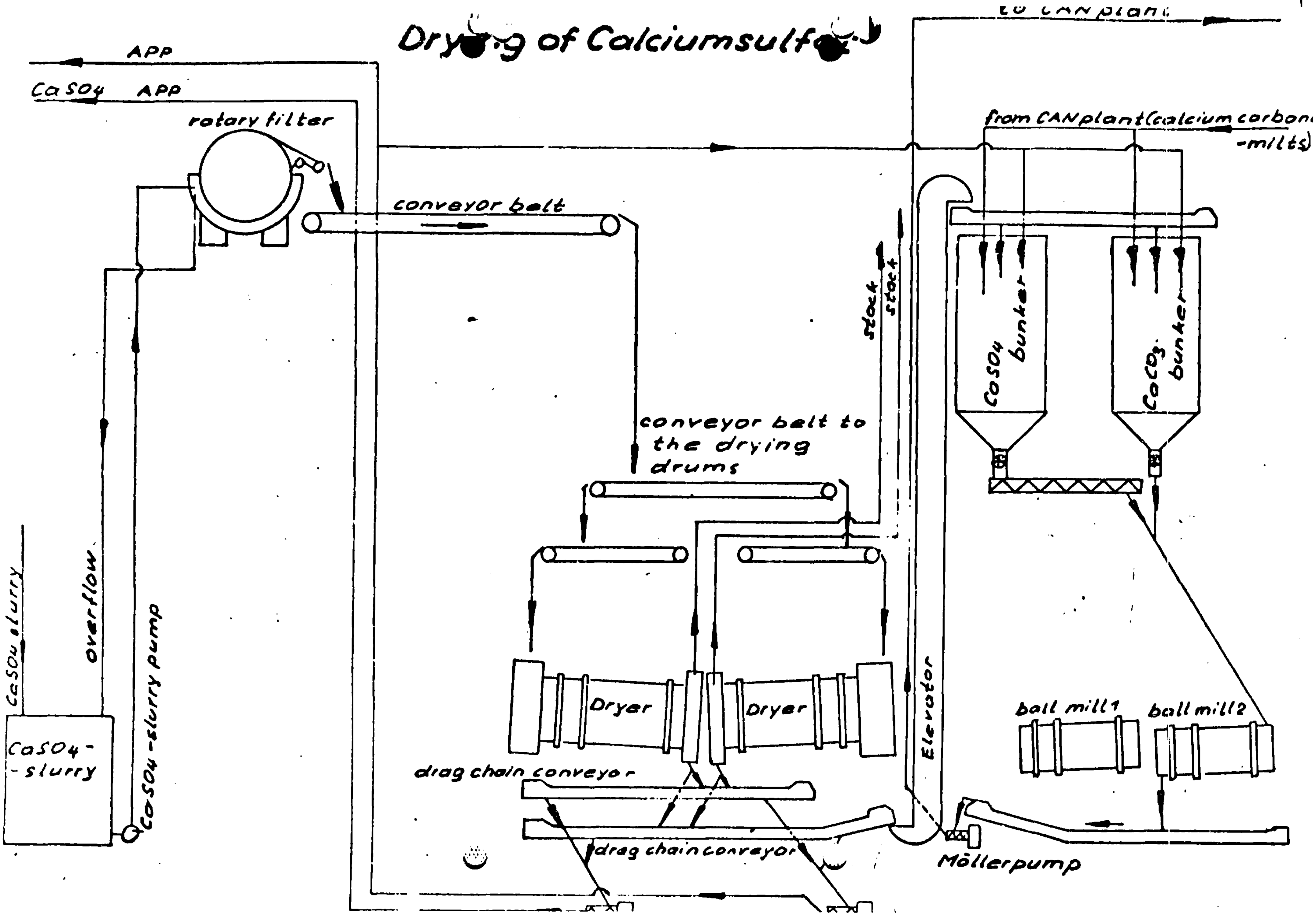
Additional hands are used to increase individual work-groups or are given complete tasks!

MATERIALS USED BY ATN

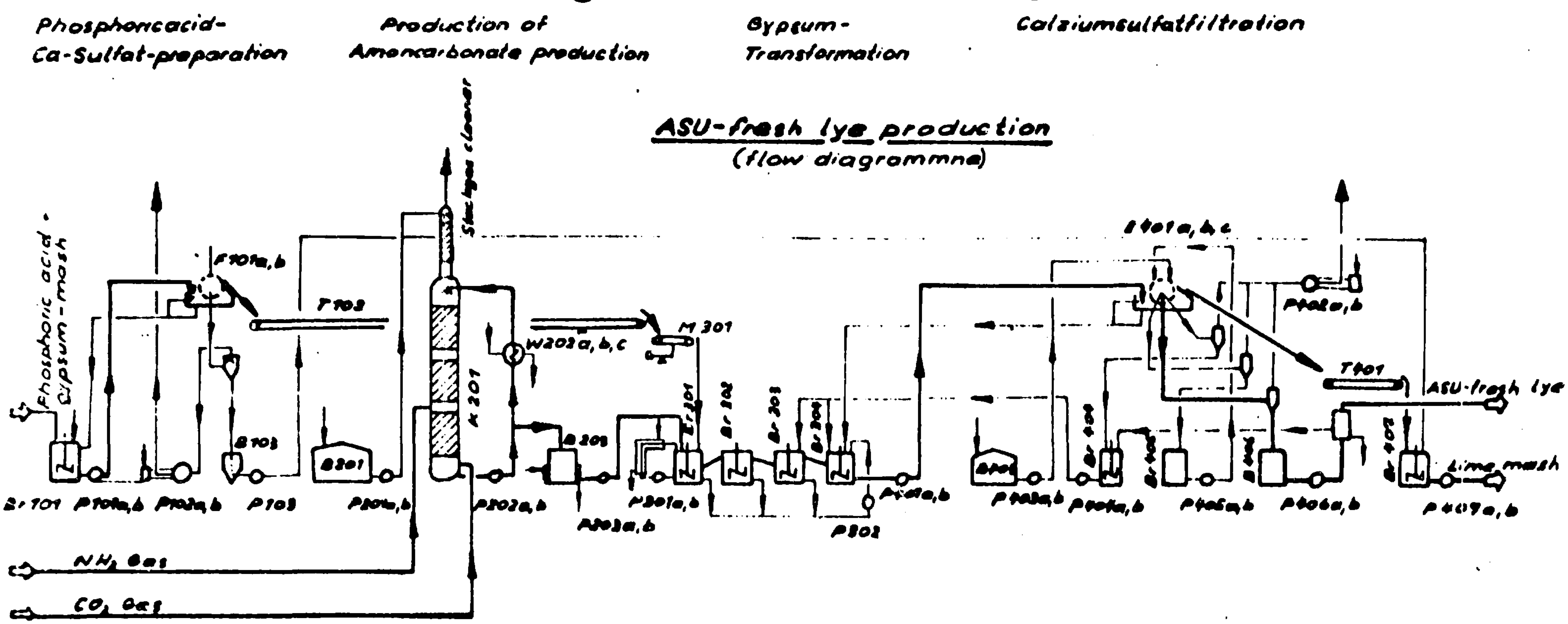
CODE		COMPOSITION						APPLICATION
mat-number	internat. code	C	Si	Mn	Cr	Mo	Ni	
	ALU 99,9 %							for pipelines + tanks (100% HNO_3)
1.4450	10CrNiNb189	0,12	0,40	0,30	18	-	9,50	for pipelines, tanks, heater (60 % HNO_3)
1.4016	8Cr17 (expired)	0,10	0,40	0,30	17,5			for pipelines, tanks, heater (45 % HNO_3)
1.4561	*) "Nictrothal 40"	0,12			20		34	for supportnet for catalyst
	Lead							for lining of tanks, pipelines, pumps
	Ferrosilicium		15					for dehydration column of HNO_3
1.3401	12OMn50	1,20	0,30	12,0				rollers in $CaCO_3$ mills
1.7335	13CrMo44 (or Alcal)*)	0,13	0,30	0,60	0,90	0,50		for lye pipelines and drums
	*) DUR 600							for welding and to armour
1.4828	15CrNiSi2012	0,20	2,0	0,60	12,0			baskets in NH_3-burners
	Teflon*) PTFE							for linings (special application & gaskets)

*) Registred Tradenames

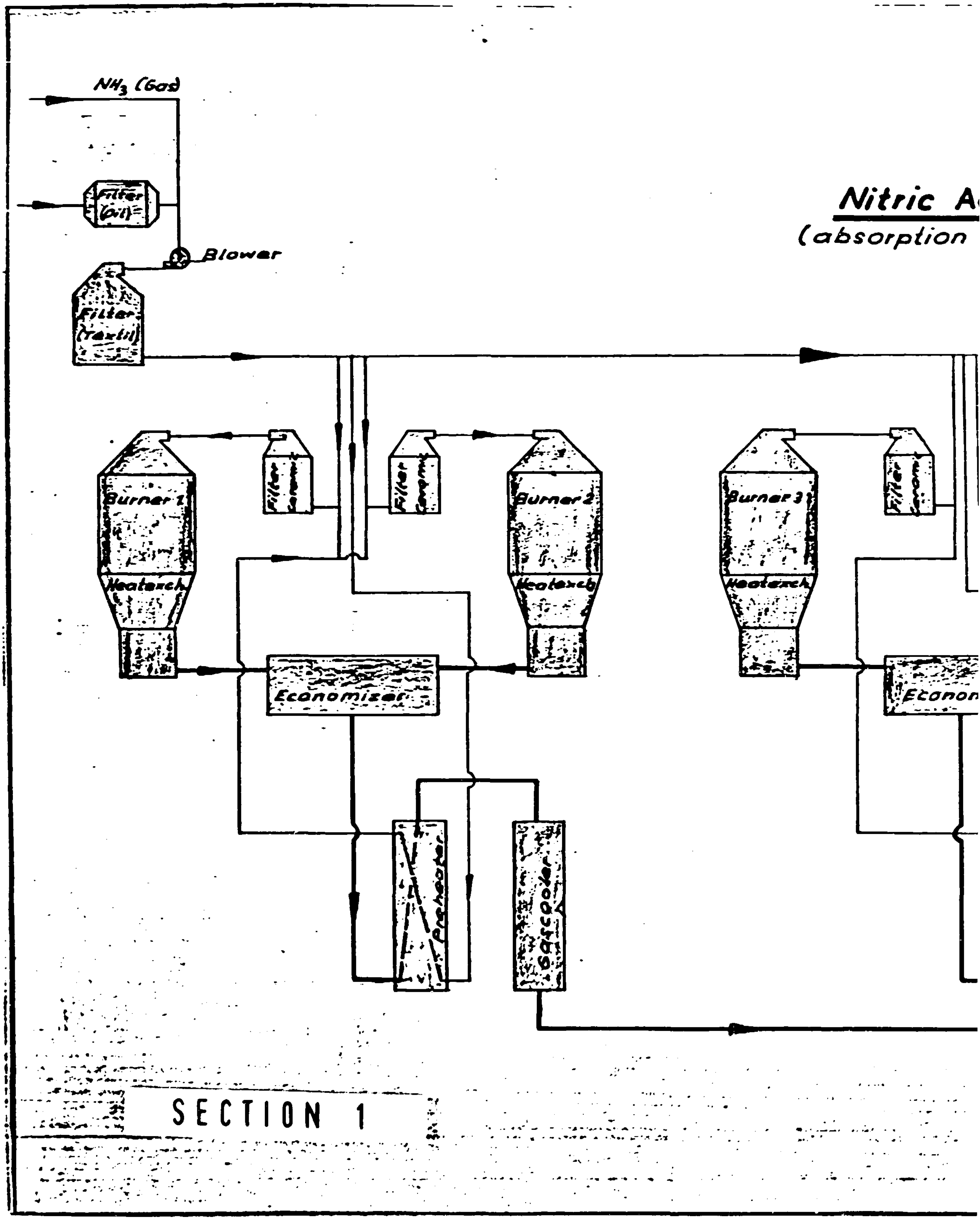
Drying of Calciumsulfate



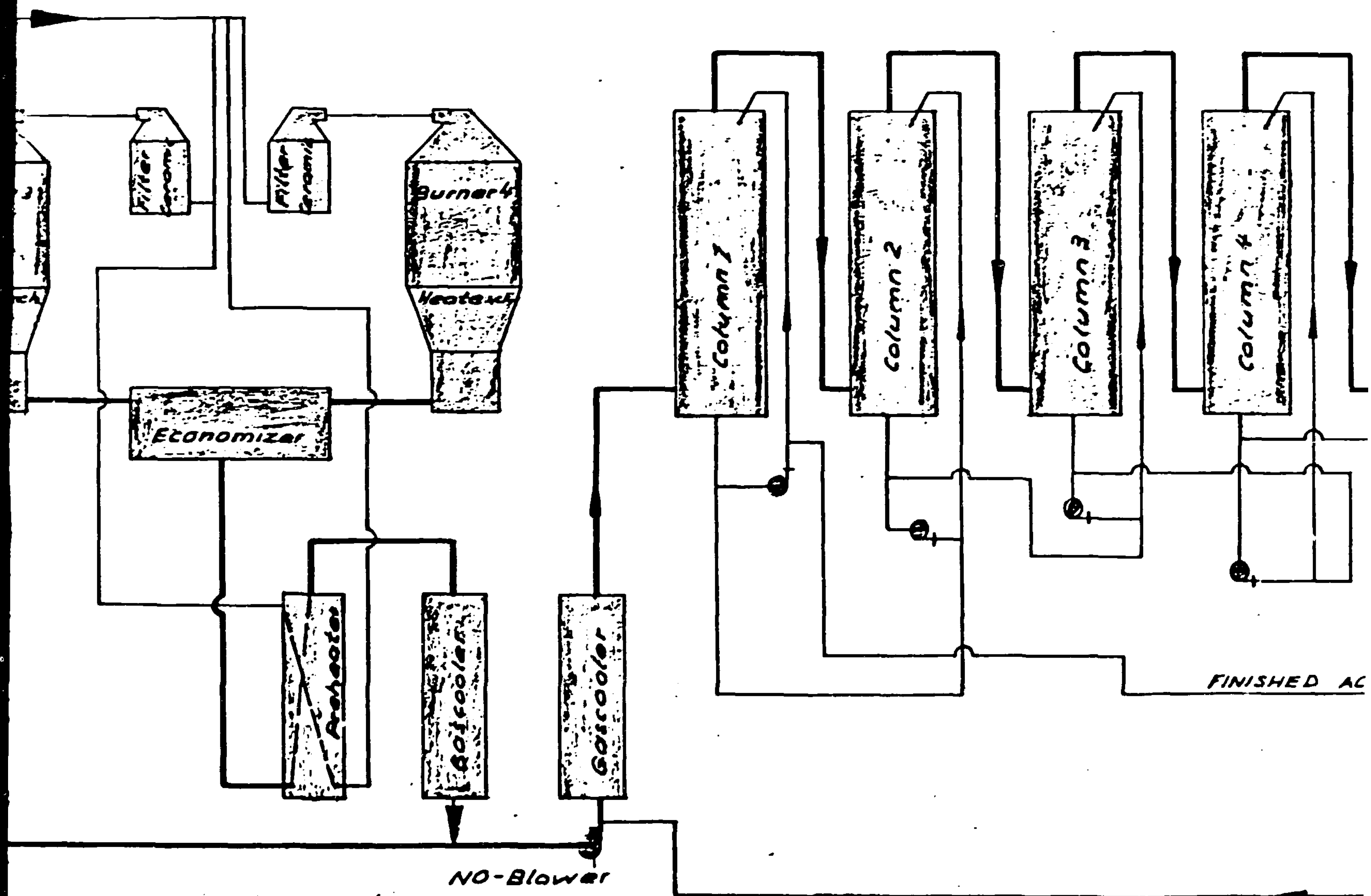
ASU-fresh lye production
(flow diagrammne)



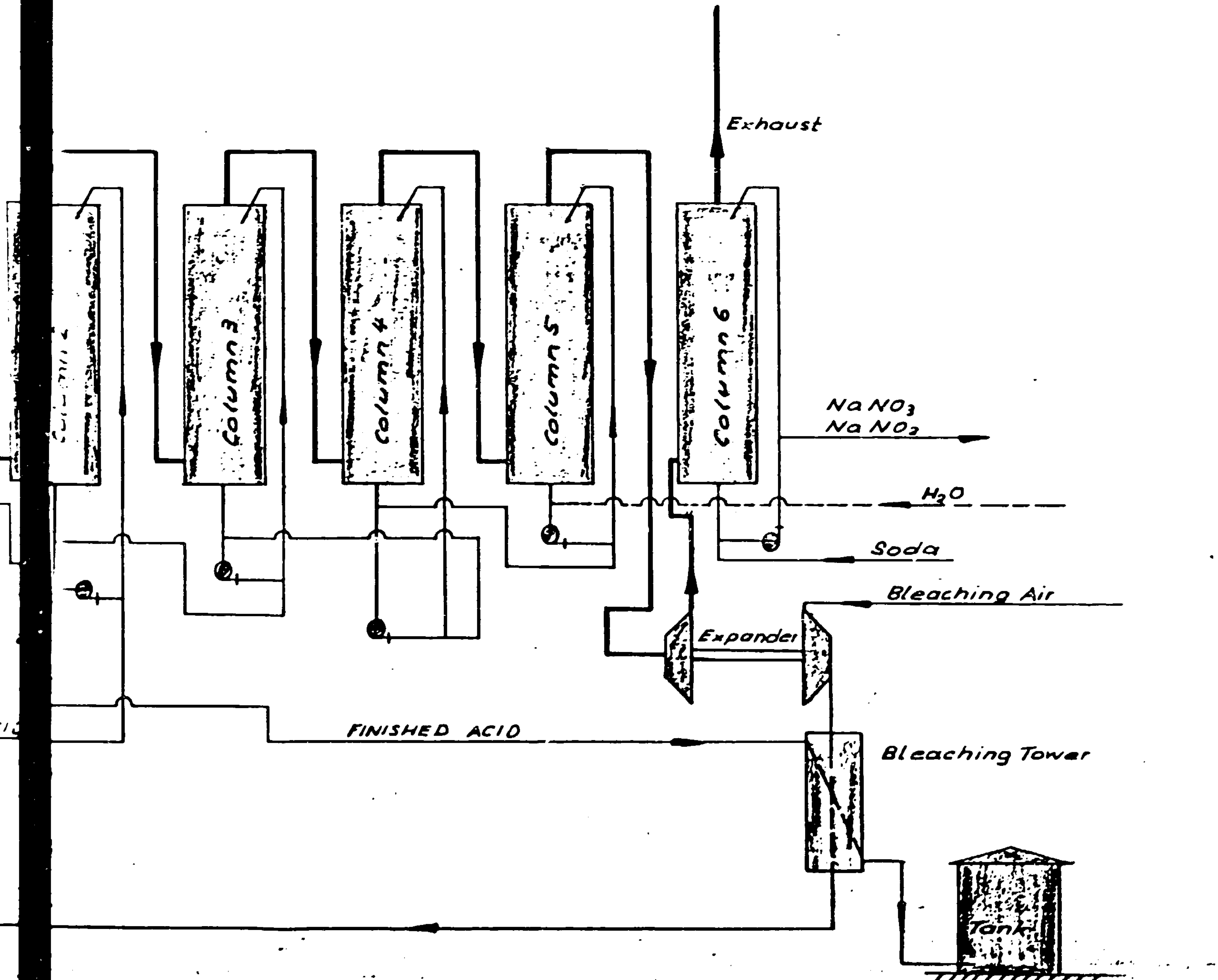
Br101	Wetting vessel with agitator	B201	Processwatercontainer	M301	Scale on conveyor belt	P401	Mash pump	B405	Vessel for filtrate
P101	Mashpump	P201	Processwaterpump	Br301	Mixingvessel with agitator	F401	Filterdrum with vacuum	P405	Filtrate pump
F101	Filter drum with vacuum	K201	AC-Lyetower	P301	Circulatingpump	T401	Conveyor belt for filtered lime	B406	ASU-fresh lye container
P102	Vacuumpump	P202	AC-Lye-circulating pump	Br302	Reaction vessel with agitator	P402	Vacuumpump	P406	ASU-fresh lye pump
T102	Gypsum Conveyorbelt	W202	AC-Lyecooler	P302	Pump	F402	Ceramic filter	Br407	Lime mash vessel + agitator
B103	Vessel for filtration	B203	AC-Lyevessel	Br303	Reaction vessel with agitator	B403	Washwater vessel	P407	Line mashpump
P103	Pump	P203	AC-Lyepump	Br304	——"——	P403	Washwaterpump		
						Br404	Container for filtrate with agitator		
						P404	Pump for filtrate		


Nitric A
(absorption
NH3 (Gas)
Filter (Oil)
Blower
Filter (Textil)
Filter Ceram.
Burner 1
Burner 2
Burner 3
Heatexch.
Economizer
Preheater
Gascooler
SECTION 1

Nitric Acid Production
(absorption at atmospheric pressure)

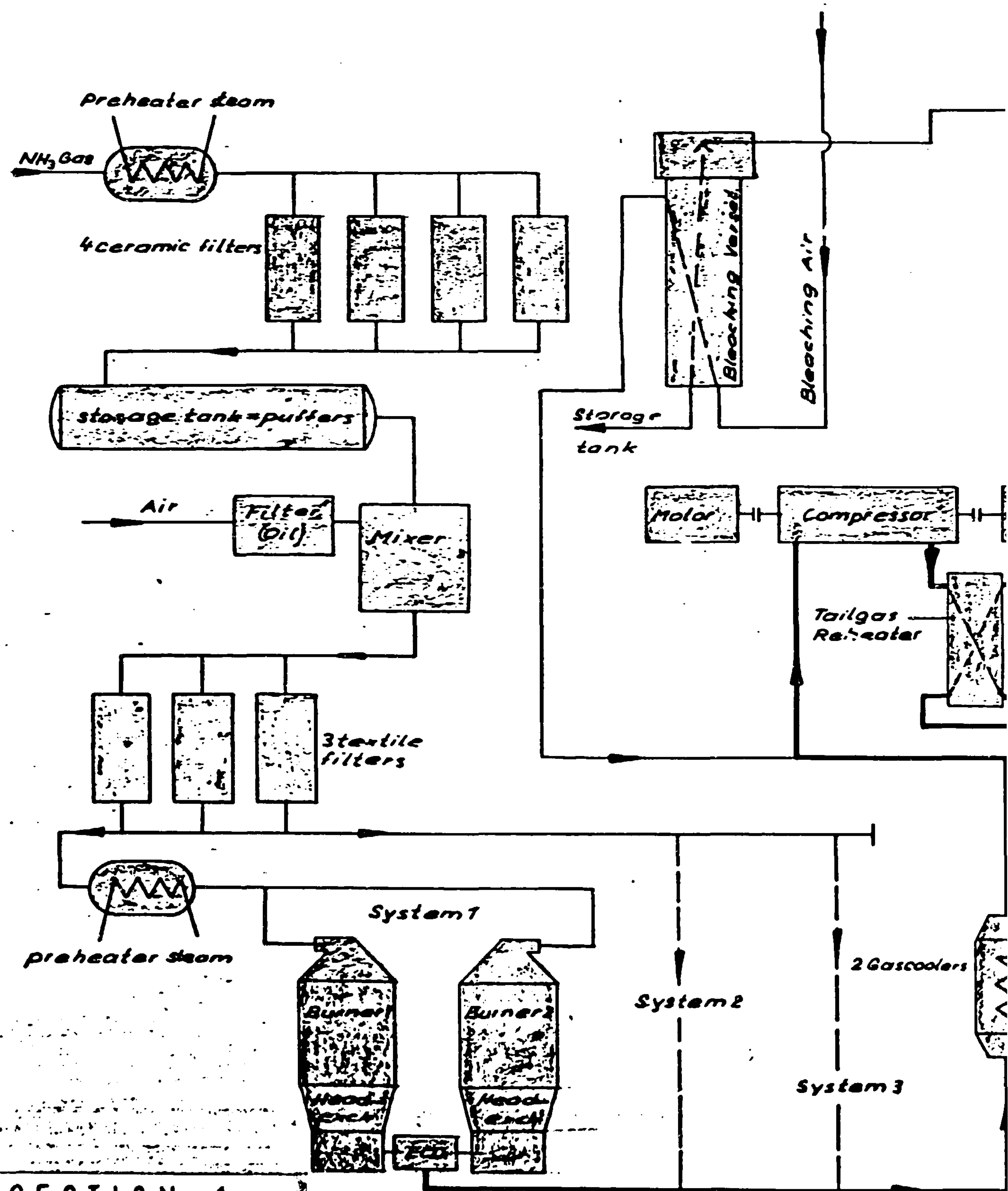


SECTION 2



SECTION 3

ATN, 1979 04 27

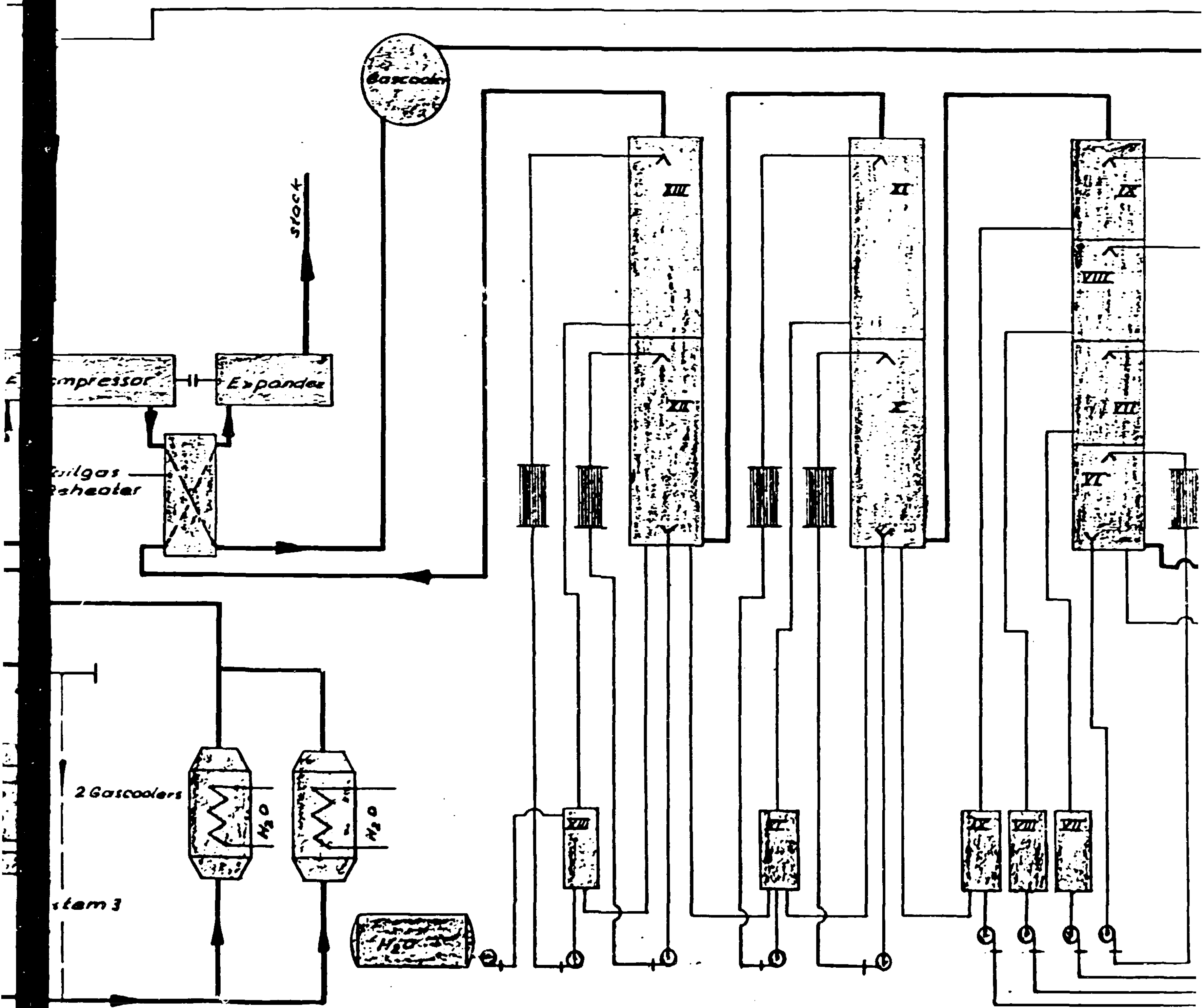


Preheater steam
NH_3 Gas
4 ceramic filters
storage tank = puffers
Air
Filter (oil)
Mixer
3 textile filters
preheater steam
System 1
Burner 1
Burner 2
Head-end
Eco
System 2
System 3
2 Gascoolers
Bleaching Vessel
Bleaching Air
Storage tank
Motor
Compressor
Tailgas Reheater

SECTION 1

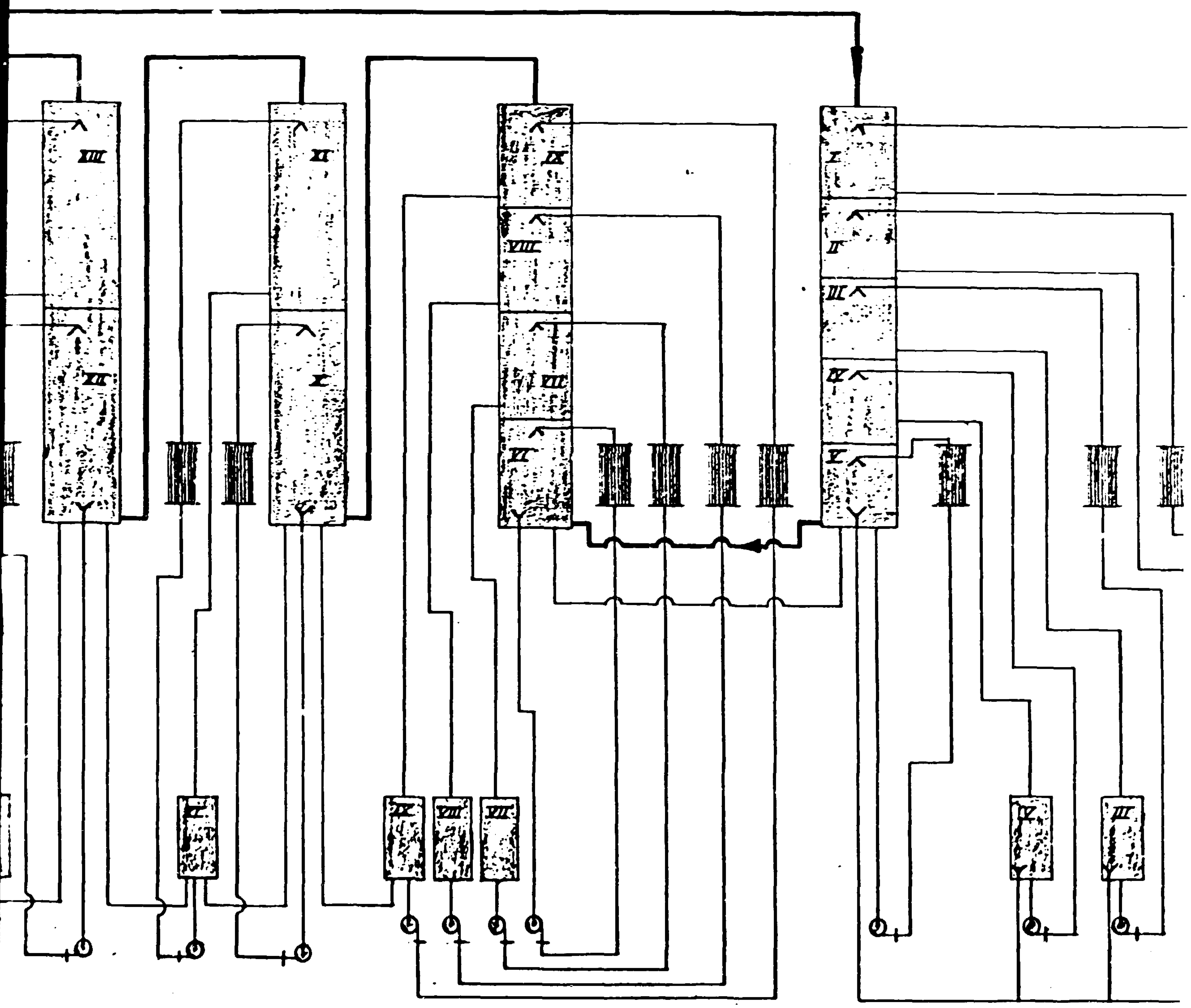
Nitric Acid Production

(absorption under pressure)

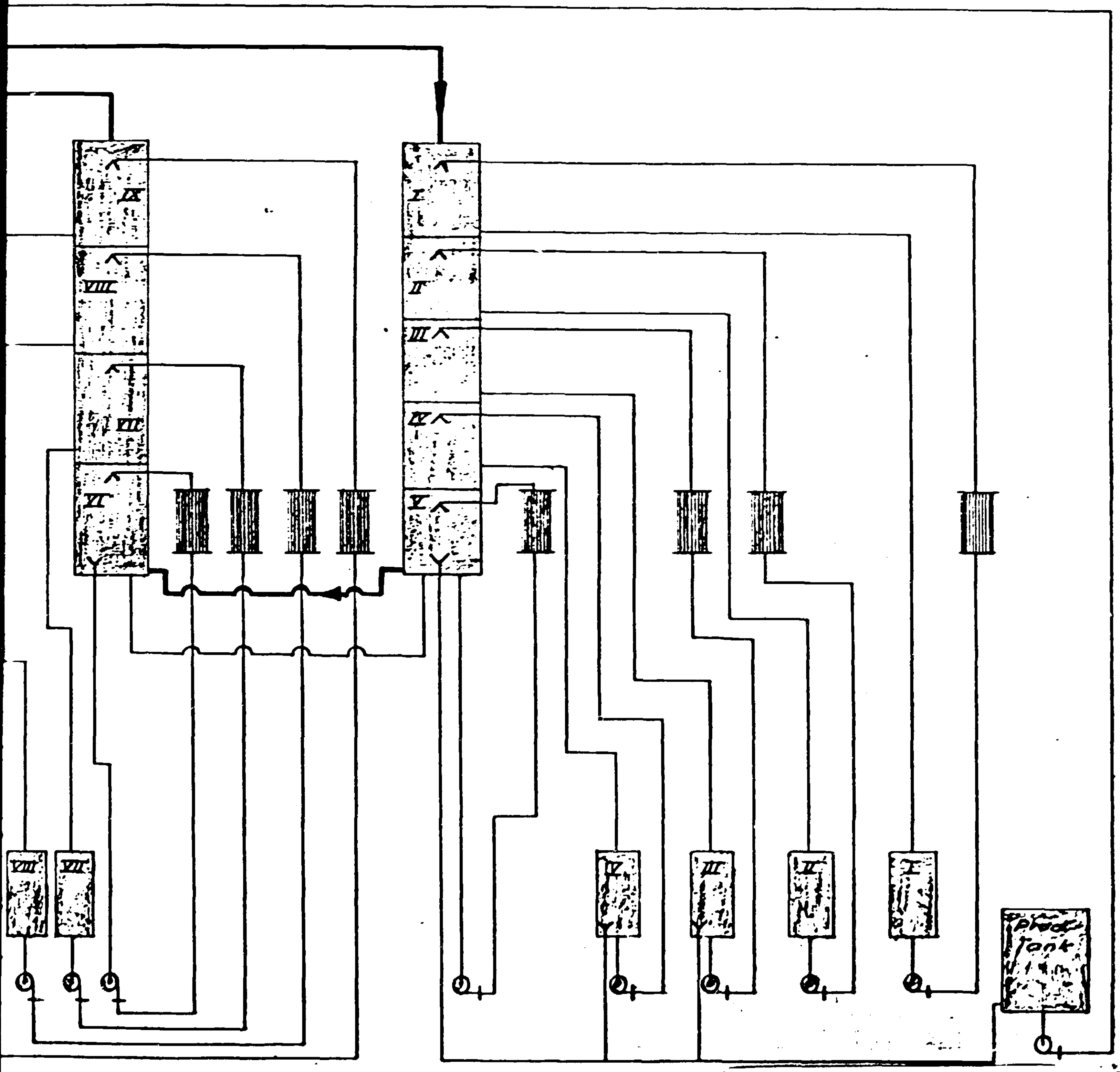


SECTION 2

uction



SECTION

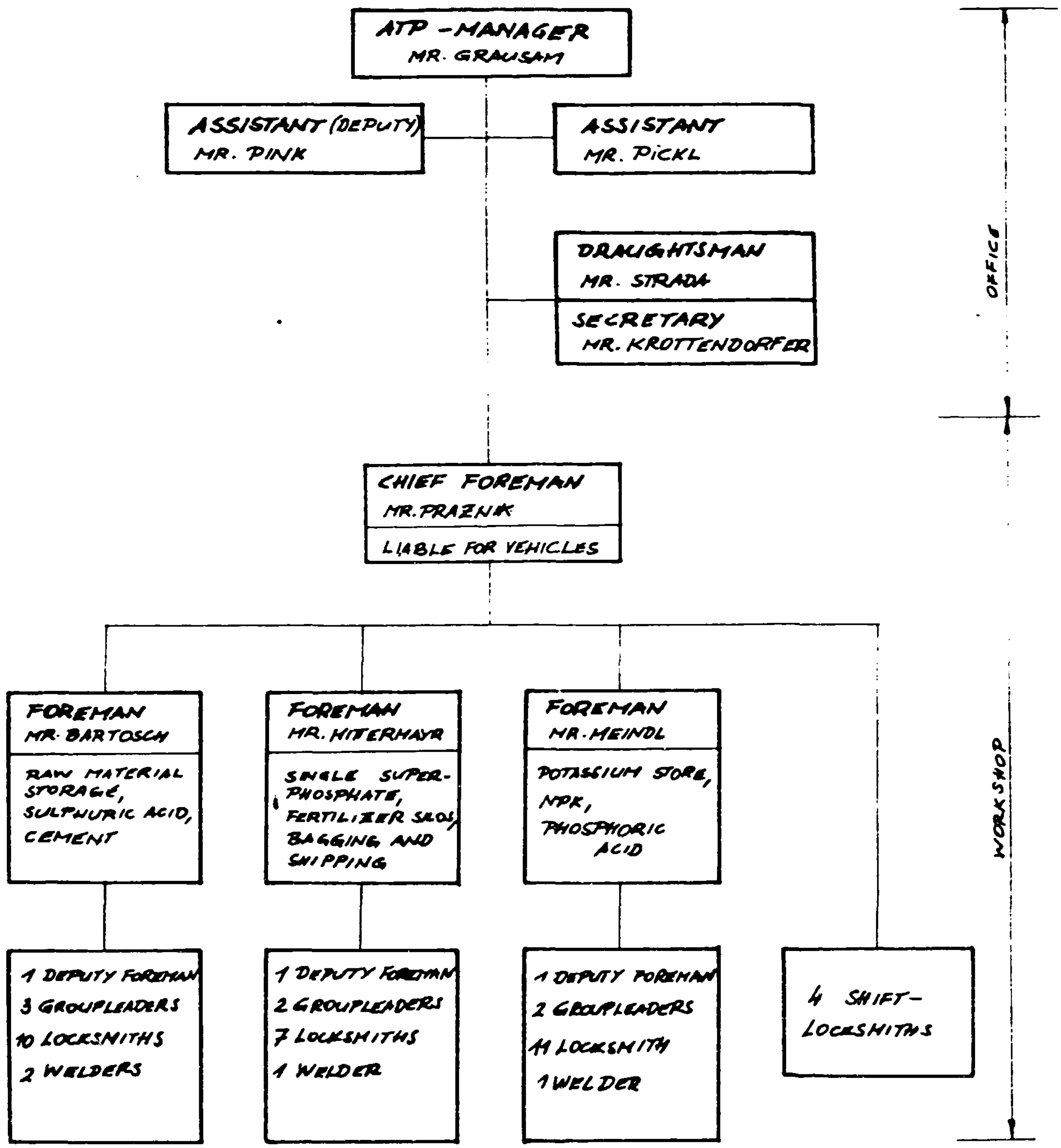


SECTION

ATN, 1899

ORGANISATION DEPT. ATP

A ..... DIVISION A (AGRICULURAL CHEMICALS)
T ..... TECHNIC
P ..... PHOSPHATIC FERTILIZERS



THE FOREMEN ARE ALLOCATED TO CERTAIN PLANTS.
THE WORKERS - IF NECESSARY - ONE CAN SHIFT BETWEEN THE 3 FOREMEN - GROUPS

RESPONSIBILITY AND TASKS OF DEPARTMENT ATP

Surveillance, check, maintenance, repair of different production units, stores raw material and final products, bagging and shipping, laboratory.

Spare parts particulary used only for a special purpose in one, two or three departments - order, record, store, use.
Common spares like screws, bolts, ... are in the central store.

Drawings: Draughtsman for sparepart-drawings, modifications in the plant, sketches. Small projects are made by the department, larger projects are made by the design-department. Drawings of design-department must be signed by the concerned maintenance and production departments. Record of drawings.

Contacts with outdoor companies, agents and representatives, suppliers of spares, machines, ...
Visit to suppliers. Correspondence with different companies, filing of correspondence.
Prospects, leaflets about special machines, parts, technics, materials used in the department.

Contacts with other departments of Chemie Linz concerning repair, investment, production, design, finance, ...

Supervision of delivery dates concerning spares, outdoor repairs, ...

Elaboration of shut-down-programs in co-operation with production and central-departments.

./2

Safety in the workshop and for all field repairs. The whole equipment has to operate in a safe condition.

Safety instructions according to the Austrian law (one time per year), accident-notice.

Information of foremen and staff, other departments, superiors, ... daily, weekly, monthly, quarterly, ...

Investment programs of small volume, repair programs, estimation of costs.

Cost control for maintenance, monthly computer prints, quarterly reports to division (comparison precast - actual).

Collecting of literature and papers concerning used operations, machinery and processes.

Training of foremen and workers in the field of technical knowledge, safety, efficient performance of repairs, ...

Experiments and tests of new parts and products.

Co-ordination and co-operation with production department (daily morning discussion).

Calculations concerning machines, parts and the process.

Energy conservation (e.g. screw compressor - new or repair?)

Engineering, process variables , physical chemistry.

./3

Accomplishment of authority-orders like pressure tests, yearly check of conveyors, earthing measurement of tanks for burnable liquids.

Obligations concerning pollution control (oil, waste gas treatment, ...)

Mutual control of maintenance and production departments resp. central departments.

Participation on seminars, courses, study of literature, visit of industrial fairs (e.g. ACHEMA, ...) to improve technical knowledge.

Expert for suggestion system.

Personnel problems - salary, transfer to other departments, overtime, ...

Jobs as adviser of start-up personnel in Austria or a foreign country.

Training of people from other companies.

Showing of plants to our customers and other interested groups (schools, ...)

Collection and filing of experience, repair cards, ...

Stand-by or on-call service from Friday to Monday.

1 engineer or foreman

2 locksmiths

chemserv
CONSULTING GES. M. B. H.

Empfänger Unser Zeichen*) Blatt Tag

HISTORY OF PHOSPHATE - FERTILIZER - PLANTS (APP - ATP)

1954: Start of gypsum-sulphuric acid plant (production of sulphuric acid and cement from anhydrite). Single superphosphate (now low demand) Storages, bagging and shipping stations.

1958: Mixed fertilizers (closed after start of NPK-plant)

1958: Sulphur burning plant (Monsanto). Continuous improvements and expansions to increase capacity.

1964: NPK-plant (1 granulator, 12 reactors, 1 cooler) - - PEC process

1966: Phosphoric acid plant, prayon process.

1967: First expansion of NPK - plant (plus 1 granulator and 6 reactors)

1969: New NPK-storage with conveyor bridges, bagging and shipping in the south area of the company.

1970: Second expansion of NPK-plant (plus 1 cooler and some improvements)

1972: Heat exchanger for raw meal in gypsum sulphuric acid plant.

1973: Third expansion of NPK-plant (1 granulator, 14 reactors, 1 cooler)

1978: Second belt conveyor from NPK-plant to storage. Equipment to use valve-bags.

1979: Second economicer for Monsanto plant.

From start-up of the plants up to now have increased the capacity of the different facilities by removing bottlenecks, for example:

Monsanto plant	Layout	75	t/day H_2SO_4
	Actual	180	t/day H_2SO_4
Phosphoric acid	Layout	60	t/day P_2O_5
	Actual	130	t/day P_2O_5

Due to good operation and good maintenance the percentual operating time of all our facilities is very high (100 % = 364 days per year):

Examples:

	1977	1978	1979	1980
Gypsum sulphuric acid plant	96 %	95 %	96,1 %	97,6 %
Monsanto plant		98 %	97,3 %	94,8 %
Phosphoric acid plant	94 %	93 %	93,9 %	93,9 %
NPK-plant I	96 %	94 %	96,1 %	95,1 %
NPK-plant II	93 %	95 %	96,7 %	95,1 %

1981
97,6 %
94,8 %
93,8 %
95,1 %
95,0 %

LEAFLETS handed over to PARTICIPANTS

"Engineering manual about plastic lined piping material"

Dow Chemicals

Sempollan
"A material for Improving Wear and Vibration Resistance"

Semperit

Information about
Gypsum sulphuric acid process.

Vöest Alpine AG

chemserv
CONSULTING GES. M. B. H.

Empfänger Unser Zeichen*) Blatt Tag

ACTUAL PROGRAMMES, PROJECTS and PROBLEMS for department ATP

Wheel loader with 1 m^3 shovel
Loading conveyors for very long wagons
Palletizer for open air storage, unit 634

Replacement of fork lift truck
Replacement of dumpers by a wheel loader - 3 m^3 shovel
Replacement heat exchanger VI - sulphuric acid plant
Replacement hot gas filter - monsanto plant
Replacement phosphate scale - phosphoric acid plant
Improvements on bulk loading systems - 620a and 633a
Speed-controllers for belt conveyors
Belt conveyors for coke
Unloading and loading of ships
Asphalt for open sulphur storage
Dose of trace elements
Improvement conversion in Monsanto plant
New sulphuric acid plant - double absorption
Sound protection - unit 601
Dose of coating agents (siliceous earth)
Lacerating machine for paper bags
Dedusting units for phosphate and potassium
Second palletizer for unit 634 (open air storage)
Scales for bulk product
Replacement cement bagging machine
Tank for AS - lye
Utilization of sulphur concentrated iron oxide
Preparation of hot water for division C
Bulk loading into vessels
Replacement KSB - compressors
Extension silo, bagging and shipping - unit 633
Coal dust combustion for cement kiln
Utilization of acid-oil in the kiln

./2

Dedusting of waste gases of spherodizer I and II
Sale of caterpillar (tracked vehicle)
Removal of fertilizer-rests from boxes - nearly empty - unit 633
Utilization of excess steam
Pipeline for sulphuric acid between the units 608 - 626 - 627
Covers of etermit on conveyor bridges
Cleaning of cement silos
Investigations about use of palettizers in unit 620 a
Investigations about corrosions on spherodizers
Reduction of P205- and F-content in by product gypsum

Repair painting of conveyor bridges
Roof repair of clinker storage
Repair of chimney sulphuric acid plant
Repair painting - unit 631
Repair or replacement of electrostatic wet gas precipitator

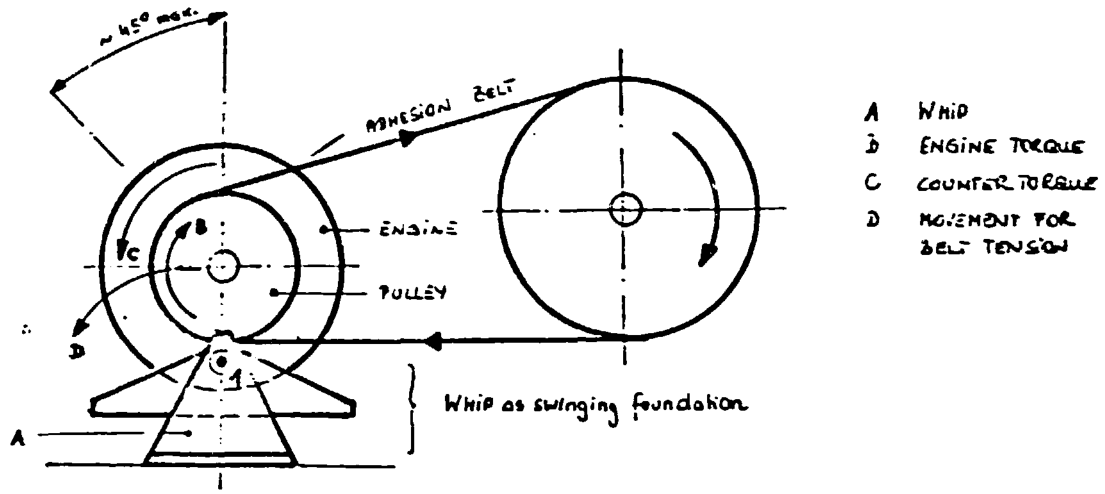
MATERIALS used by ATP

79 01 08 Rih

		CODE			COMPOSITION [%]											APPLICATION
		MAT. NUMBER	internat. code	abbrev.	C	Si	Mn	Cr	Mo	Ni	V	Cu	Nb	Ti		examples
NORMAL STEEL		1.0401	St C 16.61	C15	0,15	0,25	0,40									
NORMAL STEEL		1.0501	St C 35.61	C35	0,35	0,25	0,5[illegible]									
NORMAL STEEL		1.0503	St C 45.61	C45	0,45	0,26	0,65									
NORMAL STEEL			St 35.13 K		?0,15		0,45								P<0,05 S<0,05	CONVEYOR CHAINS (case hardened)
NORMAL STEEL		1.3401	X 120 Mn 12	Chronos	1,2	0,4	12									REDLER
NORMAL STEEL	HEAT RESISTANT	1.7258	24 Cr Mo 5		0,24	0,30	0,70	1,15	0,25							SHAFT FOR SO_2-gas exhaustor
NORMAL STEEL	HEAT RESISTANT	1.7335	13 Cr Mo 44		0,13	0,30	0,6	0,9	0,5							PADDLES FOR SPHÄRODIZER NPK
NORMAL STEEL	HEAT RESISTANT	1.7733	24 Cr Mo V 55		0,24	0,30	0,5	1,3	0,55							
HIGH ALLOYED STEEL	RUST + ACID RESISTANT	1.4550	X 10 Cr Ni Nb 18 9	SAS 2/HY6	0,1	1,0	2,0	18	–	10				(2)	[Mo+Ti ≈ 2%]	
HIGH ALLOYED STEEL	RUST + ACID RESISTANT	1.4571	X10 Cr Ni Mo Ti 18 10	SAS 4	0,08			18	(2)	11				(2)	[Mo+Ti ≈ 2%]	REACTOR-PARTS NPK
HIGH ALLOYED STEEL	RUST + ACID RESISTANT	1.4577	X 5 Cr Ni Mo Ti 25 25	HY8	0,06	1,0	2,0	25	2,25	25						H_3PO_4-resistant
HIGH ALLOYED STEEL	RUST + ACID RESISTANT	1.4580	X 10 Cr Ni Mo Nb 18 10	SAS 4	0,08	<1	<2	18	2,25	11,5						REACTORS NPK
HIGH ALLOYED STEEL	RUST + ACID RESISTANT	1.4586	X 5 Ni Cr Mo Cu Nb 22 18	SAS 10	0,07	0,65	0,8	18	3,2	22	/	2	~1			REACTORS NPK
HIGH ALLOYED STEEL	RUST + ACID RESISTANT		25 Mn Cr Mo 52													CONVEYOR CHAINS
HIGH ALLOYED STEEL	HEAT RESISTANT	1.4821	X 20 Cr Ni Si 25 4	FA	0,2	1	2	25	/	4,5						CONVEYOR CHAINS
HIGH ALLOYED STEEL	HEAT RESISTANT	1.4828	X 15 Cr Ni Si 20 12	FF	0,15	2	2	20	–	12						
STEEL CASTING				GS 60	0,36 0,46											
STEEL CASTING				GS 18	0,8 3,3	1,2 1,7	0,8 1,2								P<0,3 S<0,12	
STEEL CASTING				GG 25		4,9 3,0										MIXER FOR SINGLE SUPERPHOSPH. (ROCK PHOSPHATE + H_2SO_4)
STEEL CASTING	WEAR-RESISTANT	1.3401	G-X 120 Mn 12	Chronos	1,15	0,4	12,5									ARMOUR PLATING OF BALL MILL
STEEL CASTING	WEAR-RESISTANT			BF 253				26	3							—"—
STEEL CASTING	WEAR-RESISTANT		Si-casting	Duracid		15			3							H_2SO_4-pumps
STEEL CASTING	HEAT RESIST.	1.4823	G-X 40 Cr Ni Si 27 4	PYROTHERM FAG	0,4	1,2	/	27	/	4						COOLING SYSTEM OF KILN
STEEL CASTING	HEAT RESIST.	1.4832	G-X 25 Cr Ni Si 20 14		0,2	1,75	1,5	20	/	14						KILN-MATERIAL ENTRANCE
STEEL CASTING	HEAT RESIST.		MECHANITE HC		[illegible]	1,15	?0,6	?29?				?,?			P<0,16	H_2SO_4 converter
STEEL CASTING	RESISTANT	1.4401	G-X 5 Cr Ni Mo 18 10		0,06			18	2	11						Valves for H_2SO_4
STEEL CASTING	RESISTANT	1.4312	G-X 15 Cr Ni 18 8	Corrodur 13	0,15	2	2	18	–	9						Cooling system of Kiln
STEEL CASTING	RESISTANT	1.4410	G-X 15 Cr Ni Mo 18 9	Corrod 13 IC	0,15	2,5	2	18	2,25	10						—"—
STEEL CASTING	RESISTANT	[illegible]	G-X 70 Cr Mo 29 2	Corrod 30	[illegible]	2	1	29,5	2,25	–						H_2SO_4-pumps
STEEL CASTING	RESISTANT	[illegible]	G-X 8 Cr Ni Mo 27 5	4265 [illegible]	0,1			27	1,5	5						NPK-pumps
STEEL CASTING	RESISTANT	[illegible]	G-X 5 Ni Cr Mo [illegible]	([illegible])	0,1	1,5	2	20	3	25						H_3PO_4 submerged pumps
STEEL CASTING	[illegible]			[illegible]	[illegible]	[illegible]	0,55								[illegible]	[illegible]
STEEL CASTING	[illegible]		[illegible]		[illegible]	[illegible]	[illegible]	0,3				0,25			[illegible]	[illegible]

POESCHL SWING - WHIP (electrodynamical belt tension)

automatic, load dependend,regulated belt tension
no slide slipping
best possible efficiency

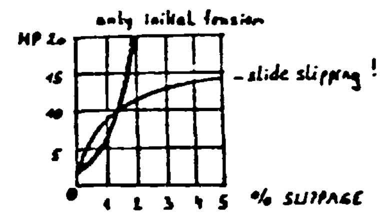


FUNCTION :

The engine torque B produces a counter torque of same size C , which causes a movement of the engine D around point 1 . This means extended shaft distance - and load depended increase of belt tension.
Best power transmission is managed by this turnable engine foundation in connection with polished-cambered pulley and special adhesion belt

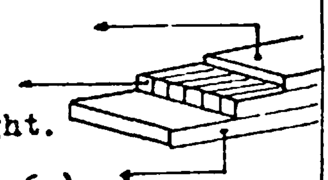
SLIPPAGE :

sliding slippage is not possible because of exact belt-tension adjustment by engine torque.
this means :
higher efficiency
lower initial belt tension
lower stress in shaft bearings
longer working period



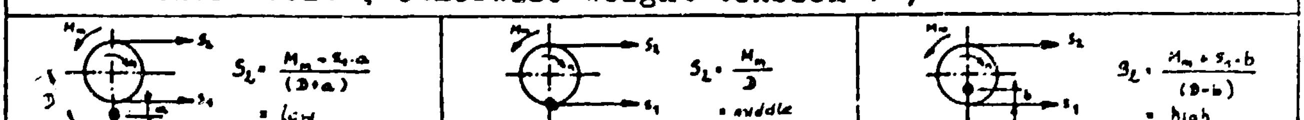
BELTING :

cover material : Polyamid
tie rod : single polyamid strips to join closely to pulley camber. High tensile strenght.
tread : chromium leather with high coefficient of friction (~o,6)



NOTICE ! :

- By changing the engine you have to make sure of right rotation, same weight and size of engine and limitation of whip movement (danger of belt damage!).
- polished cambered pulley
- short belt (otherwise weight tension !)



LINZ AG

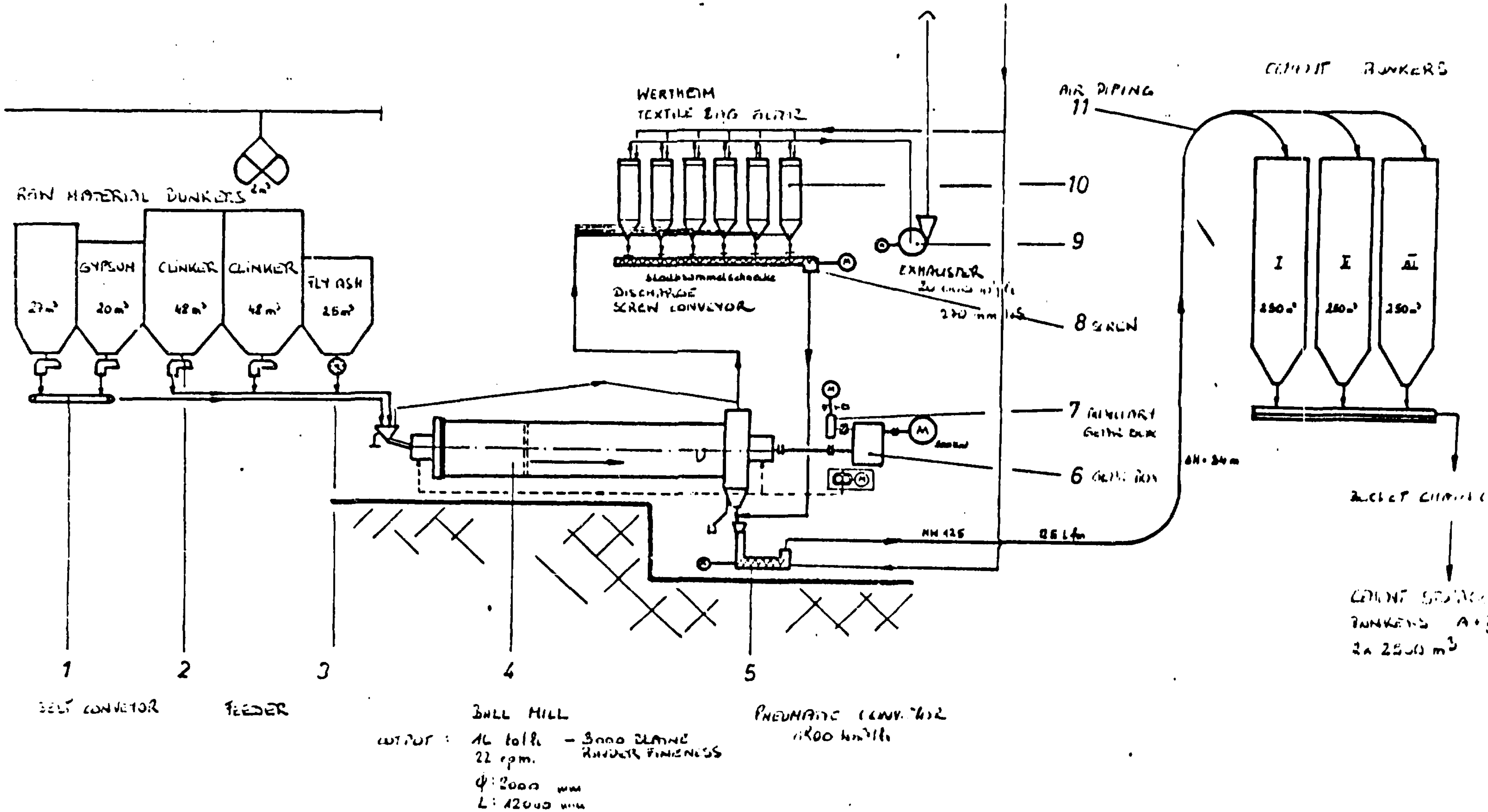
Maßst.:

gez.: 79 08 27

77 12 20

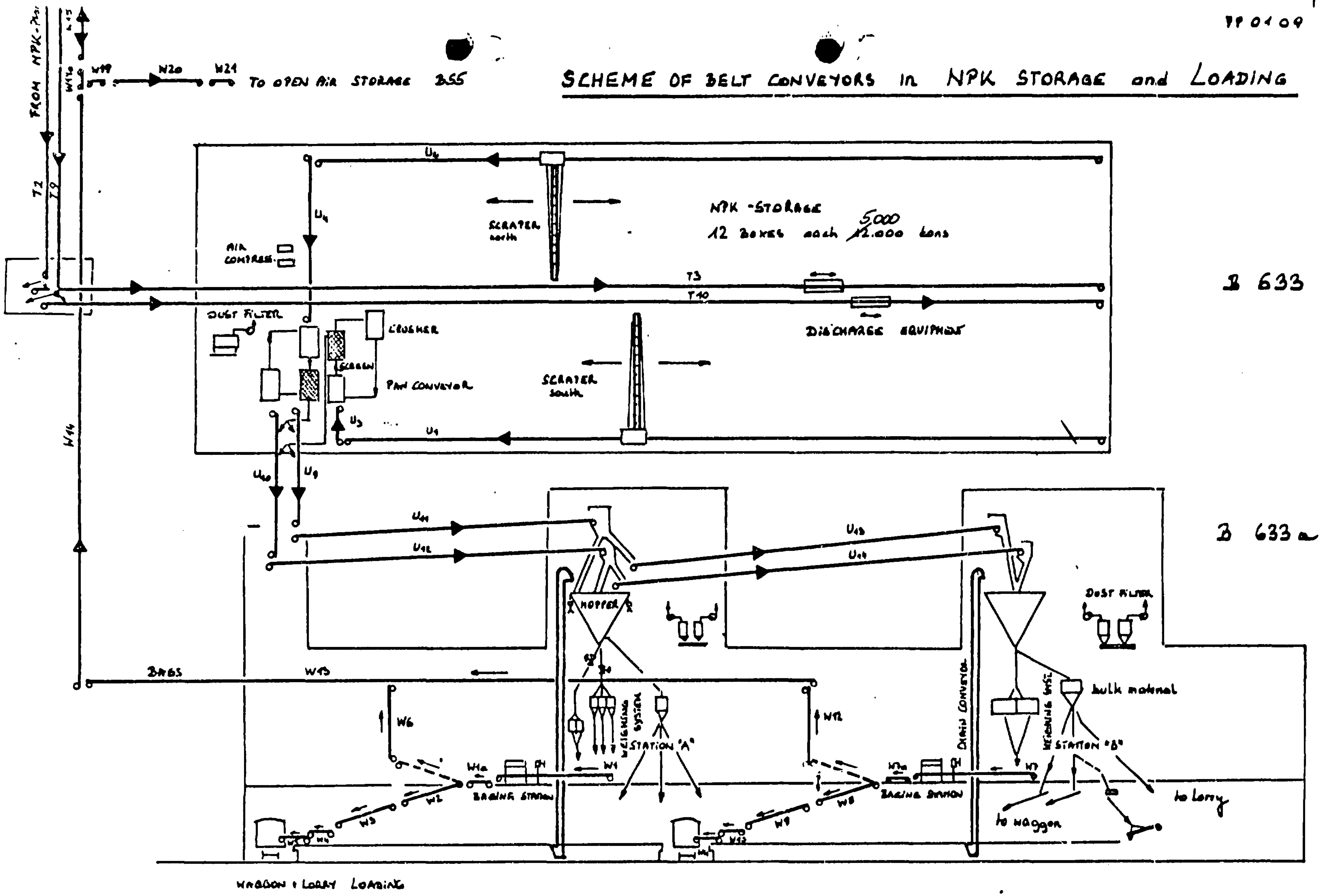
MILLING PLANT for CEMENT Bau 601

16 tons / hour



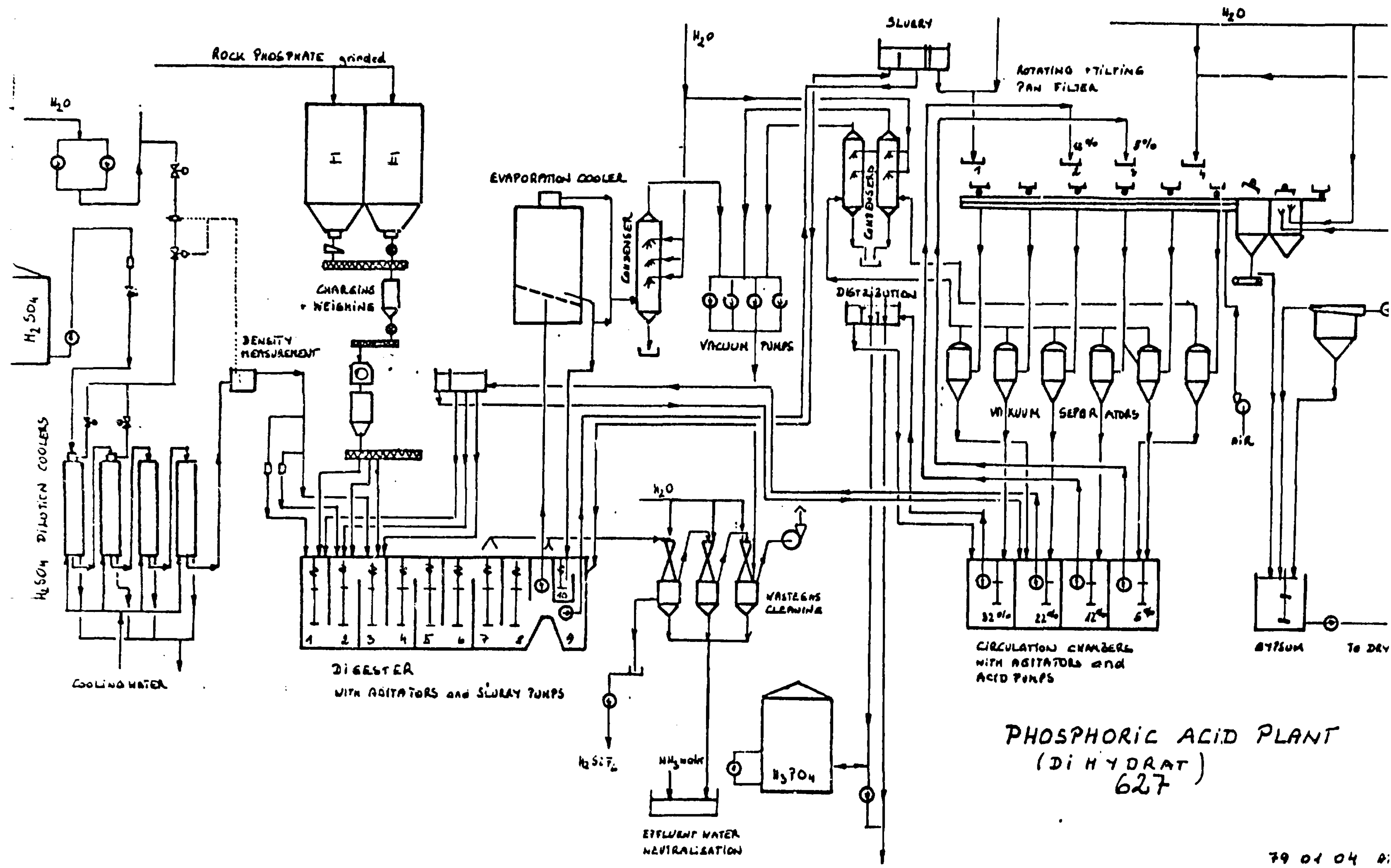
PP 0109

SCHEME OF BELT CONVEYORS in NPK STORAGE and LOADING



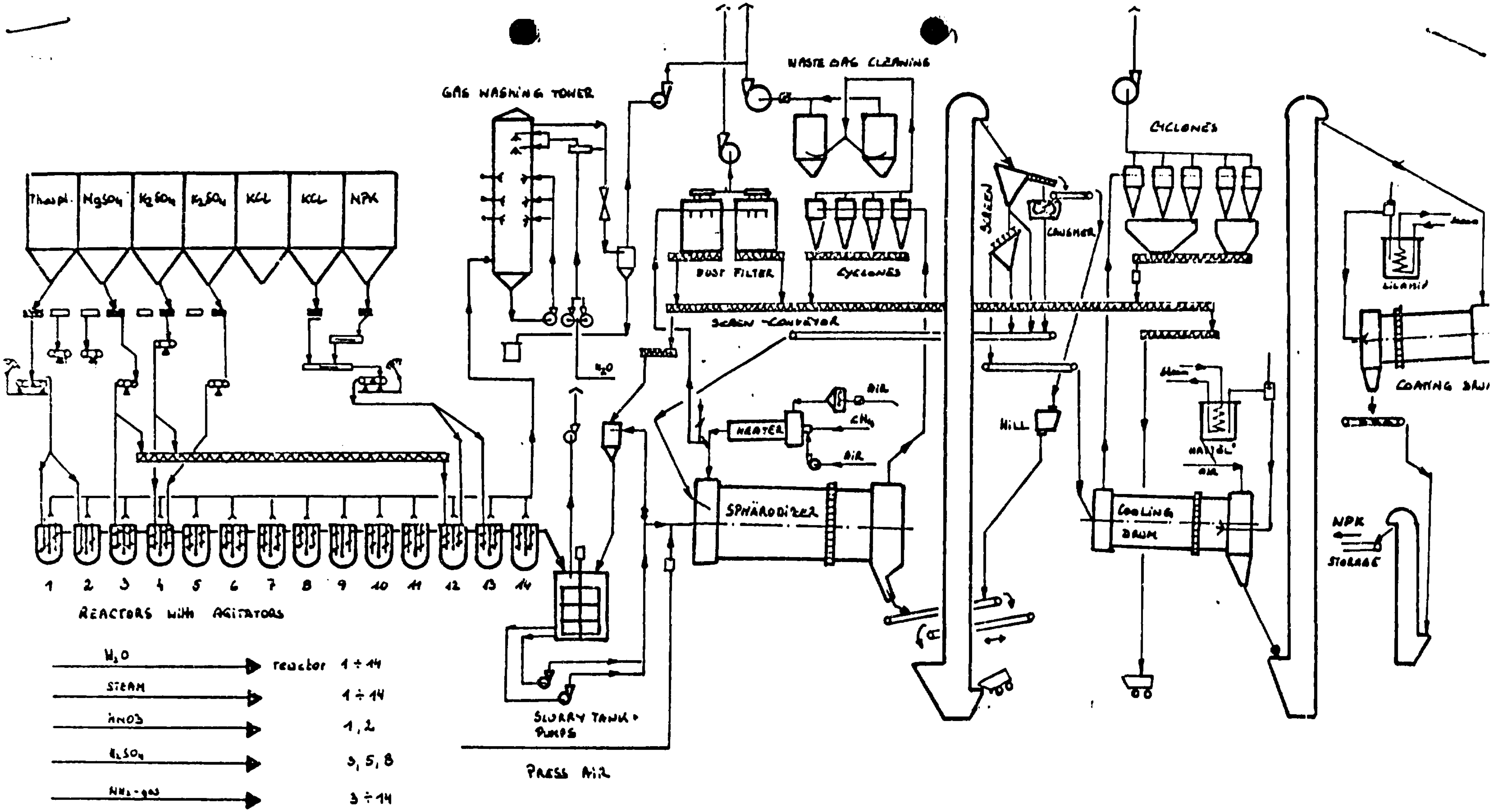
B 633

B 633 a



PHOSPHORIC ACID PLANT
(DI HYDRAT)
627

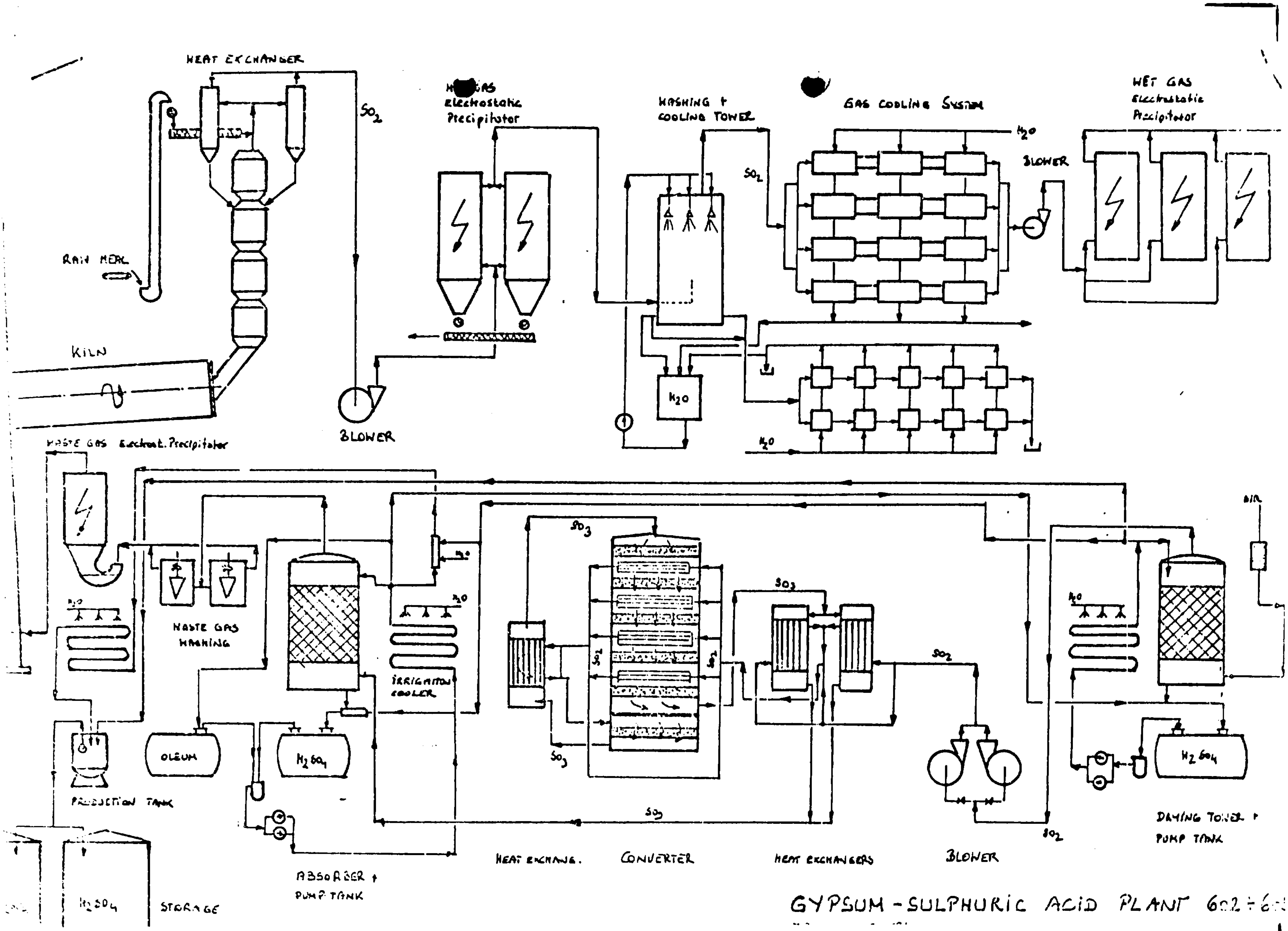
79 01 04



NPK - Plant 626

(2 DIGESTION-SYSTEMS + 3 SPHÄRODIZERS)

78 12 18 R/ATP



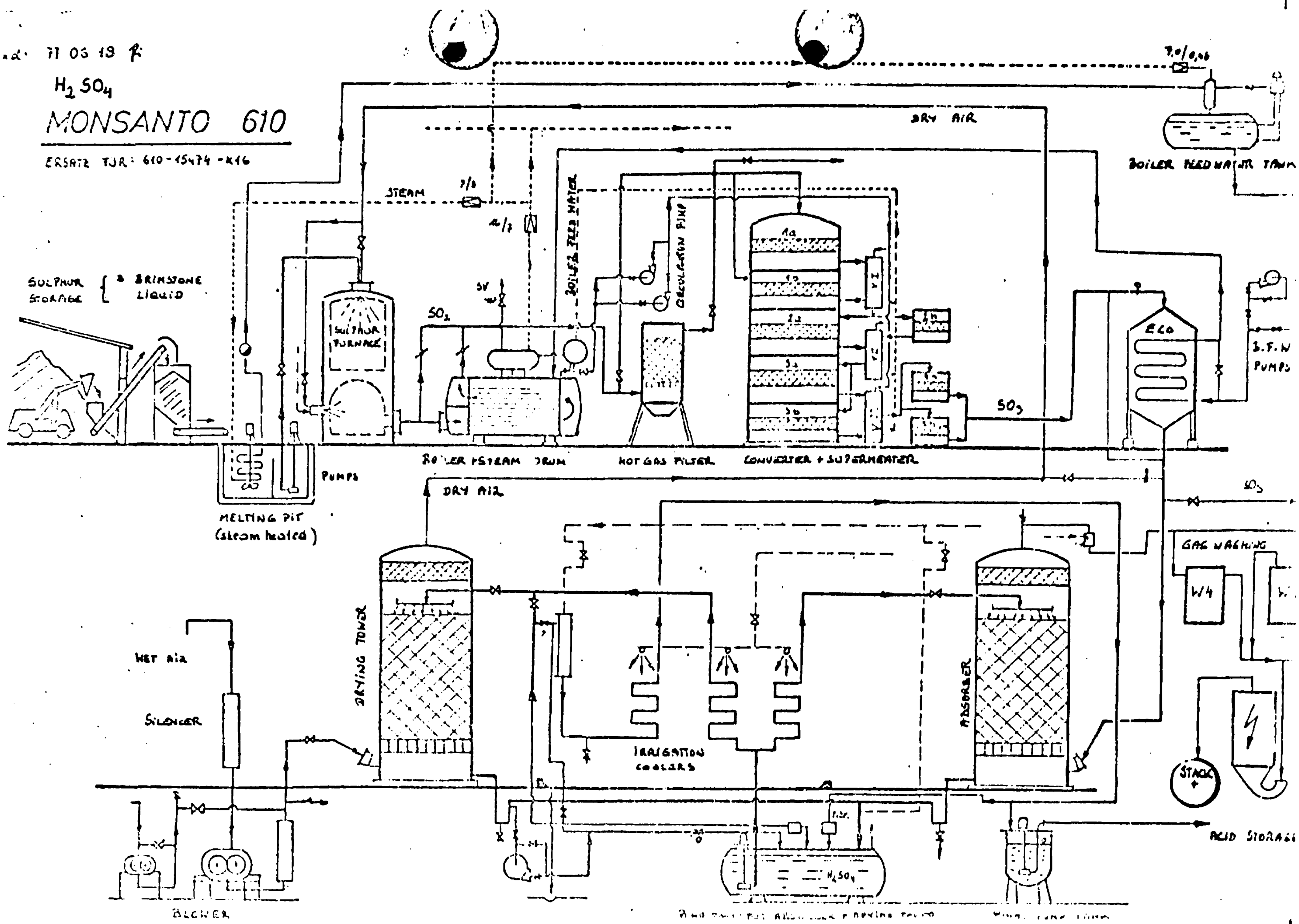
GYPSUM - SULPHURIC ACID PLANT

71 03 13

H_2SO_4

MONSANTO 610

ERSATZ TJR: 610-15474-K16



D I F F E R E N T   T Y P E S   O F   P U M P S used by ATP

M e d i u m: Sulphuric acid

CENTRIFUGAL PUMPS (Horizontal)

Producer:	Ochsner - Austria
type:	U-MOR
capacity:	100 m^3/h - 20 m (50°C) 98%
material:	Cr-casting (Ni-alloyed)
speciality:	hydraulic shaft sealing; useable for high inlet pressure
use:	circulation pump - acid store.
function:	hydraulic sealing by auxiliary impeller; in operation no contact of shaft and stuffing box because of axial shaft movement.
working period:	about 12 months (temporary working)

Producer:	Rheinhütte - West Germany
type:	RE 150/265
capacity:	240 m^3/h - 20 m (up to 120°C - 98%).
material:	n°. 4136
speciality:	hydraulic sealing - impeller with backside vanes
use:	circulation pump for absorbing tower
function:	stillstand - double stuffing box and special ring valve working - hydraulic sealing
working period:	about 12 months (continuous working)

./2

Producer: Rheinhütte - West Germany
type: RE 80/250
capacity: 50 m³/h - 20 m; 60°C; 66 - 78%
material: 18% Si-casting
speciality: divided, removeable casing in steel casting-
wear resistent Si-parts for acid contact.
Hydraulic sealing - impeller with backside vanes.
Double stuffing box and special ring valve.

- SUBMERSIBLE PUMPS (Vertical)

Producer: Rheinhütte - West Germany
type: GVS 150/265
capacity: 113 m³/h - 15 m, 100°C, 98%
material: n°. 4136, carbon shaft box
use: circulation pump-drying and absorbing tower
working period:
about 12 months (continuous working)

M e d i u m: Liquid sulphur

- SUBMERSIBLE PUMPS

Producer: Rheinhütte - West Germany
type: GVS 25/220
capacity: 2,5 m³/h - 45 m liquid sulphur, 135°C
material: cast iron, steel shaft, shaft protection box n°. 4034
speciality: steam heated casing (3,5 bar)
use: sulphur to furnace
working period:
about 12 months (continuous working)

./3

CENTRIFUGAL PUMPS (sludge pumps with packing fluid)

Producer: Klein (Jeumont Schneider) - France
type: wd 100 g
capacity: 40 m^3/h - 40 m, 1 450 rpm
material: nr 4460 or G-X 10 CrNiMo 27,5.
shaft: nr. 4580 plate welding with Celsit 50Nb
speciality: special designed impeller
stuffing box with TFE-packing and sealing liquid.
exchangeable wear disks and rings.
use: NPK-slurry to spherodizer and circulation
working period:
about 4 months (continuous working)

Producer: Worthington
type: 2 CNG 104
capacity: 30 m^3/h - 6 bar, 1 800 rpm
material: "Worthite" - 20Cr/25Ni + 2,5Mo - nb stabilized and thermal treated
shaft n°. 4586
speciality: variable split of impeller by movement of the casing cap.
use: NPK-slurry circulation
working period:
about 4 months (continuous working)

M e d i u m: Phosphoric acid

H_3PO_4-slurry - 30% P_2O_5, 3% H_2SO_4,
60% liquid - 40% solid, 80°C, y = 1,7

./4

SUBMERSIBLE PUMPS (centrifugal, vertical)

Producer: Ochsner - Austria
type: MOVS - 38/200
capacity: 240 m^3/h - 13,7 m, 970 rpm
material: n°, 4500
speciality: exchangeable wear disks and rings
use: H_3PO_4-slurry to evaporation cooler
working period:
2 - 5 months (continuous working)

M e d i u m: Phosphoric acid

H_3PO_4-slurry

SUBMERSIBLE PUMPS (centrifugal, vertical)

Producer: Ensival - Belgium
type: 30 BAV B 80
Capacity: 41 m^3/h - 18 m, 1 450 rpm
material: nr. 4500, nr. 4577
speciality: impeller with backside vanes
exchangeable wear disks and rings.
use: slurry to filter
working period : about 5 month (continuous working).

M e d i u m: Washing Water (5 % H_2 Si F6; 2-3 % SiO
- Waste Gas Cleaming je = 1,05, t = 30 - 50 °C

Centrifugal Pump (horizontal)

Producer: Ochsner - Austria

Type:	E-Mor 2213/50 H
Capacity:	25 m3/h - 45 m - 2800 rpm
Material:	all parts with fluid contact - rubber lined, shaft protection ring Nr. 4550
Speciality:	hydraulic sealing (patent Mackensen)
Use:	circulation pump for waste gas cleaner
Working period	

<u>F I T T I N G S used by ATP</u>

<u>M e d i u m : Sulphuric Acid</u>

producer:	Rheinhütte - Western Germany
type:	gate valve - AZ 1915
size:	DN 150, Pn 6
material:	Nr. 4136, stuffing box-Nr. 4410, TFE-asbestos packing.
speciality:	two piece casing, seating parts easily to regrind exchangeable wear parts, no pressure on stuffing box if valve is closed, low pressure drop because of low turbulence.
use:	for circulation pump to absorber-98% / 120°C.
Working period:	several years

Producer:	Tuflin
type:	process valve with TFE-sleeves
size:	DN 70
material:	ductil iron - fully TFE-lined.
speciality:	rotating plug in a TFE-sleeve which is locked in the body. Without stuffing box and lubrication, seals are not exposed in either open or closed position.
use:	outlet of acid dilution - 72-76 % H_2SO_4.
Working period:	

Medium: Phosphoric Acid up to 80 °C
up to 35 %

Producer: Erhard
type: diaphragm calce FD (rubber squeeze valve).
size: DN 125, Pn 10
material: cast iron - rubber lined
diaphragm - soft rubber
speciality: without stuffing box, exchangeable rubber lining and diaphragm, lifting limitation.
use: throttle valve in acid pipes.
Working period:

Producer: Dürholdt
type: tyre valve
size: DN 50, PN 10
material: cast iron for casing with anticorrosive protection layer; resistant rubber tyre.
(TFE - silvered rubber parts for sulphuric acid).
speciality: without stuffing box, exchangeable rubber parts.
use: stop valve for phosphoric acid.
Working period:

Medium: NPK-SLURRY, Y = 1,3 to 1,7 / 110 to 140 °C
bicalciumphosphate
ammoniumnitrate
calciumnitrate, - chloride and 20 % water

Producer: Worcester
type: 4466 T ball valve
size: DN 100 (25)
material: Nr. 4401 for body, ball and shaft.
TFE for sealings

./7

speciality:	no maintenance, no greasing.
	exchangeable wear parts
use:	Stop-valve for NPK-circulation.
Working period:	about 2 month
Producer:	--- Chemie Linz
type:	---
size:	DN 80
material:	Nr. 4580
	tube in Si-casting, TFE-sealing
speciality:	exchangeable tube and disk
	simple construction.
use:	Throttle valve for NPK-slurry to sphärodizer.
Working period:	3-months
Producer:	Tuflin
type:	D 127 througway valve
size:	DN 50
material:	stainless steel for body (18-10-Mo)
	TFE for ring, sleeve and diaphragm.
speciality:	no maintenance and lubrication
use:	slurry circulation
Working period:	several weeks
Producer:	Gecos W-Germany
type:	PR- plug valve
size:	DN 100
material:	tfe-sealing
speciality:	no stuffing box
	lubrication box for all time greasing.
use:	slurry pipe to sphärodizer

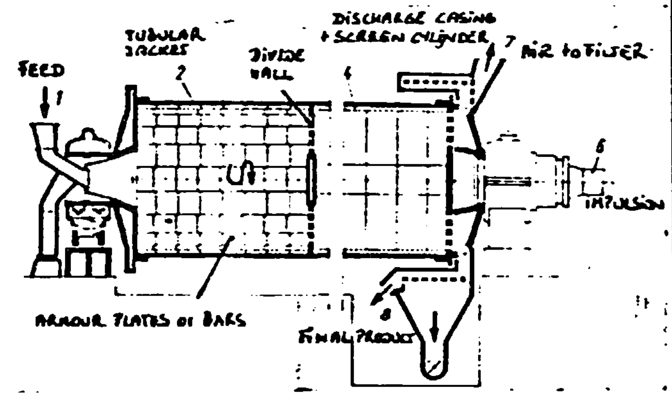
DIFFERENT SYSTEMS OF SIZE REDUCTION used by ATP

G R I N D I N G

BALL MILL

lined with wear resistant Cr-Mn-Mo alloyed stell (1. 3401)

Casted or forged balls up to a size of 100 mm Ø .



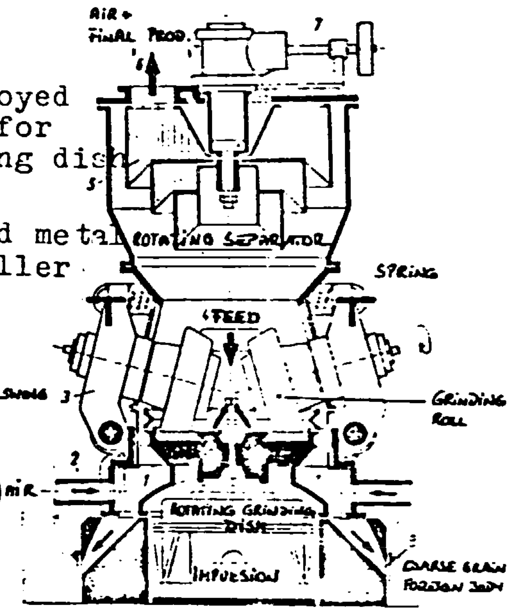
grinding stock: rock phosphate, coke cement clinker, sand

used as separator mill : phosphate, coke, sand
or through way mill : cement clinker

ROLLER MILL

Cr-alloyed stell for grinding dish

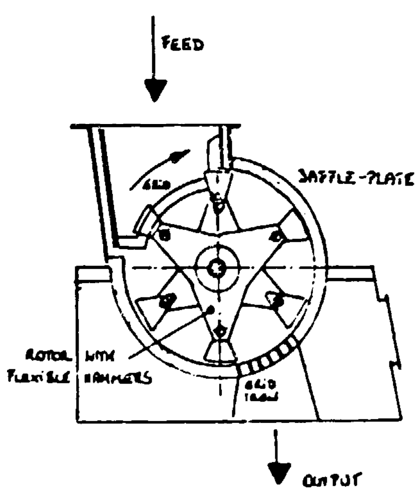
Mn-hard metal for roller jacket

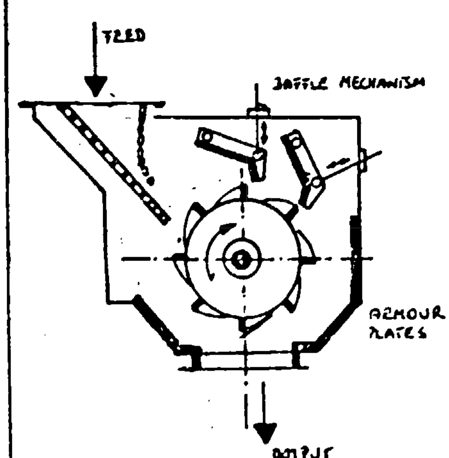


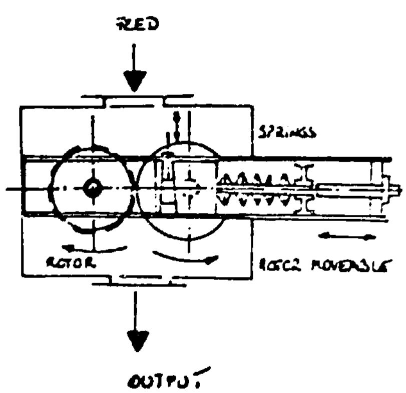
grinding stock: anhydrite, coke, drying of fly-ash.

C R U S H I N G

		HAMMER CRUSHER	BAFFLE CRUSHER	ROLLING CRUSHER
grinding stock:		anhydrite	granulated NPK	granulated NPK
size:	input :	0-250 mm	25-150 mm	0-25 mm
	output:	0- 20 mm	0- 30 mm	0- 2 mm







materials :

armour plates : Mn-steel
hammers : GX 120 Mn12

rollers : [illegible]

ROLLER-ADJUSTMENT for ROTARY KILN or big ROTATING DRUM.

To keep the wear and tear of rollers, tyres and gearboxes of an inclined, rotating drum as low as possible you have to keep up a continuous movement in longitutinal axis-up and down. This axial movement should be limited by two horizontal rollers. The period of moving up and down (distance i.e. 60 mm) should be abaut 8 hours.

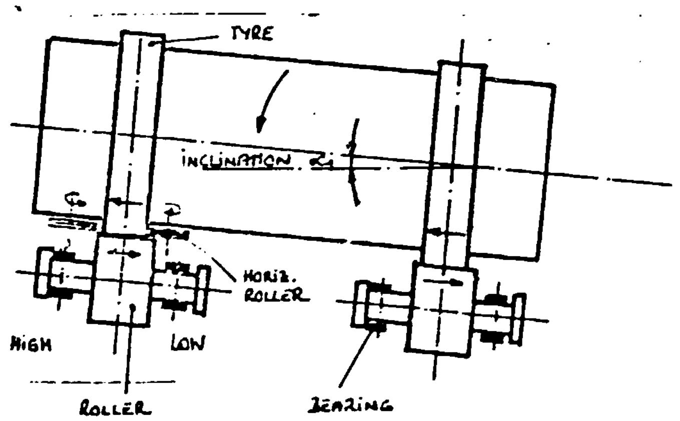
There are different possibilities to manage this movement:

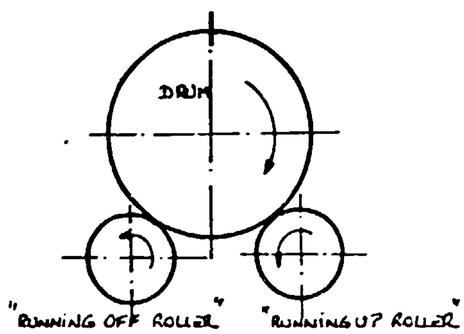
1. <u>HYDRAULIC MOVEMENT</u>

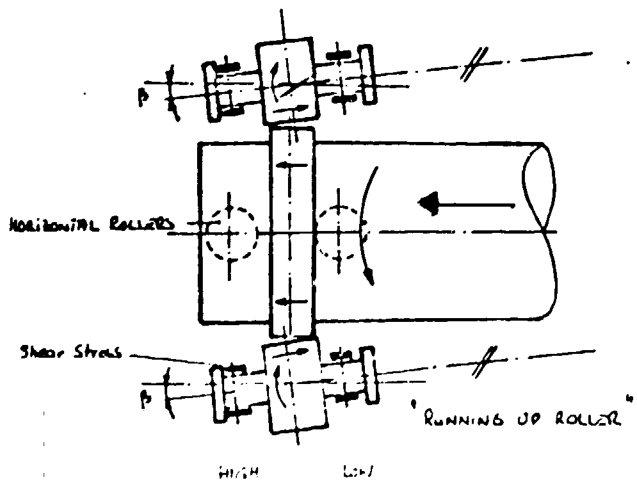
The kiln or drum slowly is pushed up and down by hydraulic cylinders in certain periods.

2. <u>CROSSING OF THE ROLLERS</u>

You start shifting the rollers at the station which is nearest to the impulsion or horizontal rollers and you continue downwards if necessary.
You always have to lift the "running up roller" on this side of the tyre where you intend the drum to move along. Don't lift too much and always keep the roller shafts of one station parallel otherwise abrasion would increase. You strictly have to control temperature of bearings (60 °C). If the drum is in position high and won't come down you have to lubricate the roller surfaces.







NPK-PLANT

82 09 25

NUMBER OF APPARATUS	MACHINES / APPARATUS	CAPACITY	UTILIZATION PERIOD	REPAIRS
626/176 177 stand by (040)	WORTHINGTON - NPK SLURRY PUMP 2 CNG 104 (CIRCULATION PUMP) 2 RUNNING 1 SPARE	30 m³/h - 6 bar 1800 rpm 33 kW	1 YEAR	~~CHANGE~~ / ~~REPAIR OF IMPELLER~~ REPAIR OF CASING } 4886 WELDING
626 / 236 stand by (292) 293 stand by (382) 383 stand by (474) spare 472	KLEIN - NPK SLURRY PUMP HD-100G (PRODUCTION - PUMP) 3 RUNNING 3 STAND BY 1 SPARE	40 m³/h - 40 m 1450 rpm 45 kW	6 MONTHS	CHANGE / REPAIR OF IMPELLER REPAIR OF CASING CHANGE OF FRONT + BACK WEAR DISC
626/022-039 256-261 323-336	STEEL REACTORS FOR NPK DECOMPOS. 18 PLANT I 16 PLANT II 4-6 SPARE PARTS	50 to/h 25 to/h raw care	50 MONTH 170 MONTH and MORE	CHANGE OF REACTOR 1-8 CHANGE OF REACTOR 9-18 SOMETIMES WELDING REPAIRS NECESSARY
626/041-048 249-255 317-320 -620	GEARS FOR REACTOR-AGITATORS EES RV50	1460-240 rpm 15 kW	~ 5 YEARS	REPAIR OF BEARINGS CHANGE OF GEAR WHEELS
626 / 123 262	BUCKET CHAIN ELEVATORS MUT FOR NPK-CIRCULATION PLANT I 750 mm x 24,1 m AA 80 BUCKETS RENOLD CHAIN 8"/1%		8 YEARS	CHANGE OF CHAIN
626/ 418	BUCKET CHAIN ELEVATOR FHN FOR NPK-CIRCULATION PLANT II 400 mm x 29,0 m AA HV-CHAIN 26φ x 400 RUD-SINGLE TEETH A26 x 100 GS45	196 t/h 29 kW 1,1 ms⁻¹	4 YEARS	CHANGE OF CHAIN AND WHEELS
626/ 126 239 436	WASTE AIR BLOWER - SPHÄRO. V2E 24 c I V2E 24 e III V2H 25	95.000 Nm³/h 95.000 Nm³/h 115.000 Nm³/h	3 YEARS 1 YEAR 2,5 YEARS	CHANGE OF ROTOR DAMAGED BEARINGS NEED FOR BALLANCING
626/ 127 360 403	WASTE AIR BLOWER - COOLING DRUM V2E Gi. 24 BÜTTNER RSR 20D95 RSR 20D95	80.000 Nm³/h 80.000 Nm³/h 80.000 Nm³/h	5 YEARS 2,5 YEARS 2,5 YEARS	CHANGE OF ROTOR (BEARINGS) BALLANCING
626/098 265 377	ROLLING CRUSHER DRAGON CA 3E 55/220 rpm VOEST WB 70 140 DF 230/330 rpm VOEST WB 70 140 DF ~~COARSE~~	680 φ 1400 b 10 t/h 90 kW 13 t/h 90 kW 700 φ 1400 lw	13 YEARS 14 YEARS 6 MONTH	CHANGE OF ROTORS CHANGE CHANGE OF ROTORS CHANGE OF BELT
626/ 104 263 344	ROUGH SCREEN NPK FLAMMRICH 1800 x 400 x 5,5φ FLAMMRICH 1800 x 400 x 5,6φ RHENUM 1750 x 2600 x 5,6φ DPE 680-6/F480-4/175 x 310	65 to/h 5,5 kW 65 to/h 5,5 kW 180 to/h	3 MONTH 5 MONTH	NEW SIEVE NETTING NEW SIEVE NETTING
626/ 105 264 345	FINE SCREEN NPK RHENUM A22/180 2150 x 1810 x 22 Schwingkörper SD 200 A RHENUM WA 14/190 x 313 7 SB 338 2x(950 x 5130	40 to/h —"— 60 to/h	1-3 MONTH 1-3 —"— 2 MONTH	NEW SIEVE NETTING NEW SIEVE NETTING
626/ 091 092 266	OCHSNER ROTARY COMPRESSORS RW 108 RW 108 RW 108	1000 m³/h - 7 bar	1500 - 10.000 h	CHANGE OF VANES MACHINING OF HOUSING REPLACE ROTATING RINGS, BEARINGS
626/ 124	LIEBHERR FHN			

PHOSPHORIC ACID PLANT

22.09 25

NUMBER OF APPARATUS	MACHINE / APPARATUS	IN OPERATION	CAPACITY	UTILIZATION PERIOD	REPAIR	
627 / 023 + 026	SLURRY PUMP TO FILTER D'ENSIVAL 30 BAV 80	1	41 m³/h – 18 m 1450 rpm 20 kN	(3) to 6 MONTH	REPLACE IMPELLER (or welding) REPAIR HOUSING CHANGE OF WEAR DISCS	
627 / 133 622 + 025	SLURRY PUMP TO COOLER OCHSNER MOVS 38/200 D'ENSIVAL VAPZ 200/150	1	240 m³/h – 14 m 970 rpm	(2) to 6 MONTH	IMPELLER HOUSING WEAR - DISCS	
623 / 083 + 084 521 + 543 161 + 162	PUMPS FOR GYPSUM TRANSPORT VOGEL 100 VE - 225 HEN	2	100 m³/h - 16 m 1450 rpm - 15 kN	(4) to 6 MONTH	REPAIR / REPLACE OF IMPELLER HOUSING	
627 / 165 ÷ 170 048 ÷ 052	H_3PO_4 - ACID PUMPS D'ENSIVAL VAP 95/65 S	6 ÷ 8	25 m³/h -22 m 1470 rpm	3 to 4 YEARS	—·—	
627 / 078 - 86	AGITATORS OF DIGESTER	9	75 rpm 22 kN	3 YEARS	REPAIR OF PLATES (HV 9) REPAIR OF RUBBER LINING	
627 / 058 059 060 061	VACUUM PUMPS OCHSNER 20 V3 OCHSNER 15 V3 OCHSNER 12 V1 } 30 TORR	2 1	2000 m³/h 740 rpm 48 kW 860 m³/h 950 rpm 520 m³/h 950 rpm			
627 / 024	PRAYON - FILTER TYPE 12 B RUBBER PLATES FILTER CLOTHES ACID TUBES SAFETY CLUTH "SIPDI"	 12 12 12	13,5 m² FILTER AREA	 15 YEARS 1 MONTH 2,5 YEARS 2 YEARS	 RENEWED WASHED AFTER FORTNIGHT, → REPLACED	
627 / 063 - 71	H_2SO_4 - DILUTION COOLER CARBONE LORRAINE GM8	4	8 m² — 16 blocks	9 YEARS (6-8 MONTH)	REPLACEMENT OF BLOCKS CLEANING OF THE POLYBLOCS	
627 / 063 - 71	BUCKET WHEEL - PHOSPHATE BUNKER	2	280 ϕ / 200 ϕ / 420	2 YEARS	REPLACEMENT OR REPAIR	
627 / 021	EVAPORATION COOLER -		1460 ϕ 6300	4 YEARS	REPAIR OF RUBBER LINING AND ACID RESISTANT BRICKWORK	
627 / 132 133	MOHNO PUMPS N 80		18 m³ 25 m 200 rpm 5 kW			

OIL LUBRICATION BY MEANS OF CONSTANT LEVEL OILER

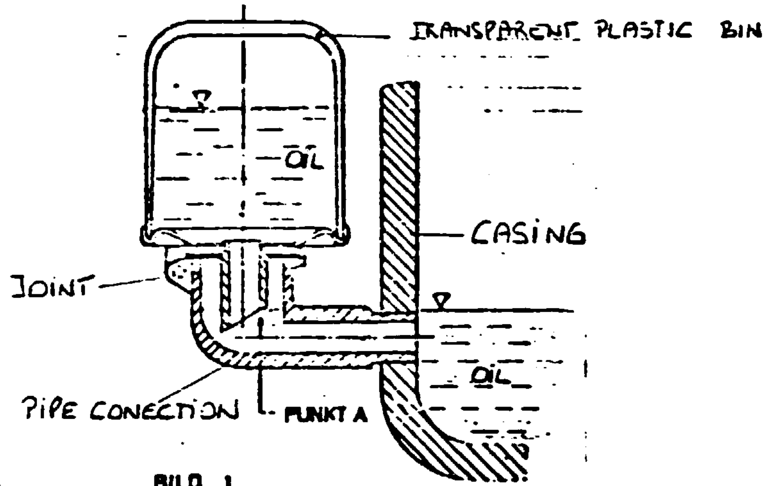


BILD 1

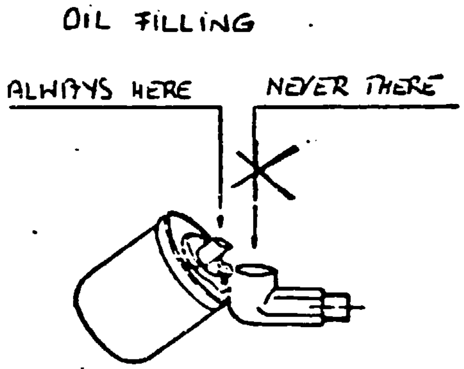


BILD 2

- IS THE OIL LEVEL LOWER THAN POINT A
- AIR COMES INTO THE NOZZLE OF OIL BIN
- OIL DROPS OUT UNTIL POINT A IS REACHED

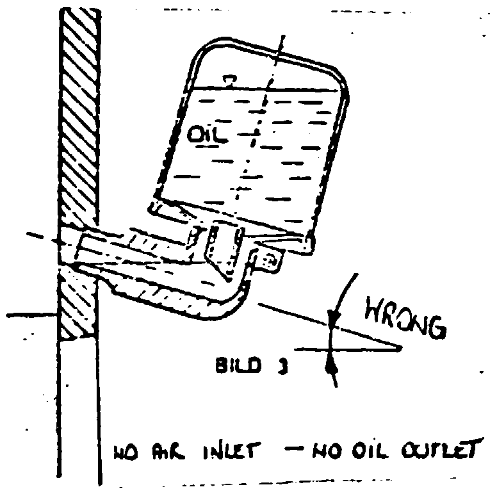


BILD 3

CAUTION !

EXACT HORIZONTAL MOUNTING OF OIL PIPE CONECTION IS NECESSARY OTHERWISE AIR INLET AND OIL OUTLET IS IMPOSSIBLE

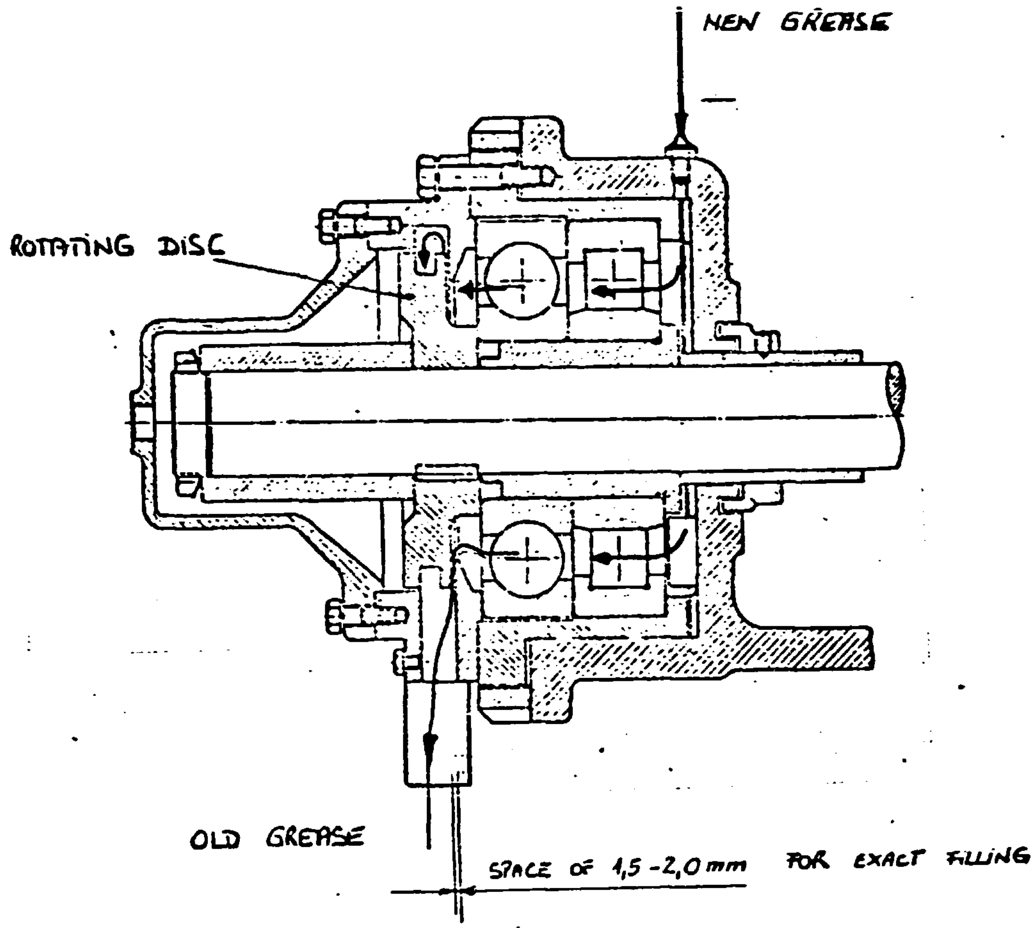
APPLICATION

OIL LUBRICATION FOR STANDARD CHEMICAL PUMPS

LUBRICATION CHART.

NR. OF APPARATUS	TYPE OF MACHINE	PART	KIND OF LUBRICATION	LUBRICANT	QUANTITY	CONSUMPT.	INTERVAL CHANGE	CONTROL	REMARK
EXAMPLE 633/021	GEAR	GEAR WHEEL BEARINGS	DIPPING	MOBIL D.T.E. COMPOUND A.A	65 l		1/year	1/per month.	

REGULATED LUBRICATION OF ROLLING BEARINGS



ROTATING DISC ENABLES LUBRICATION DURING OPERATION TIME BY REMOVING OLD, SPENT GREASE OUT OF THE CASE.

ADVANTAGE : CONTINUOUS CHANGE OF GREASE WITHOUT DANGER OF OVERFILLING

CAUTION : LUBRICATION ONLY IN OPERATING TIME ALLOWED .

APPLICATION : FOR BEARINGS OF HIGH SPEED AND HIGH TEMPERATURE

— ESPECIALLY C3 AND C5 BEARINGS (HIGHER RADIAL CLEARANCE).

RADIAL CLEARANCE OF ROLLING BEARINGS

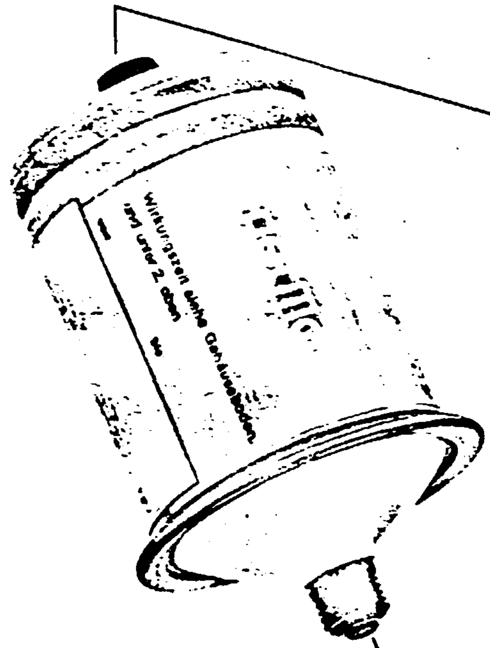
C 1
C 2 } LOWER AMMOUNT OF RADIAL CLEARANCE (I.E. BALL BEARINGS ON GEAR WHEELS)

— NORMAL CLEARANCE

C 3
C 4 } HIGHER AMMOUNT OF RADIAL CLEARANCE (I.E. HOT GAS BLOWER),
C 5

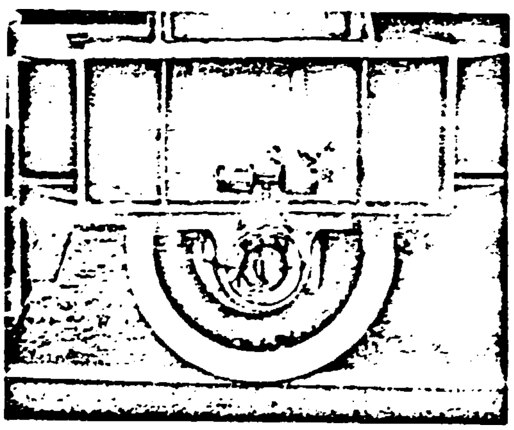
AUTOMATIC GREASE INDEXTOR

SIMPLE SCREWING IN GREASING IS TAKEN CARE FOR ABOUT 6-MONTHS



SCREW FOR STARTING A CHEMICAL PROCESS TO PRESS OUT THE GREASE (PRESSURE VESSEL).

GREASE OUTLET



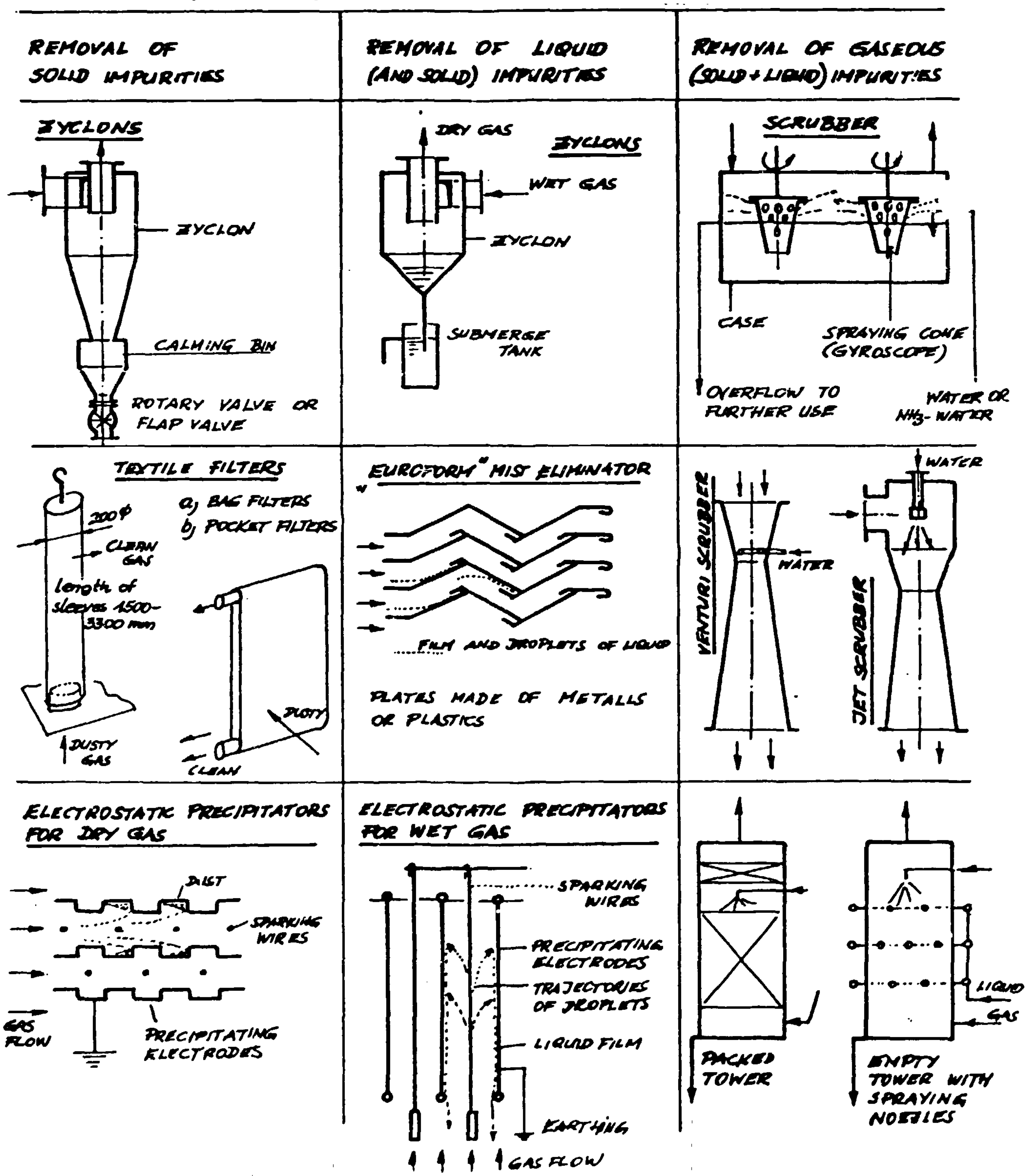
ORGANISATION OF LUBRICATION / DEPARTMENT ATP - APP - APZ

OPERATORS	MAINTENANCE PEOPLE
REFILL AND ADJUST DROP OILERS REFILL GREASE POTS CONTROLL OF ALL POINTS OF LUBRICATION i.e. NIPPLES GREASE BOXES OIL DROPPERS LUBRICATION OF FILTERS - NPK plant	ALL CLOSED LUBRICATION SYSTEMS: (GEAR BOXES ....). MOTOR GREASE PRESS : i.e pan conveyors CENTRAL LUBRICATION SYSTEMS (except FILTER LUBRICATION)

WASTE GAS - POLLUTION CONTROLL

a) Injunctions of authorities:
Due to the very closed location of Chemie Linz to the town of Linz we have very severe injunctions concerning pollution controll. In the planning state of a new plant we have to declare the volume, chemical analysis, dust content, temperature of all effluents. We are obliged to controll this effluents in a determined way and to show this notes to the authotities.
Examples: Continuous recording of SO2-concentration of the waste gas in sulphuric acid plants. Dust determination at least four times per year. Analyses of effluent water from different points of the sewage-system.

b) Methods of gas cleaning in dept. ATP



Responsibility:

There is a separate department in our company responsible for Chemie Linz internal pollution controll and competent for all the contacts to authorities.

HOW TO DRAW UP A SHUTDOWN PROGRAMME
(gypsum sulphuric acid plant)

Factors for planned shutdowns in Chemie Linz

a) Weather conditions (labour, plant)
b) Availability of personnel (principal leave time in winter and summer)
c) Energy situation (surplus or shortage of steam)

Planned shutdowns of large plants in Chemie Linz mostly are timed
April - June
September - October

Chemie Linz practice in timing of large shutdowns:

1) Determination of shutdown date by production and maintenance department
2) Coordination of mentioned shutdowns by central division T (technic) according manpower availability
3) Coordination of fixed shutdowns with all concerned departments (production-, maintenance-, procurement-, sales-, energy-department,.....)
4) Draft of shutdown programme by maintenance department (shutdown book).
   Discussion and completion of the draft together with production department.
5) Estimation of shutdown time and manpower demand.
6) Typewriting of programme, copying, distribution of programme one to three weeks before shutdown.
7) Arrangements with personnel department and works council concerning working time, overtime, shift work, additional allowance.
   Information of staff by notice.
8) Shutdown discussion with all concerned workshops (engineers, foremen) one week before shutdown.
9) Integration of personnel from other maintenace departments, allocation of jobs to skilled working groups of department workshop and central workshop.

./2

10) Preparation of job permits according to shutdown programme by production- and maintenance-foremen.
11) Shutdown of plant, cooling down to working conditions, start of jobs. Some jobs can be started before shutdown.

SHUTDOWN - PROGRAMME

GYPSUM SULPHURIC ACID PLANT

The shutdown time is appointed by the renewal of the high voltage installations for electrostatic hot-gas-aand wet-gas-precipitators:

1982 09 14 - 09 15:	Shutdown and cooling down of the plant after removal of kiln-crusts by means of high pressure water spraying system. Removal of existing high voltage device by TEL	
1982 09 16 - 09 19:	Cleaning of high voltage room. Take care to remaining electrical installations e.g. insulators.	
	Whitewashing of the room.	TBW
	Cleaning after whitewashing	TBW/APZ
1982 09 20 - 09 22:	Erection and assembly of the new high voltage machines, TEL	
1982 09 23 :	Testrun . Start of the plant.	

Unit 601 (raw meal preparation)

1)	Clean suction air duct between filters and compressors (arrange supply from CL-network)	APZ/ATP
2)	Check batch weighers in raw meal mixing station	TME
3)	Check of journal bearings of mixer and screw conveyors	ATP
4)	Change water valves below mixing station	ATP
5)	Repair elbows in pipe for pneumatic transport of phosphate from unit 601 to phosphoric acid plant	THW
6)	Check rotary valves and screw conveyors in mixing station	ATP

7) Repair filter for homogenization plant
start job at 1982 09 13 ATP
8) Drawing for impeller of coke-filter fan ATP
9) Convert phosphate mill for grinding of cement
(1982 09 13) and back to phosphate (1982 09 20) ATP
10)
11)
12)

Unit 602 (kiln plant)

1) Check brick-lining of the kiln and the heat exchanger TBW/APZ/ATP
2) Alignement of klin ATP
3) Check apron conveyors and clinker crusher ATP
4) Repair clinker cooler ATP
5) Repair chute from clinker cooler to apron conveyor ATP
6) Repair chute from belt weigher to kiln ATP
7) Check main drive of kiln ATP
8) Check redler conveyor for cracks ATP
9) Change bearings on SO2-hot gas fan THW
10) Renew ceramic plates in raw meal hopper for belt weigher TBW
11) Check granulation filter ATP
12)
13)
14)

Unit 605 (gas preparation)

1.	Investment programme 1707 - "High voltage device, GS-plant, unit 605 (replacement)." Appointed time see page 1	TEL
2.	Change frames for spraying electrodes (enforced type), measure guide-slots of precipitation electrodes in electrostatic hot gas precipitator	ATP
3.	Repair leakage on lead duct upstream wet-gas-precipitator	THW
4.	Redler conveyor C-repair tension station on deflection pulley	ATP
5.	Renew chute from redler conveyor C	ATP
6.	Lead jobs on gas duct outlet cooling tower	THW
7.	Repair gas coolers (start job at 1982 09 06)	THW
8.	Asseble new frame to return water pump	THW
9.	Repair leakage on ceiling of high voltage room	TBW
10.	Renew drain of collecting tank for washing acid	THW
11.		
12.		
13.		

Unit 607 (contact plant)

1.	Screening of catalyst (mounting of electric hoist)	APZ/ATP
2.	SO_3 duct, renewal of tee - inlet heat exchanger I and I a	THW
3.	Check and clean pipe, outlet drying tower	APZ/ATP
4.	Check plastic lined pipes (experiments) for sulphuric acid	ATP/TMP
5.	Check acid resistant brickwork in drying and absorption tower	TBW/ATP
6.	Remove distance piece with compensator, prepare saddle and support of duct	THW
7.	Welding job inlet of distribution through 3, absorption tower	ATP
8.	Assemble distance rings in pipes above acid pumps	ATP

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9.	Check moisturizer (flange leaks)	ATP
10.	Renew flanges bypass heat exchanger VI, DN 400	THW
11.	Check submerged suction pipes for acid pumps inside tanks	APT
12.	Check heat exchanger VI and associated ducts (timder)	ATP
13.	Set blinds into gas duct downstream SO_2 blower (cleaning)	ATP/APZ
14.	Replace gaskets eventually flanges in gas duct outlet catalyst-bed "F"	THW
15.	Change armatures and acid pipelines	ATP
16.		
17.		
18.		

<u>Unit 609 (waste gas cleaning)</u>

1.	Repair gas inlets into waste gas scrubbers	THW
2.	Adjust condensate pipe coming from electrostatic precipitator	THW
3.	Change gaskets at siphon inlet electrostatic precipitator	ATP
4.	Repair AS-lye tank (steel, lead, sandblasting, painting)	THW
5.	Lead jobs (leaks) on electrostatic precipitator	THW
6.	Repair neutralization pit	TBW
7.		

<u>General jobs</u>

1.	Change of safety valves	ATP
2.	Scaffolding jobs according request	TBW
3.	Electrotechnical and instrumentation jobs .	TEL/TME
4.	Insulation jobs after instruction	TBW

SHUT DOWN PROGRAM

PHOSPHORIC ACID PLANT , Building 627

1. Removing and control of all agitators and gears of the reactors.
2. Change of gear box for agitator n°. 6.
3. Repair of brickwork - reactor n°. 1.
4. Control of brickwork - reactor n°. 2 - 10 and acid circulation tanks by the civil department.
5. Control of metal plates inside of reactors.
6. Removing and cleaning of discharge pipe of evaporation cooler.
7. Control of rubber lining - evaporation cooler.
8. Control of rubber lining and water nozzles - vacuum condensers.
9. Mounting of new rock phosphate scale.
10. Removing and control of agitators and vertical pumps of acid circulation tanks.
11. Control of rock phosphate bunker and pneumatic extraction.
12. Control of vertical pumps for filter and evaporation cooler.
13. Repair of belt conveyor for gypsum.
14. Repair of gypsum chute.
15. Control of pan filter and distributer.
    Control of variable speed gear.
16. Change of filter cloth and filter plates if necessary.
17. Removing and cleaning of dipping pipes of reactors.
18. Control and cleaning of waste gas scrubbers.
19. Control of extraction fans of gypsum throw-off chute and pan filter.
20. Remove of sulphuric acid metering unit.
21. Remove and cleaming of flow meters for sulphuric acid dilution coolers 1 -4.
22. Remove and cleaning of control valves for 5% and 12% acid and washing water.

./2

23. Remove and cleaning of flow-meter of wash-water and 5% acid.
24. Control of metering unit of SiO_2.
25. Calibration of transmitter for vacuum gauge.
26. Control of all shafts of agitators in the reactors including the plastic liners.
27. Control of lead-lining at the bottom of pan filter.
28. Repair of dust filter of rock phosphate bunkers.
29. Remove and cleaning of wash-water pip-filter.
30. Control of gypsum-slurry tank and agitator.
31. Change of pipes in the area of sulphuric acid metering unit.
32. Control of discharge vessels on pan filter - change of rubber plates.
33. Control of reactors 1 - 10.
34. Control and repair of stower pipeline - rock phosphate.
35. Change of sulphuric acid dilution cooler n°. 2.
36. Remove control valve for vacuum of evaporation cooler.

---

37. Control of sulphuric acid pipelines being on test (teflon lined).
38. Check of dimensions of conical bottom - evaporation cooler.
39. Repair of frames - pan filter.
40. Get going of slide plate between reactor 1 and reactor 10.

ATP - TEST RECORD   Serie n°.

Plant: Phosphoric acid plant   Unit n°.

Place Transport of gypsum (by-product)

Object: Gypsum, pump   App. n° 423 084

Actual Status: Impeller material n° 1.4580
test n° II

Modification: Impeller material n° 1.4460 (increased Cr content
lower Ni content)

Purpose: Material test (resistance)

Method: Comparison of erosion rate (two pumps at the same time)

		weight start	weight end	G kp	h	erosion rate
Start of test:	1981 06 26					
	impeller I	8,8	6,7	2,1	4349	0,48g/h
	impeller II	9,2	5,9	3,3	5571	0,59 g/h
Control:	1982 03 19					
End of test:	1982 06 02					

Result: 20 % less erosion with mat. n° 1.4460

Conclusion:

Cost: 12 % higher price of material

Average cost of one repair:

Efficiency: - 20% erosion / + 12% price ----- o.k.

Performance: in future order only 1.4460

chemserv
CONSULTING GES.M.B.H.

Empfänger | Unser Zeichen*) | Blatt | Tag

CHECK-BOOK for BELT CONVEYORS

According authority regulation § 95 ADSV all belt conveyors have to be checked yearly. The results must be recorded. The inspection is ordered resp. carried out by the responsible maintenance foreman.

A) Check of a stationary belt conveyor comprises the following items

1.	Test pre-alarm before starting the conveyor	APP/ATP
2.	Test all safety switches	APP/ATP
3.	Check safety devices on drive pulley	ATP
4.	Test all pull-line switches	APP/ATP
5.	Check safety devices on tail pulley	ATP
6.	Check safety devices on tension-station	ATP
7.	Check belt-cleaners	ATP
8.	Check idlers and return idlers	ATP
9.	Check function of non-return brake and condition of protective cover	ATP
10.	Check protective caps over coupling and shaft	ATP
11.	Pay attention to squeeze-points on feed- and discharge-chuts	ATP
12.	Are all earthing wires in good condition?	ATP/TEL
13.	Particularities: e.g.: has the conveyor to be equipped witö an electric-conductive belt and is such a belt actually used?	ATP

B) The inspection of a transversable or moveable belt conveyor covers all the items of a stationary conveyor according A) plus the following additional points:

1.	Test limit switches for turning or movement	APP/ATP

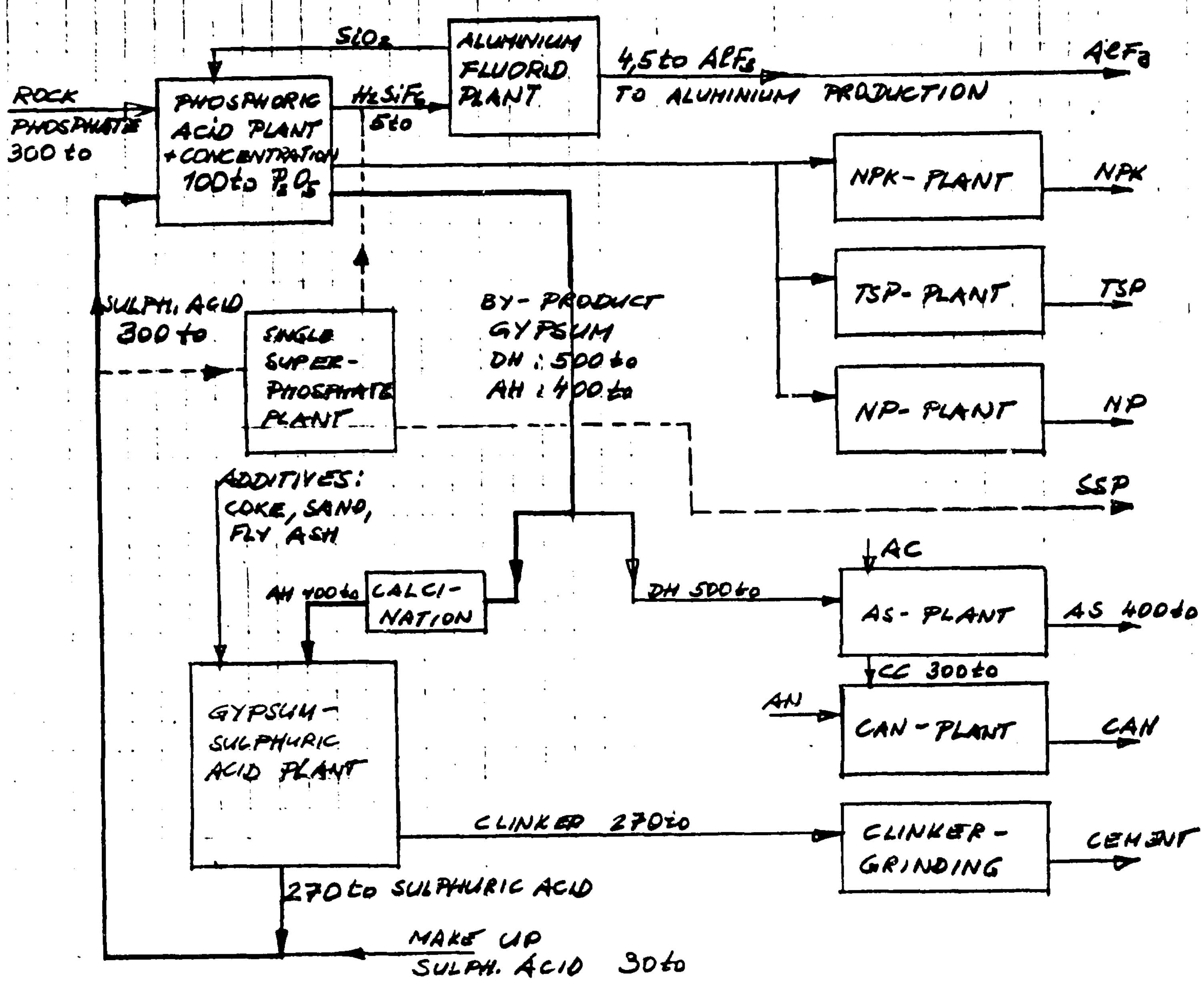
2. Protective cover on moving-motor	ATP
3. Rail-cleaners	ATP
4. Test alarms if anyone exist	APP/ATP
5. Drag-cable with suspension or cable drum including protective equipment	ATP/TEL
6. Electric collectors and electrical lines and protective shield	ATP/TEL
7. Tranction winches with ropes	ATP/T-RV

In the following tables the checks are to be confirmed with date and signature. Troubles recognized during inspection are to be described under a footnote at the end of the booklet. The trouble must be solved immediately. After a repeated check the regular condition must be stated with date and signature.

After the checks carried out in a distance of one year the check-book is to be shown to the department manager who has to sign the check book.

Our safety department and all authorities are allowed to ask for the check book.

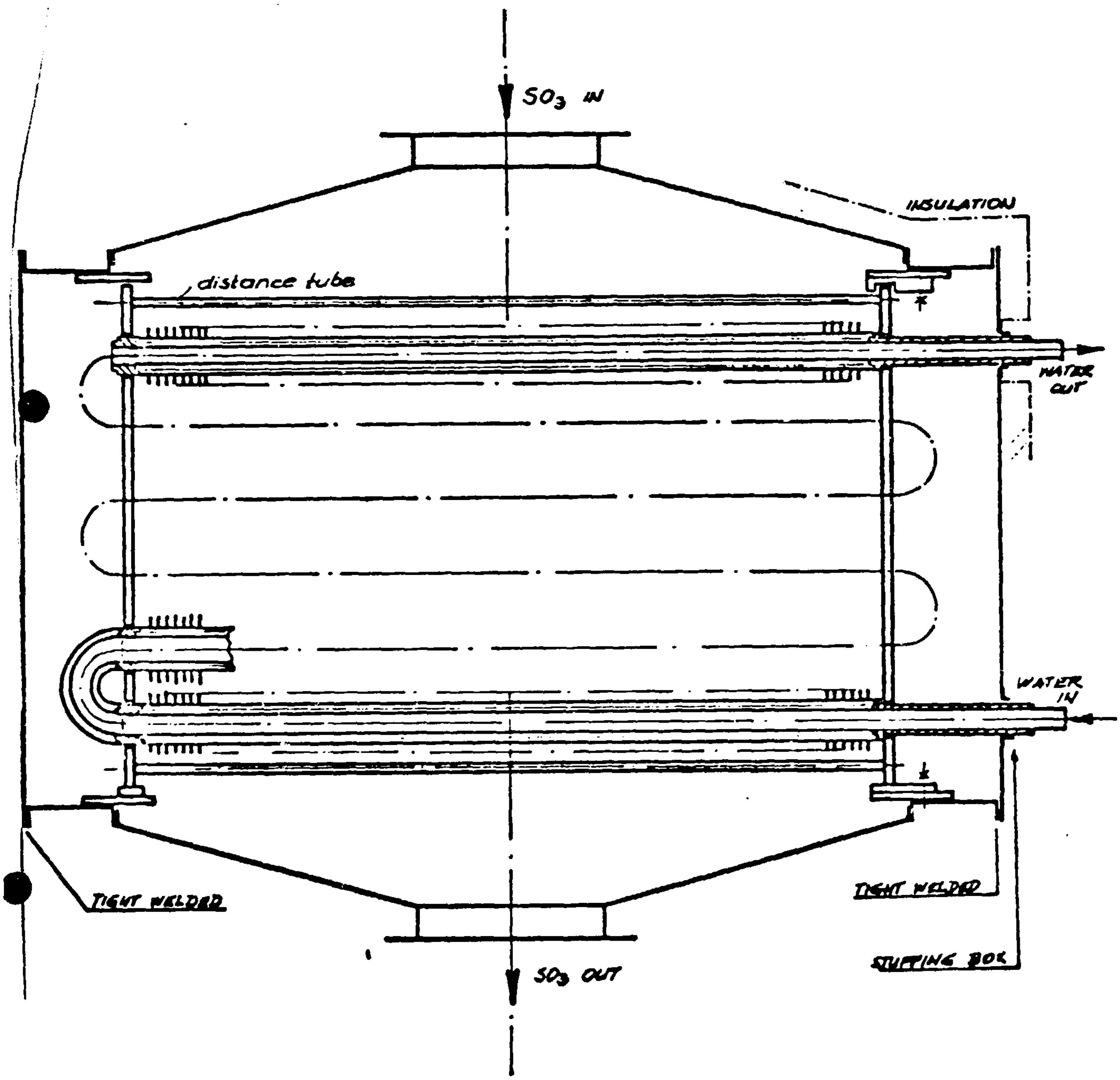
CIRCUIT OF SULPHURIC-ACID



DH .... GYPSUM DIHYDRATE
AH .... GYPSUM ANHYDRITE
AC .... AMMONIUM CARBONATE
AN .... AMMONIUM NITRATE
AS .... AMMONIUM SULFATE
CC .... CALCIUM CARBONATE

IAP / MR. DUBOWY
ATP / MR. GRAUSAM
1979 06 18

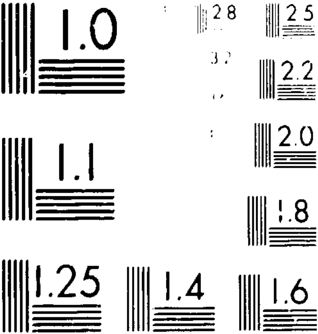
The sketched economizer is a construction of Rheinstahl Eco GmbH



CHAR.

seamless carbon steel, steelpipes
fin-tubes of cast iron
two-piece elbows (cast iron) with asbestos sealing, filling the hollow between interior and exterior elbow with iron-file-chips.
housing gastight welded
water in- and outlet protected with cast iron and stuffing box.

./2


1.0
2.8
2.5
2.2
1.1
2.0
1.8
1.25
1.4
1.6

The first ECO-design in the Monsant-plant of Chemie Linz AG was similar to the system at Chittagong. Since 1965 we have three steam generators between the passes of the converter (cooling the SO_2/SO_3-gas) and one economizer after the 4. pass in a construction as shown above. All tubes and elbows are inside the housing protected with cast iron against corrosion. We can recommend this system and we warn against a construction with flanges. In Europe there are only a few experienced manufacturers of these tubes, i.g.

Foster Wheeler, Great Britain
Rheinstahl ECO GmbH, West Germany

The steel pipes either will be shrinked into the cast iron fin-tubes or the diameter of the steel pipes will be increased in consequence of overpressure after fitting with the cast iron fin-tubes. The cast iron shield has to be very tihgt avoiding condensation and corrosion.

Acid distribution

In our acid plants we have different acid distributors:

Monsanto plant: distribution cup with overflow weirs. The material of the cup is Meehanite CB3 with $<$3,3% C, $>$2,7% Si, 0,6% Mn, 0,3% Cr, $>$0,5% Cu.

Anhydrite plant: Trough distribution system in cast iron with downcomers in ceramic. Experiments with downcomers in stainless steel 1,4580 and cast iron have not been satisfactory.

INSTRUCTION FOR PLASTIC-LINED PIPING SYSTEMS

Plastic-lined piping systems consist of a corrosion resistant inliner and a compression-proof steel-tube: steel-plastic-compound-tube.
These compound pipes are produced by different methods of manufacture and various plastic qualities: polypropylene, Kynar, FEP, PTFE,... The maximum length is about 6 000 mm.

General design

The inliner is seamless and it is bordered over the flanged pipe. The lapped flange is a separate part of the pipe. The plastic borders fulfill the function of a gasket between the different lined tubes and they avoid any fluid contact with the metallic tube. The inliner must be chemically resistant. PTFE can be used for nearly all liquids like acids, solvents, oils up to temperatures of 260°C.

Plastic lined pipes have to be ordered in the proper length for installation because it is not very easy to shorten the delivered pipes or to change them in any other way additionally.

Assembling of TEFLON-lined H_2SO_4 pipes

1. Jobs at the H_2SO_4 pipelines are not allowed before released by the production department. All safety measures prescribed on the job-permit (safety goggles, face shield, acidproof overall, acidproof gloves, rubber boots, ...) have to be observed absolutely.

./2

2. Assembling of piping system

2.1 All delivered piping parts are equiped with protecting covers on their open ends. To remove the covers is only allowed a short time before assembling. If they are removed only for inspection they have to be fixed again to avoid damage of inliner-flanges.

2.2 The pipes and fittings should not be put down to the ground without cover. Always use a carton or the disassembled protecting cover as a sole plate to avoid damage of the plastic border.

2.3 All delivered piping parts have to be checked by the material testing lab before assembling. On the inliner a high voltage breakdown test should be carried out by means of a "Poroscope". Testing voltage is 15 KV. Also measurement of inliner-thickness and a visual control of the complete supply must be executed.

2.4 Tubes and fittings lined with Teflon or plastic have vent-holes or other design measures that gases enclosed between steel pipe and inliner can escape and leakages can be recognized immediately. For the last reason during installation one has to observ that vent-holes look to the ground. If the piping system will be painted keep all the vent-holes open.

2.5 Before installation one has to inspect all piping parts visually (inside and outside). Contaminations are to remove. The flanges of the inliner must be cleaned carefully with a cloth to get a clean sealing joint.

2.6 It is not allowed to install additional gaskets between the Teflon flanges. Only for connections of lined tubes with metal, glass, ceramic etc. one has to use an additional Teflon-gasket.

2.7 Torques for screwing down:
If you overwind the screws it is possible that the Teflon-flanges will be deformed which results in leakages. To avoid this failure the following initial torques have to be observed:

./3

DN 80, screws according DIN 601 a. 6 x M 16 initial
torque = Nm
b. 8 x M 16 initial
torque = 45 Nm

Threads of bolts must be oiled to define exactly the stress due to torsional moment. If there does not exist a torque-wrench you have to use a normal wrench with a maximum length of 150 - 200 mm for tightening of screws and supporting the heads of the bolts.

After starting and operation on normal temperature all flanges have to be inspected and tightened again in the case of leakage.

Teflon-lined pipelines must not be used as earthing connection for electrical devices or as contact pole for welding machines.

3. Mounting of compensators

3.1 For mounting of compensators consisting of Polyfluoron-PTFE-bellows and two steel flanges the instructions according item 2. are valid. Furthermore you have to consider that bolts for flanges show with their head to the expansion-bellows and the nuts are situated on the flanks of the pipeline-flanges. This is necessary to get no reduction of compensator-expansion by use of bolts too long.

3.2 Torques for screwing down

According to § 2.7 the following initial torques have to be observed

DN 80, screws according DIN 601 a. 6 x M 16 initial
torque = 90 Nm
b. 8 x M 16 initial
torque = 67 Nm

3.3 Adjustment of compensators

Before mounting of compensators you have to calculate the insatallation-length.

Required data:

a. Compensator length: 95 $\mp$ 25 mm deflection
   minimum 70 mm, maximum 120 mm

b. Operating temperatures
   maximum 40°C (maximum acid temperature)
   minimum minus 20°C (shutdown in winter time)

c. Surrounding temperature at the time of mounting

Adjust the nuts which limit the compensator length to the maximum. Control of expansion and contraction of piping system is possible by observation of the compensators.

4. Operation

During start-up of the piping system pressure and temperature should be increased continuously.

5. Precautionary measures for disassembling

5.1 For disassembling of inlined tubes and fittings it is not allowed to introduce parts of metal like pliers, levers or screw-drivers between the flanges because the sealing joint will be damaged.

5.2 It is forbidden to use torch-cutting for disassembling. The maximum allowed temperature is 260°C for the Teflon-inliner. Blocked nuts must be removed by means of a chisel or a metal saw.

5.3 The precautionary measures valid for assembling have to be observed generally.

SAFETY DESCRIPTION OF NPK-PLANT, unit 626

The situation of the plant is to see on the site-plan. Approach roads, formation-places for fire-brigade and fire plugs situated around the NPK-plant are to keep accessible.

The building was erected without use of burnable construction materials. Emergency ways (flight-ways) inside the building are marked by "flight arrows" and plates "Emergency Exit". Three flight stairs in each of the two plants lead from the different floors to ground level outside the building. Orientation lights installed above the emergency exits burn about one hour after electricity failure. The normal staircases are equipped with an empty fire-fighting-system. Fire extinguishers and flight masks placed in sealed boxes are checked continuously by our fire brigade. Normal contact with the fire-brigade is made by telephone, in emergency cases also by fire-alarms installed in the two staircases (tested in a distance of one week together with siren-alarm after contact with the fire-brigade).

Alarming of persons inside the plant can be carried out by the central intercom-system or the two sirens in the old and the new plant. In arrangement with our department "Safety" near dangerous areas safety devices are placed (jumping-tubs with warm water, emergency showers, eye-flushing bottles).

The following parts of the plant are checked in ordered and constant distances by Chemie Linz departments:

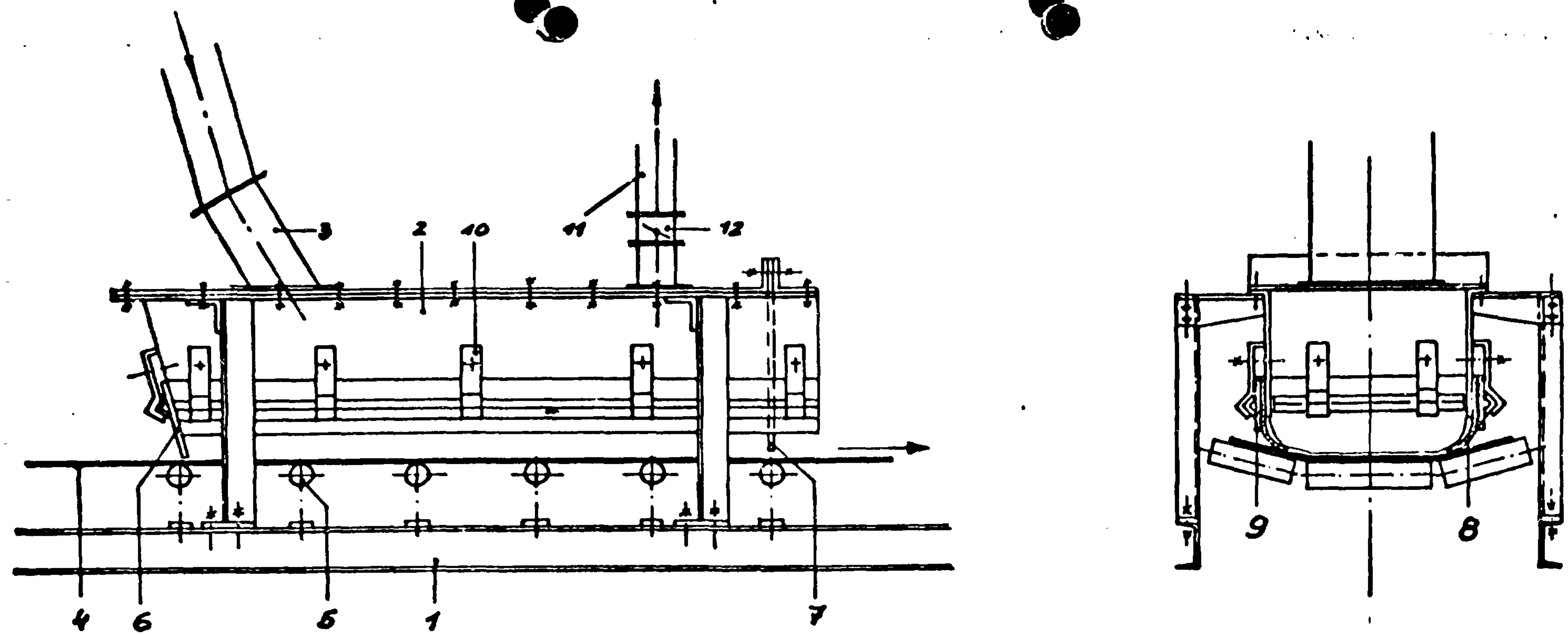
./2

- earthing resistance in the whole plant, in particular on the storage tanks for coating agents
- check of lighting rods
- tightness test on natural gas manifold
- lifts, hoists, winches, cranes
- pressure vessels
- belt conveyors
- gas burners and interlock system

The natural gas fired burners for preparation of hot air can be switched off by emergency push buttons from the spherodizer switchboard or from a place outside of the production plant. The burners will shutdown automatically in the following cases:

- failure of spherodizer fan
- failure of spherodizer main drive
- failure of primary- or secondary-air fan
- pressure of combustion air too low
- flame failure (UV-cell)
- gas pressure too high or too low
- reaching of maximum temperature gas inlet or gas outlet of spherodizer
- electrical failure on thermocouple connected with shutdown system

Closed to the natural gas control-valves inside the building CH4-probes are installed to alarm a potential untightness. Temperature of hot air is measured at spherodizer inlet and - outlet in each plant by 3 different thermocouples for registration, alarm and turn off. Adjustment of alarm- and shutdown-temperatures necessary by changing of production only can be carried out by instrument personnel.



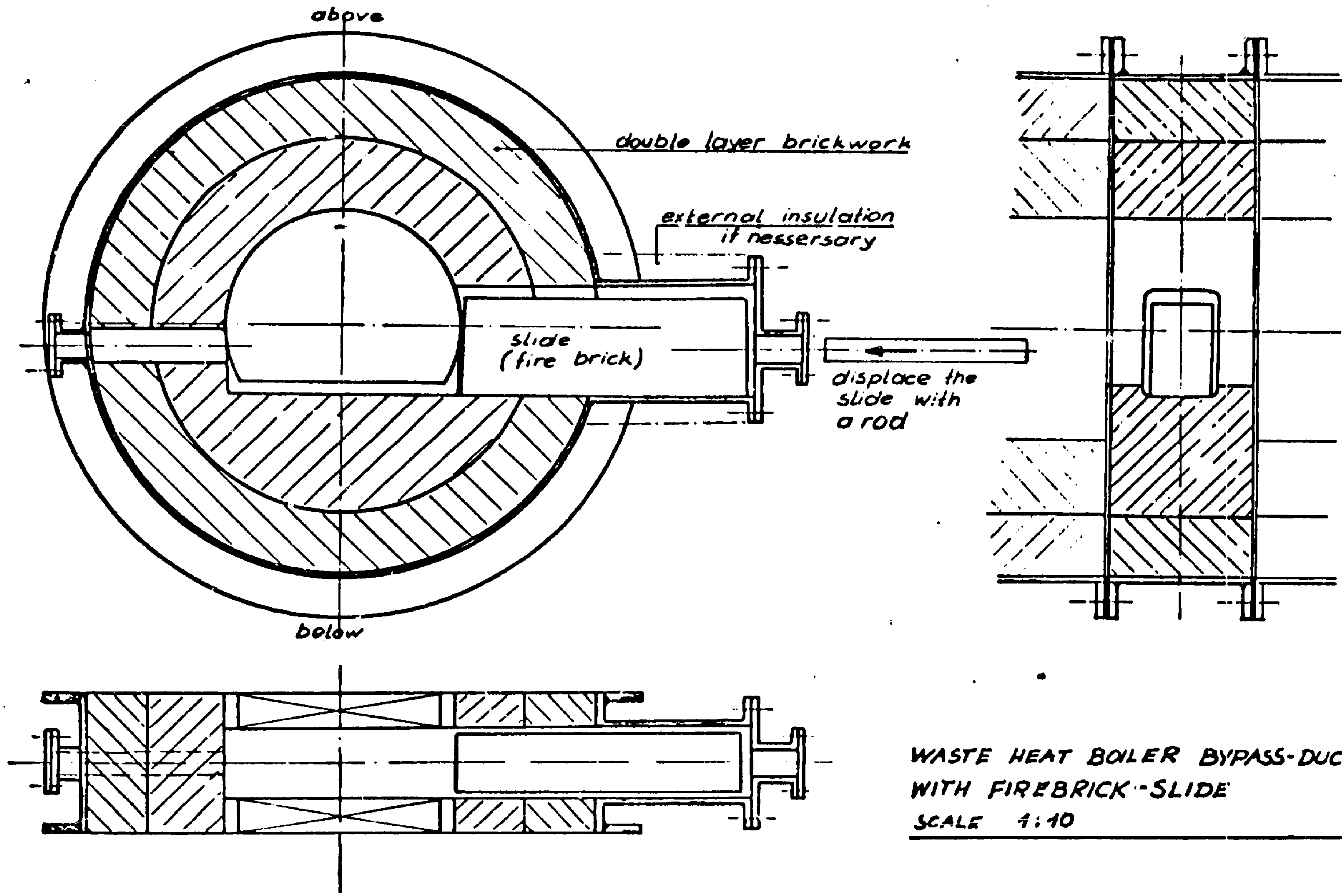
PRINZIPLE SKETCH OF A CLOSED AND DUSTFREE BELT-CONVEYOR DELIVERY-STATION in the fertilizer plants of Chemie Linz AG and Donau Chemie AG.

1) conveyor frame
2) sheet metall housing
3) material feed duct
4) rubber belt
5) roller
6) rearward rubber apron, 12 mm thick
7) front rubber apron, 4 mm thick, soft rubber
8) lateral inside rubber apron, 4 mm thick, soft rubber
9) lateral outside rubber apron, 12 mm thick

all the aprons are readjustable

10) clamp-bow to fasten the aprons
11) exhaust duct to a dust precipiator
12) butterfly valve to regulate the exhaust flow.

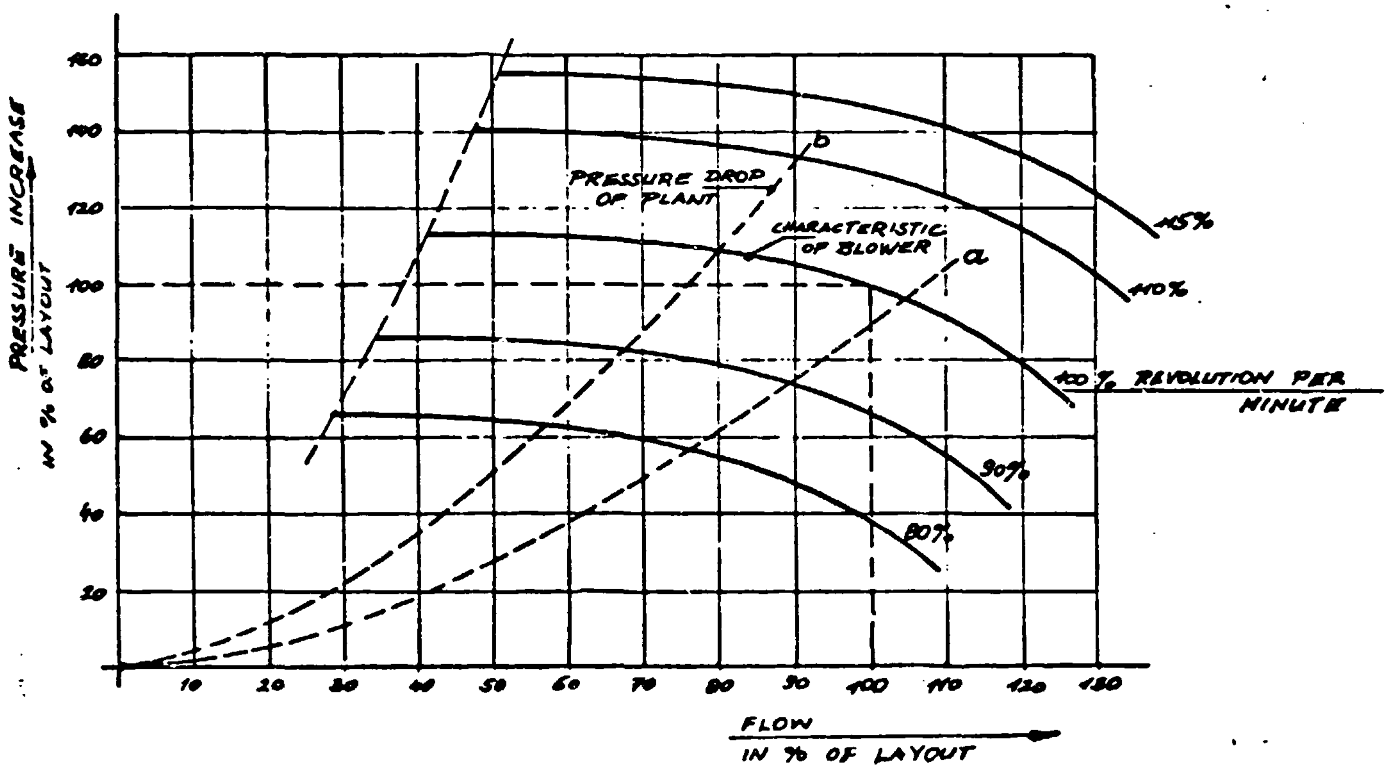
ENCLOSURE IX



WASTE HEAT BOILER BYPASS-DUCT
WITH FIREBRICK-SLIDE
SCALE 1:10

Example for characteristic of a main blower:

In sulphuric acid plants with a centrifugal blower the acid production depends decisivly on the pressure drop of the plant. A higher pressure drop of the plant means a lower quantity of flow.



Presupposition for the following explaination:

Blower can run with maximal 100 % speed. Plant runs with constant SO_2- content. Pressure drop of the clean plant = curve a. Pressure drop of the dirty plant = curve b.

On the diagramm you see the clean plant can run with 105 % and the dirty plant can run only 80 % of the lay-out-capacity.
If you need over a certain time a high quantity of sulphuric acid, sometimes it is suitable to stop and clean the plant (hot gas filter and the first catalyst - bed), to make all repairs and to start up with a higher capacity.

Estimated calculation:

Time of shutdown: 7 days

Production loss during shutdown: 80 % . 7 = 560 %
Haul up time: 560 : (105 - 80) = 22,4 days

That means after a running time of 22,4 days you will gain production if you have cleaned the plant.

7r

POSSIBILITIES TO REDUCE SHUT-DOWN-TIMES

AVOIDANCE OF BREAKDOWNS AND TROUBLES - EXAMPLES

LONG STOPPAGE TIMES DUE TO:	DECREASING RESP. AVOIDANCE OF STOPPAGES	EXAMPLE	PLANT
1) CLEANING OF THE PLANT	MODIFICATION OF OPERATION	H_3PO_4 - TANK, FILTER HEAD	PA
	CLEANING DURING OPERATION	HAMMERS ON SPHERODIZER	NPK
	MODIFICATION OF CONSTRUCTION	CONSTR. BELOW ROLLER CRUSHER	NPK
	USE OF MORE PERSONNEL (ORGANISATION)		
	CLEANING PROCEDURE	CLEANING OF KILN (BURNING/CO_2/GUN/H_2O)	G-SA
	CLEANING DEVICE	PNEUMATIC TOOLS FOR CYCLONS	NPK
	IMPROVEMENT OF WORKING CONDITIONS	PODESTALS, ADDITIONAL WORKING FLOORS	G-SA
	PROTECTIVE DEVICES	GRID IN DUCT SPHERODIZER CYCLONS	NPK
	AVOIDING OF CLEANING POINTS	DRUMS OF BELT CONVEYORS (RUBBER COVER, BAR-DRUMS)	
		INSULATION OF SCAVENGING-AIR-DUCTS TO FILTERS (CONDENSATION)	
2) CHANGING OF PARTS DUE TO WEAR	USE OF SUITABLE MATERIAL	DELBAG FILTER (STAINLESS STEEL)	NPK
CORROSION		TEFLON-LINED MIXER	SA
FATIGUE		ARMOUR PLATES (BOFORS, Cr.) FOR MILLS	CEMENT
	INCREASING WALL THICKNESS	INLET-ARMOUR PLATES	CEMENT
	IMPROVED CONSTRUCTION	VIBRATION-CRACKS ON REACTORS	NPK
	CHANGING PROCESS	WETTING OF WASTE GAS: STEEL → PP	SA
3) OVERLOAD: MECHANICAL	CHANGING OPERATING CONDITIONS	ROLLER CRUSHER → IMPACT CRUSHER	NPK
THERMIC	EXACT LAY-OUT	SHEAR PIN BUCKET ELEVATOR	STORAGE
ELECTRIC	CONTROL - SWITCH OFF	SPEED CONTROLER (CRUSHER - ELEVATOR)	NPK
	WELL TIMED SHUTDOWN	HOT SPOTS ON KILN SHELL	G-SA
	GENEROUS LAY-OUT	DUST FILTERS	NPK
	STRENGTHENING OF PARTS	SCREW CONVEYORS FOR POWDERING AGENT	NPK
	PROPER OPERATION		

LONG STOPPAGE TIMES DUE TO:	DECREASING RESP. AVOIDANCE OF STOPPAGES	EXAMPLE	PLANT
4) UNPROPER OPERATION DUE TO	MORE ATTENTION	TROUBLE WITH CATERPILLARS	SILO
- IGNORANCE	BETTER KNOWLEDGE (TEACHING, TRAINING)	SWITCH GEAR FOR KILN	G-SA
- CONVENIENCE OF OPERATOR	MORE EXPERIENCE	RECIPROCATING SULPHUR PUMP	SA
- FEAR, FRIGHT	PROPER PLANNING	KCL (POTASSIUM) IN REACTORS 1+2	NPK
- LACK OF TIME	COMPREHENSION OF SUPERIOR FOR PRODUCTION LOSSES		
5) NO IMPROVEMENTS	DON'T FIGHT AGAINST TROUBLES, TRY TO AVOID THEM	CLEANING OF SPHERODIZERS	NPK
- IN PROCESS	OBSERVATION ON THE SPOT - SUBSEQUENT CONCLUSIONS		
- ON MACHINES	GOOD CONTACT WITH OTHER DEPT. (EXCHANGE OF EXPERIENCE AND KNOWLEDGE)	SCREW CONVEYORS WITH RUBBER TROUGH	NPK
- IN REPAIR TECHNOLOGY	COURAGE TO EXPERIMENTS	LAB - PLANT	
6) FALSE REPAIR	GOOD KNOWLEDGE OF MACHINES		
	GOOD KNOWLEDGE OF PROCESS		
	COMPARISM OF DIFFERENT REPAIR METHODS	BOTTOMS OF DRYING-AND ABSORPTION-TOWER	SA
	THINKING ABOUT ECONOMY		
	PREPARATION OF A REPAIR	TIMETABLE, SHUT DOWN PROGRAMME	
	CARE FOR SPARE PARTS		
	ESTIMATE OF REPAIR VOLUME AND TIME FOR REPAIR		
	SUPERVISION OF MAINTENANCE		
	IDENTIFY FAULT BEFORE SHUT-DOWN		
	DISCUSSION OF REPAIR WITH LOCKSMITH BEFORE START		
7) GENERAL ITEMS	FILING OF EXPERIENCE	REPAIR CARDS	
	KNOWLEDGE OF LIFE-EXPECTANCY → OVERHAUL-CYCLES	MEASUREMENT THICKNESS OF WEAR-PARTS	
	KNOWLEDGE OF TROUBLE-SYMPTOMS (NOICE, TEMPERATURE, LENGTH, AMMETER, ...)		
	PREVENTIVE MAINTENANCE DURING OPERATION		
	WORKING CLIMATE IN THE GROUP		
	FINANCIAL STIMULUS (PERSONNEL MOTIVATION)	ATTENTIONAL ALLOWANCE (DUST, NOICE, ...)	

Guidelines for successful fight against thermal decomposition of NPK-fertilizer

The necessity of the use of labour-saving products in the field of agriculture leads to fast increase of the demand for mineral fertilizers in general and NPK-products in particular.

These fertilizers are not explosive c self-flammable under normal transport- and storage-conditions. Complications are not to expect

NPK-fertilizers containing ammonium-nitrate can decompose slowly at temperatures above 130 °C particulary due to influence of fire. At some fertilizers decomposition will stop if heat transfer from outside is stopped. Other formulars can decompose completely over the whole mass of stored fertilizer and can develope a large volum of hot nitrouse gases (350°C) and water vapour.

The ases are poisonous, the fight against hot spots can only be performed by use of breathing devices (in the open with B/ST- or F/ST-filters, in closed silos as well as in areas of high concentrations with heavy breathing devices).

NPK-fertilizers mostly are stored in paper- or plastic-bags. An interruption of the reaction by water irrigation of the bag-piles will not be expected. The most secure method to avoid extension of the hot spot is to devide concerned mass of fertilizer from the rest, to transport it to the open air and to make full use of water spraying to stop reaction.

In case of decomposition of bulk fertilizer it can be brought to open air at an early stage of reaction (e.g. by shovels). Another way is to spoil out the endangered amount of fertilizer by means of a strong water jet.

<u>ATTENTION:</u> The fight against decomposition by other measures (e.g. foam, carbon dioxide, steam, cover with sand or fertilizer) is useless. Decomposition even can be accelerated by such measures.

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In case of decomposition of palletized material fork lifts can be used to remove the concerned piles to the open air. Under certain circumstances wetting of the storehouse can be avoided. There is no danger for explosion for the fork-lift-driver. But he has to wear breathing devices.
After some time of reaction the bags will fall to pieces. The decomposing fertilizer then can be spoiled by a strong water jet.

Poisoned persons are to lay with the face to the ground, body in half-side-position, keep the person warm and calm and provide a doctor immediately. Wash eyes and mouth with neutralizing products (e.g. bicarbonate of 3 % concentration, but no boron-water), eventually start breathing with oxygen.

Guidelines about useful storage of mineral fertilizers are distributed to all warehouses, the final users (farmers) will be informed in a proper manner.

This information is distributed to all fire brigades of Austria.

General quidelines for fertilizer storages

Under normal transport- and storage-conditions mineral fertilizers are wether explosive nor self-flammable.

In general it is sufficient to the ferilizer dry and clean to avoid contact of different products and in consequence chemical reaction of the mixtures.

Fertilizer with ammonium-nitrate (e.g. CAN,NPK) can decompose under influence of extern fire or heat at temperatures above 130 °C. Decomposition will proceed slowly without extern heat supply through the total fertilizer mass. A yellowbrown, pungent smelling, poisonous smoke will be developed (nitrouse -gases- dangerous breathing-poison).

Preventive safety measures

If the following recommendations are observed the danger of thermal decomposition can be excluded certainly. In case of fire in a storage decomposition can be avoided with high propability.

Please observe:

1) Clean storage rooms before storing of fertilizer containing ammonium-nitrate. In particular follow this instruction for bulk-stores.

2) Burnable products e.g. coal, sulphur, corn, oil and fuels also acids, unslaked lime, CAN and thomas-phosphate are not allowed to mix with fertilizers and are to store separately.

3) Smoking and use of fire or open light is prohibited in the storage room (also welding, soldering,...)

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4) Take provisions that ammonium-nitrate-containing fertilizers can not be heated from outside. Steam lines (even if insulated), electrical cables, electrical motors and heat producing lighting fixtures also hot exhaust gases of vehicles may not come in contact with fertilizer.
Also there must be a guarantee that conveyors for fertilizer transport can not run hot.

5) Should occur a fire in the area of the warehouse immediately the fire brigade must be informed in which buildings fertilizer containing ammonium-nitrate is stored to protect such fertilizer stores against fire in the best way.

Fight against decomposition

If recommendations mentioned above are not considered or in case of fire closed to the stored product a slow decomposition has started the following measures must be taken immediately:

1) To fight against the hot spot fire brigade with heavy breathing devices must be called. Information of spontaneous helpers about peculiarity of the stored product and all necessary precautions.
Keep away curious persons from the endangered zone!

2) Wait for arrival of fire brigade, do not [illegible] lone and in your own responsibility against the deco[illegible]g fertilizer. The hot spot increases only very slowly. There is no danger that product starts burning or explosion.

3) Open all windows and doors of the storehouse to enable free smoke exhaust. Do not breath the smoke! In case of heavy smoke do not breath and leave the endangered zone immediately. Open windows and doors only from outside if necessary by force! Keep away persons and animals from the area of smoke.

4) We want to mention explicitly that a fight against decomposing fertilizer by means of foam- or CO2-extinguishers, steam, by covering with sand or other fertilizers is useless. Such measures even can accelerate decomposition.

5) All fire brigades are informed about fight-measures. Instructions of the fire brigades are to obey strictly.

This information is distributed to all customers (warehouses and farmers).

FACTS ABOUT STORAGE SILO FOR NPK - UNIT 633

length	186 m	
width	53 m	volume of the building: 125.000 m^3
height	22 m	

12 boxes, each 5000 tons = 60.000 tons storage capacity
repair box for reclaimer
possible extension: 4 boxes each 5.000 tons = 20.000 tons

max. storage height	14 m	wall thickness between the
max. storage width	43 m	boxes: 1 m number of gates to
max. storage length	14 m	the storage : 24

Mechanical equipment:

2 reclaimers delivered by SCHADE (Western Germany), each for a capacity of 180 t/h. weight of one reclaimer: 40 t

capacity of feed conveyors : 2 x 60 t/h
capacity of reclaimers : 2 x 180 t/h

Head building with control room, screens and crushers

length	46 m
width	15 m
height	27 m

Bagging and shipping

length	106 m	
width	19,5 m	width of the loading ramp 9,6 m
height of towers	24 m	

Mechanical equipment: 2 bagging and shipping stations, each for 60 t/h bagged product and 60 t/h bulk product

Belt conveyors	- feed conveyors to storage silo	2336 m
	conveyors between silo and bagging station	700 m
	conveyors for wagon loading	56 m
	conveyors for ship loading	777 m
	conveyors to open air storage	35 m
	total	3904 m

Energy supply

electrical energy 800 kW installed power
drinking water
separate station for compressed air
steam supply
fire water supply over 14 hydrants

supervision and control from 2 control rooms
the whole plant is equipped with dedusting filters of high efficiency

additional streets	650 m
additional railway lines	4500 m

2 dayrooms for operating personnel, rooms for supervisors, modern sanitary facilities

SAFETY MEASURES FOR THE COMPLEX FERTILIZER STORAGE AT CHEMIE LINZ PLANT SITE

A. PRODUCT

- complex fertilizer (NPK) or occasionally CAN (28 %) with max. 0,4 % C.

- storage feed temperature max. 50° C. Continuous measurement by means of two independent thermocouples. Temperature is indicated and recorded with max. alarm in the control room of complex fertilizer plant.

B. DESIGN MEASURES

1. Belt conveyors

- belts with in the silo in flame-adverse material
- speed controler (shut off)
  straight running control (alarm)
  emergency switch with pull lines (shut off)
- lower belt temperature-control by pyrometers for the storage feed conveyors
  (alarm in the control room of the silo)
- division of the belt bridge into fire fighting sections by means of waterspray-curtains
- emergency exits (ladders) marked by arrows (always two exits for each belt bridge in addition to the stairs in the corner stations)
- metal detector before the entrance of the silo (shut off of conveyors) and additional magnetic metal-pick-up at the way out of the complex fertilizer plant

- swivel chute located in the last delivery station before the silo for discharge of the belt conveyor to the open air.
- arrangement of the belt conveyors so that they cannot be an initial heat source for the fertilizer
- fire extinguishers (C02) within a distance of 35 m along the belt system
- telefon system with connections in a distance of 100 - 150 m
- interlocking of all belt conveyors to ensure shut down of preceding conveyors in case of failure.

2. <u>Silo</u>

- partition to 12 boxes, each with a max. capacity of 5 000 t.
- thickness of partition walls designed that in case of a decomposition in one box ignition in a neighbour box due to heat transfer is not possible.
- all civil engineering material used is flame resistant
- feed product is screened by gratings to remove lumps
- heat sources like steam supply lines and electrical cables are not in contact with the fertilizer
- electrical equipments are mounted sidewards and designed in wet-room-standard.
  Main switches are outside of the silo.
- lighting rods protect the silo
- emergency orientation lights in the roof top of the silo, along the reclaimer path and in the lateral belt-channels (automatically switched on in case of power failure). No bulbs but only fluorescent tubes are used.
  Handlumps are not permitted.

- windows for opening and closing along the roof top (5 % of the ground floor area).
  All windows are remote-controlled from outside the silo by a separate supply of compressed air and daily operating tests.

- emergency exits from the roof top, the reclaimer pathes and the conveyor bridges marked by arrows

- extinguishing line (dry) for fire water in the head building of the silo

- flooding line for each belt channel with a capacity of 2,5 m^3/min.

- hydrants outside the silo connected with a ring system of 600 - 400 mm diameter

- 12 mobile water canons each for 1,5 m^3/min adjustable for spray or jet application

- free outlet of product slurry after opening of the doors on the end of the belt channels

- emergency exits from the lift

- separate repair box for repairs on the reclaimer and jobs with fire.

C. MEASURES BY ORGANISATION

- general strict prohibition of smoking
  exception: dayrooms, office of supervisors, workshop and control-room in the head building of the silo

- repair jobs are only allowed in accordance to the written "job permit"

- welding within the storage silo only under special supervision and not near the product. Control of the spot for 6 hours after finishing of the job by means of an infrared-instrument.

- operating manuals for all working places, safety instructions every half a year
- control of the storage silo every half an hour recorded by means of a printing-watch and control book
  wireless contact of the control person to fire-brigarde
- sufficient respirators for compressed air and gas masks, most of the operating personnel is trained in heavy gas protection.
- free access for the trucks of the fire brigade
- warning plan (sequence) in the case of danger
- shovels and buckets are available

ORGANISATION BTH

Maintenance group for Melamine und Urea Plant

Departement Manager (DI. Simon)

Secretary (Frl. Baumgartner)

Deputy Manager (DI. Gebert)

Chief Master (Hr. Geroldinger)

2 Masters (Hr. Lehner, Hr. Plecher)

Formen (Hr. Seidl, Hr. Kaufmann)

Groupleaders

Hr. Lust — 4 workers

Hr. Mara — 4 workers

Hr. Leitner — 4 workers

Hr. Eckart — 4 workers

U R E A P L A N T

Our new urea plant was built in 1975/76 and substitutes an old 300 m ton/day plant.
The start up was early 1977. The design capacity is 1000 m ton/day. It is a SNAM PROGETTI PROCESS. After overcoming various start up problems, we can say that the performance of the plant is good. Since 1978 we reached an on-stream factor of 330 days per year.

Mayor equipement and its vendors:

equipement	vendor
CO_2- Compressor (5 Stage reciprocating compressor)	GHH (BRD)
NH_3-Pumps 7 Plunger pump	Worthington (BRD)
Carbonat Pumps 5 Plunger pump	Worthington (BRD)
Ejector, Vacuum System	Koerting (BRD)
Reactor Carbamate separator	VOEST ALPINE (A) " " "
Stripper	FBM Milano (I)
Centrifugal pumps	Ochsner Linz (A)
Belt Conveyor System	Mut Stockerau (A)
Scrapper	Schade BRD)
Weighing System Sack Welding Machine	Libra BRD)

Maintenance Problems of the Urea Plant

The Major problem in an urea plant is the sealing of the high pressure section. It is of vital importance that the surfaces and the lense are very clean. The lense hardness must be less than the hardness of the piping.
The gasket of the reactor manhole is an aluminium-teflon tape gasket.

A second point are the high pressure pumps. We use pumps designed and fabricated by Worthington (Hamburg). After 1 1/2 year of service we can say that they work satisfactory. The piston packing lasts about one year.
The valves have to be changed about every six month.

The packing (details give the attacked drawings) has to be prepressed.
Valves fail mainly because of spring break.
This can be influenced by the spring material and the spring geometry.
The CO_2-compressor - which is maintained by ATH - had problems mainly because of vibrations.

Material problems existed mainly during the start-up-phase. The welds of the reactor lining had to be repaired (lining material is 316L).

Until now the large width belts in the prilling-tower are not satisfacotry. We have to change them after about 1 1/2 year, which is a too short time of service. We plan to substitute these synthetic belts by rubber belts.

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In the urea storage the main problem was the sack-welding-machine. This was mainly a problem of adjusting the welding temperature and the lenght of the cooling zone on the sack-welding-machine.

AUXILIARY DIVISION T

- Instruments
- Electric
- Transportation
- Centralworkshop (450)
  - Planning (8)
    - tools & purchasing (3)
    - wages & personal (3)
  - Workshop (188)
    - vessel constr & maint
    - heatiexchg. (57)
    - valves (20)
    - mechanic machining (33)
    - tin-platers (25)
    - plastic (20)
    - carpentry (19)
    - tools (14)
  - Field (229) maintanance & erection
    - machines (48)
    - pipe & steel I/II/III (85)
    - internal transport (74)
    - plumbers (22)
- Mat. testing
- Civil
- Laboratory mant.
  - Tech. dept. (design & planning)
- Inspection

Brochures and leaflets handed over and/or discussed

Manual for LEISTER Electric Hot-air-welding-pistol	
Special Material Requirements Section Table of Contents	
Pipe Testing	Chemie Linz AG
Hardfacing by powders Powder weld Cold facing Plasma welding	
Valve Machinery	Hauerwas
Testing device for mechanical seals	Waldrich
Welding of Corrosion Resisting Steels	

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36612 u. 36613

VEREINIGTE EDELSTAHLWERKE AKTIENGESELLSCHAFT (VEW)

ELEKTRODEN - RÜCKTROCKNUNG
RE-BAKING OF ELECTRODES

+) Rücktrocknung (Re-Baking) 1 = nicht erforderlich (not necessary)
2 = 2h/200 - 250 °C
3 = 2h/250 - 300 °C
4 = 2h/300 - 350 °C

Marke BÖHLER	R+)	Marke BÖHLER	R+)	Marke BÖHLER	R+)
FOX A 7	3	FOX DUR 350	4	FOX KW 10	3
FOX A 7-A	3	FOX DUR 350 Ti	1	FOX LH 2	4
FOX A 7-A/Kb	3	FOX DUR 400	4	FOX LEDURIT 60	4
FOX A 7-HL	3	FOX DUR 500	4	FOX LEDURIT 63	4
FOX A 8 L	4	FOX DUR 600	4	FOX LEDURIT 65	4
FOX A 9 M	4	FOX DUR 650 Kb	4	FOX 12 MNI-A	4
FOX A 16 L	4	FOX DUR 700 N	1	FOX MSU	1
FOX AK	1	FOX EAS 2	3	FOX 20 MVW	3
FOX AN	3	FOX EAS 2-A	3	FOX 2,5 Ni	4
FOX AS 2	3	FOX EAS 4 M	3	FOX NC 8	4
FOX AS 2-A	3	FOX EAS 4 M-A	3	FOX Ni Cr 70 Nb	3
FOX AS 4	3	FOX EAS 4 Mu	3	FOX Ni Cu Cr	4
FOX AS 4-A	3	FOX EAS N 25 M	3	FOX NUT	1
FOX AS 17 N 4	3	FOX ETI	1	FOX OH 1	1
FOX ASN 5	3	FOX EV 47	4	FOX OHV	1
FOX CELSIT 421	4	FOX EV 50	4	FOX RAPID 68	4
FOX CELSIT V	4	FOX EV 50-A	4	FOX RDA	4
FOX CELSIT V HL	4	FOX EV 50 Ni Cu	4	FOX S 90	4
FOX CELSIT V Ti	4	FOX EV 55	4	FOX SAC-A	2
FOX CHRONOS	4	FOX EV 60	4	FOX SAS 2	3
FOX CM 2 Kb	4	FOX EV 63	4	FOX SAS 2-A	3
FOX CM 2 Ti	1	FOX EV 65	4	FOX SAS 2-A/150	3
FOX CM 5 Kb	4	FOX EV 70	4	FOX SAS 2-AR	3
FOX CM 5 Ti	1	FOX EV 75	4	FOX SAS 2-BR	3
FOX CM 9 Kb	4	FOX EV 80	4	FOX SAS 2 R	3
FOX CN 13/1	3	FOX EV 85	4	FOX SAS 4	3
FOX CN 13/4	3	FOX EVD	1	FOX SAS 4-A	3
FOX CN 13/6	3	FOX EV Supra	4	FOX SAS 4-A/150	3
FOX CN 16/6	3	FOX FA	3	FOX SAS 10	3
FOX CN 16/13	3	FOX FF	3	FOX SAS 20	3
FOX CN 16/13 Co	3	FOX FF-A	3	FOX SCM 2 Kb	4
FOX CN 18/11	3	FOX FFB	3	FOX SKWA	3
FOX CN 18/16 M	3	FOX FFB-A	3	FOX SKWAM	3
FOX CN 18/16 M-A	3	FOX FFB 400	3	FOX SPE	1
FOX CN 20 Co 50	4	FOX GA	1	FOX SPE Ultra	1
FOX CN 23/12-A	3	FOX GFW	1	FOX SPEM	1
FOX CN 23/12 Mo-A	3	FOX GH	1	FOX SSMO 2	4
FOX CN 29/9	3	FOX GNI	1	FOX SUM	1
FOX CN 29/9-A	3	FOX GNX	1	FOX Super DUR W 70 Cr	4
FOX DBK	1	FOX GSK	1	FOX Super DUR W 80	4
FOX DCMS Kb	4	FOX HL 130 Ti	1	FOX TT 250	3
FOX DCMS Kb/S	4	FOX HL 150 Ti	1	FOX UMZ	1
FOX DCMS Ti	1	FOX HL 180 Kb	4	FOX UNA	1
FOX DMO Kb	4	FOX HL 180 Ti	1	FOX WA 12	2
FOX DMO Ti	1	FOX IN 9 Kb	4	FOX WA 20	4
FOX DMV 83 Kb	4	FOX KDE	4	FOX WH 2	4
FOX DUR 250	4	FOX KE	1	FOX WKZ 50	4

WAY OF LABOUR

Inquiry (from inside our company, or outside)

Estimation - cost, timing

Quotation

Comparison of prices
for new things, very large maintenance

Order (fixed prices)
cost are booked to costcodes (plant, division)
and to costcenter workshop (tools, labour)

Procurement of material and labour
store-house	hire of workers
purchasing dept.

Execution of work

Cost	cost-bills
cost accounting bill

MIG - MAG - welding equipment

With a mig-mag machine, massive wires of 0,6; 0,8; 1,0; 1,2 mm ø are welded under:

CO_2	carbon steels
mixed gas Corgon 2;	for low allowed steels
Argon for Aluminium S1;	for stainless steels

This system enables to weld low alloyed steels, stainless steels, aluminium and aluminium alloys.

Equipment: Threephase transformer with constant voltage characteristic ⟶ silicon threephase bridge-rectifier.

Welding current ⟶ direkt current (D. C.)

Both processes feature filler metal electrodes, bare wire being machine fed from a reel to melt in its own electric arc.

Only D. C. welding sets and rectifiers with constand voltage characteristic are used (generally — electrode + Pol).

Owing to its high efficiency, this process is applied to an ever increasing degree for welding steels.

Wire ø	0,8 mm	⟶	deposition rate kg/h	⟶	1,0 - 3,7
	1,0	⟶	- " -	⟶	1,2 - 4,0
	1,2	⟶	- " -	⟶	1,8 - 4,6
	1,6	⟶	- " -	⟶	3,2 - 6,2
	2,4	⟶	- " -	⟶	8,0

WIG/TIG - welding equipment

TIG-Process:

Its source of heat is the electric arc burning under a shield of inert gas. Electrodes are either straight or rhenium alloyed tungsten.

The shielding gas is either argon or helium. The gas shields the weld puddle as well as the melting wire from atmospheric action. Only D. C. welding sets and rectifiers are used by TIG-process.

The application range covers sheet fabrication, high quality root runs in tubing, and plates. (Generally: electrode - Pol.)

Corrosion resisting steel	D. C.	electrode negativ.
High temperature and creep Resisting steels.	D. C.	electrode negativ.
Aluminium	A. C.	

Inert gas welding

Principles

With inert gas shielded arc welding, a flow of inert gas protects the electrode and puddle from the air.

The electrode is either non-consumable and only carries the current and arc, of consumable and is fed constantly to provide filler metal.

This difference accounts for the basic distinction between two types of gas shielded arc welding.

1 non consumable electrode

Tungsten Inert gas (TIG)

2 consumable electrode

Metal Inert Gas (MIG)

Metal Active Gas (MAG) (if gas mixtures are used)

Electrodes for welding high-temperatures steels.

Marke Böhler Grade Böhler	AWS	description - base metal
FOX DMO Ti	E 7013-G	→ Mo-alloyed titania-coated elektrode mild steels, pressure vessel steels and ½% Mo steels, up to 510 N/mm² min. tensile strength.
FOX DMO Kb	~E 7018-A1	→ Lime coated.
FOX DCMS Ti	E 8013-B2	→ Cr-Mo-alloyed titania-coated electrode 1% Cr - ½% Mo high-temperature steels. Can be used in the temperature range up to 550 °C.
FOX DCMS Kb	E 8018-B2	→ lime coated
FOX CM2 Ti	E 9013-B3	2½% Cr, 1% Mo alloyed titania-coated electrode. 2½% Cr - 1% Mo high-temperature steels up to 600 °C
FOX CM2 Kb	~E 9016-B3	
FOX CM5 Kb	E 502-15	5% Cr, Mo alloyed lime-coated electr. 5% Cr - 1% Mo high temperature steels up to 600 °C
FOX IN9 Kb	——	lime-coated, 3% Cr, Mo, V electrode Cr-Mo-V steels for hot hydrogen service
FOX CN 16/13	——	lime-coated electrode. 16% Cr - 13% Ni + Nb high-temperature steels.

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FOX CM2 Ti	E9013-B3	2½% Cr, 1% Mo alloyed titania-coated electrode. 2½% Cr - 1% Mo high-temperature steels up to 600 °C
FOX CM2 Kb	~E9016-B3	
FOX CM5 Kb	E502-15	5% Cr, Mo alloyed lime-coated electr. 5% Cr - 1% Mo high temperature steels up to 600 °C
FOX IN9 Kb	——	lime-coated, 3% Cr, Mo, V electrode Cr-Mo-V steels for hot hydrogen service
FOX CN 16/13	——	lime-coated electrode. 16% Cr - 13% Ni + Nb high-temperature steels.

Austenitic stainless electrodes

Austenitic special purpose electrodes

Marke Böhler Grade Böhler	AWS	description - base metal
FOX SAS 2	E 347 - 15	lime coated electrode 18/8 Cr-Ni steel. Temp. up to 400°C
FOX SAS 2-A	~E 347-16	titania-lime type coated electrode. 18/8 Cr-Ni steel. Temp. up to 400°C
FOX SAS 4	~E 318-15	lime coated electrode. 18/8 Cr-Ni-Mo steel.
FOX SAS 4-A	~E 318-16	titania-lime coated electrode. 18/8 Cr-Ni-Mo steel.
FOX EASN 25M	——	a low carbon, lime coated Cr-Ni-Mo type. used in urea-plants (Matl. no. 1.4435)
FOX A7	——	a lime coated electrode for the joint welding of dissimilar steels.
FOX AN	——	a lime coated electrode for the joint welding of dissimilar steels.
FOX CN 23/12 Mo-A	~E 309 Mo L-16	titania lime coated electrode for welds to join austenitic stainless and carbon steel.
FOX CN 29/9	~E 312-16	universal type coated electrode for welds to join dissimilar, high tensile steels.

Coated electrodes for hard surfacing.

Inert gas welding wire

Marke Böhler Grade Böhler	AWS	description - hardness
FOX DUR 250		lime coated electrode for hard and tough buildups. Hardness ~ 250 HB
FOX DUR 350		lime coated electrode for wear resisting buidups. Hardness ~ 340 - 440 HB
FOX DUR 600		lime coated electrode Hardness: 54 - 58 HRc.
Antinit Celsit 50 Nb		cast, ground rod for hardfacing sealing faces on valves Hardness ~ 45 - 48 HRc
FOX Celsit VHL		a efficiency, alloy powder, titania coated electrode with drawn core. For contact face buildups n gas, steam and acid .ervice

		description
Xuper 2240	Castolin	electrode for grey cast iron
Inconell 182 (coated electrd)	Huntington	for shielded metal-arc welding of inconel Ni-Cr alloy to itself or to stainless or carbon steel. For joining dissimilar alloys such as austenitic and ferritic steels to each other and to high-nickel alloys.
Inconell 82 (alloyed wire)	Huntington	
Silox S2	Ogussa	gas welding rod for grey cast iron

Filler metal for inert-gas-welding.

Marke Böhler Grade Böhler	AWS	description - base metal
EMK 6	ER70S-G	a copper coated wire for MAG-welding under CO_2 or mixed gas. mild steels and pressure vessel steels.
DMO-IG	E70S-GB	cooper coated, Mo alloyed wire mild steels, pressure vessel steels. up to 500 °C
DCMS-IG	E70S-GB	cooper coated, Cr-Mo alloyed wire. 1% Cr - ½% Mo high-temperature steels up to 550°C
SAS 2-IG	ER 347	bright drawn wire 18/8 Cr-Ni-steel
SAS 4-IG	ER 318	bright drawn wire. 18/8 Cr-Ni-Mo steel.
CN 29/9 IG	ER 312	bright drawn wire for problem steel welding and building up on hot work tools, and for joining stainless to carbon steels

Gas welding rods

BW VII	RG 45	a copper coated, carbon steel wire. low carbon steels. fluid puddle.
BW XII	RG 60	a copper coated, Ni-bearing wire. viscous puddle low and medium carbon steels.
DMO	RG 60	a copper coated, Mo-bearing wire for oxy-acetylene welding. medium carbon and low alloy steels; pipes.
DCMS	RG 65	a copper coated, Cr-Mo-alloyed rod. 1% Cr - ½% Mo high temperature steels. up to 550°C.

Empfänger Unser Zeichen*) Blatt Tag

I N S P E C T I O N

Law for inspection

Regulations of technic

Inspectors nominated by head of province or county
officers of county
technical supervision association - TÜV

Field of inspection

All pressure vessels (1b)
steam vessels (0,5 b)
pipes) for certain service
valves)
lifting devices
cranes
hoists
lifts
safety valves
refrigeration plants

chemserv
CONSULTING GES.M.B.H.

A) WORKS COUNCIL: Unser Zeichen*) Blatt Tag

Group Works Council: Branch Linz	Workers Employees other than workers

Central Works Council: Chemie Linz AG

A central works council has to be established, if some, but at least 2 branches, where works councils exist,

1. are within one enterprise,
2. form one economic unity, and
3. are subordinate to one central administration.

Workers: 4 200 Branch Linz	22 committeemen, consisting of: 19 " , "Socialistic Fraction" 3 " , "Fraction of Christian Unionists & ÖAAB"
Employees other than workers: 2 800 Branch Linz	18 committeemen, consisting of: 15 " , "Socialistic Fraction" 3 " , "Fraction of Christian Unionists & ÖAAB"
Central Works Council: 8 000 empl. Chemie Linz Peat winning Bürmoos Leifa Neumarkt Werk II-Enns Branch Wien	15 committeemen, consisting of: 13 " , "Socialistic Fraction" 2 " , "Fraction of Christian Unionists & ÖAAB"

B) Competence of the Organs of the Works Council

(According to the Constitutional Law for Labor)

Competence	§ of the Constitutional Law for Labor	Works within the Enterprise, where a Central Works Council should be established	
Control on the rules of law	89	Group Works Council	
Right to intervention	90	"	/ Central Works Council
General right to information	91	"	
Right to give advice	92		"
Foundation & administration of welfare institutions	93	"	
Cooperation in social concerns	94	"	
Cooperation in incustrial welfare institutions (instructional & educational institutions)	95	"	/ "
Measures under the obligation to consent: Introduction of 1. Disciplinary order 2. Personal questionnaires 3. Control measures & techn. systems for the control of employees 4. Piece-work pay, task wages, and tut-work pay	96	"	
Works' agreements	97	"	
Cooperation in personal concerns	98	"	
Cooperation in the engagement of employees	99	"	
Cooperation in incentive wages in special cases	100	"	

Competence	§ of the Constitutional Law for Labor	Works within the Enterprise, where a Central Works Council should be established
Cooperation in employees' transfers	101	Group Works Council
Cooperation in decree of disciplinary actions	102	"
Cooperation in allotting cottages	103	"
Cooperation in advancements	104	"
Avoidance of terminations	105	"
Avoidance of dismissals	106	"
Right to economical informations, interventions and advices	108	/ Central Works Council
Cooperation in changes ithin the works: 1. Reduce or shutdown 2. Removal of a branch 3. Fusion within other industries 4. Change of business use 5. Introduction of new working systems 6. Introduction of measures for increased efficiency and automation, resp. 7. Changes in the legal form	109	"
Cooperation in the board of directors	110	"
Objections to carrying through of business	111	"
Right to objection in the Governmental Economy Commission	112	"

C) Works Council Fund

To cover the administration costs of the works council and to establish and maintain welfare institutions, as well as to carry through welfare measurements in favour of the employees a works council rate may be retained of each employee. It is limited at half a percent of the gross wages.

After a 3 month's belongingness to the company the following pecuniary supports are granted:

1. For employees in the employ of Chemie Linz AG salary losses from sickness or other costs (medical establishment) in relation with the sickness may be refunded up to the full extent and without time limit appropriate to the social situation of the applicant. In calculating the pecuniary assistence fund are to be comprehended.

2. Payments for dental prothesis (in case of performance of the sick benefit fund) are refunded up to half of cost, extended to the utmost of S 1 000,--. For an employee's wife not practising a profession up to S 600,--. For an employee's children an extra allowance may be made for dental prothesis in the case of payment of the sick benefit fund.

3. Payments for spectacles are made (in the case of performance of the sick benefit fund) to half of cost up to an extent of S 500,--.

4. For marriage S 500,-- are allowed.

5. At birth of a child S 500,-- are allowed.
   In the case of married people in the employ of Chemie Linz AG, both have a claim on items 4 and 5.

6. For private removal a quarter of the arising costs is payed, but at least S 400,--. If there is a removal without a bill S 400,-- are allowed.

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7. In the case of retirement and if there was no performance of the works council fund within the foregoing year on account of salary losses a non-recurring payment of S 500,-- is allowed.

8. Employees submitting their graduation from a high school for adults are getting an amount of S 1 500,--.

9. All visitors of a high school for adults proofing salary losses from their attendance at school for the year of final examination are getting an amount to the extent of S 6 000,--.

10. Employees returning from having served their military time are getting S 1 000,--.

11. Employees studying on the Johannes-Kepler-University may receive a partial compensation for their salary losses from studying, beginning with the first half of their 5th term. This payment is half of the real salary losses up to an extent of S 900,-- for 3 months.

12. Reliefs in the case of death:

    a) On request employees with the obligation to bear funeral costs for died family members may get one forth of these funeral costs up to an extent of S 800,--.

    b) In the case of death of a family member an employee having had a legal obligation to support or a died family member having lived in an employee's house-community the employee will receive a relief of S 500,-- on request.

13. An employee coming in undeserved embarrassment may apply for special support in consideration of the social situation.

Other performance from the works council fund:

Holidays action for children:

About 700 children of employees at the age from 6 - 12 years may take part in a 3 weeks vacation in July or August.
(Costs per child: S 2 400,--; costs to be payed by the parents: S 250,-- each child)

Vacation for pensioners:

About 220 pensioners of our company as well as their sponses may take part in a 2 weeks free of cost vacation in the months of June and September, resp.
(Costs per pensioner: S 2 030,--)

Jubilee gifts:

For 20 years of service in Chemie Linz:	One gold-ducat (four-fold)
" 25 " " " " " " :	Five coins at S 100,-- each (silver)
" 30 " " " " " " :	One testimonial in gold (for selection: Ring, sleeve-links or brooch, resp.)
" 35 " " " " " " :	Five bars of silver, 100 g each

Several reliefs for internal clubs like athletic club and musical club, as well as for ecternal associations like welfare institutions and dormitories.

Collective Labor Agreement

The collective labor agreement for employees in the industry agreed between the Association of Austrian Chemical Industry and the Austrian Trade Union Federation, Trade Union of Private Employees, Section Industry and Trade, regulates:

1. Income Policy

- Salary arrangement of the collective labor agreement, like group of employment
- Pay for controlling personal (controller, master, chief master)
- 13th (Christmas remuneration) and 14th salary per year
- Travelling expenses, expense allowance, fair payments, mileage allowance
- Extra pays and charges for shift operation and holiday work
- Extra pays for unhealthy operations
- Payment in case of standby and attendance service
- Overtime lump-sums
- Payment for suggestions regarding improvements
- Compensation for inventions in service
- Apprentice rates
- Wage payment in case of death, a. s. o.

2. Social Policy

Social policy measures belong to the most important tasks regarding the collective labor agreement. They include regulations on:

a) Working hours: Normal working hours, overtime, sunday, holiday and night work.

b) Vacancy: Extent of vacancy, sick leave and home-stays.

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c) Paid time in case of prevention: Marriage, private removal, child birth of an employee's wife, in case of death, a.s.o.

d) Compensation for retiring employees: Compensation for men having finished 65 years and for women having finished 60 years. Compensation on indenting for early retirement in case of long duration of old-age insurance.

e) Obligation for non discharge of employees.

f) Professional and protective clothes

The sollective labor agreement also includes special provisions as to short-time employment.

Besides the foregoing items collective labor agreement policy is an instrument to arrange work suitable for human beings and to guarantee employment regarding its quantity and quality.

E. Additional arrangements to the collective labor agreement made between the board of directors and the works council of Chemie Linz AG

1. Suggestions on improvement

2. Flexible work-hours:

   Having flexible work-hours the concerned employees may arrange them to a certain extent in accordance to their personal wishes and needs.

3. Extra pay for impeded working conditions:

   a) Basic extra pay

   b) Specific extra pay; when using gas mask
auditory protection
other protection

   c) Extra pay for extreme conditions

4. Salary scale:

   It guarantees regulations for salaries taking into account the differing tasks of a modern industrial establishment.

5. Other agreements, like:

   - Compensation for travelling expenses:
     Reduced fares in public conveyance reasonably used for the way to and from the working place.

   - Self- administrated pension-plan:
     Chemie Linz AG grants its former employees as well as their widows and orphans, respectively, a self-administrated pension in addition to an employee's pension from the social insurance.

C I V I L D E P A R T M E N T - ACTIVITIES AND ORGANIZATION

The main tasks of the civil department are:

- Planning of structures, streets, sewers, tracks and other civil constructions (pipe racks, bridges, wells, etc.) including all technical house equipment (except electrical equipment)

- Surveying of the ccnstruction sites

- Supervising of the erection of all constructions

- Maintenance of all constructions

- Administration of all documents, static calculations and plans concerning civil activities

- Contact with authorities concerning problems of public interests of Chemie Linz interests.

Planning, surveying, administration of documents and the contact with the authorities are done by the planning group which is divided into 5 subdivisions.

- industrial plants construction and statics
- building-, storage- and pharmaceutical plants construction
- steel construction
- sewers, streets, railway and surveying
- water installations, heating and ventilation, air conditioning, insulation.

The planning group includes about 30 employees. Up to the sum of 200 mill. Schillings (about 15 mill. US$) of erection cost a year, this group can fullfill its tasks itself. If there are several extensive projects at the same time outside contractors support the planning group. Supervision and repairing are done by the supervision group. The 15 members of the supervision group have to supervise the erection and repairing done by outside contractors and they have to direct the 7 repairing groups:

- bricklayers, floor tilers and roofers (20 men)
- special bricklayers (refractory brickwork, acid- and lye resistant brickwork), coating (20 men)
- sewermen (20 men)
- carpenters and scaffold carpenters (20 men)
- painters (houses and steel constructions), (20 men)
- insulators (pipes, boilers, furnaces, etc.), (20 men)
- railway track repairing group (10 men)

Every group is led by a foreman and an assistant foreman. Some 5 workers, bricklayers, scaffold carpenters and insulating workers are within reach day and night for emergency in production plants. During the winter track workers are also within reach because the switches can be blocked by snow and ice.

To give a picture of the work that has to be done by these 150 men it is necessary to know some data about the Chemie Linz plant in Linz.
The plant area is about 1,5 km².

Some 350 buildings and other constructions of civil character stand there. Approximately 120 000 m² of roofs are to be kept in good condition. A special problem is the coating of the countless steel constructions, pipes and boilers in an aggressive atmosphere. About 15 km of streets, 15 km main sewers and 35 km railway tracks with some 120 switches are to be repaired continuously.

About 100 mill. AS (7 mill. US$) are spent for maintenance every year. One half of the work is done by the Chemie Linz repairing team. The other one is done by outside contractors.

The repairing group is kept as small as possible. The number of the workers is just as high as it must be, allowing the group to do:

- all emergency jobs in a quick way, even during night and weekend
- all jobs that are too little extensive or too difficult to survey to give it to outside contractors.
- all jobs that need spècial workers or special knowledge of the plants.

The main jobs given to outside contrators are:

- roofing of large roofs
- coating of steel constructions
- housepainting
- repairing of streets and railway tracks.

F I R E R E S I S T A N T M A T E R I A L S

General view

The different qualities of fire resistant material depend on the different working conditions.

There is no material that is resistant against everything. Especially bricks are either resistant to acids (e.g. SO_2 in the flue gas) or to quick changing temperature. Other bricks are especially used for heat insulating (light bricks). Of course it is always important to use the special plaster for the special brick.

The different possibilities of heat-resistant lining are:

lining with bricks
lining with stamped material
lining with squirted material

The operating instructions for these materials given by the manufacturer of the material have to be observed very exactly. The thickness of the plaster between the bricks is about 2 - 3 mm regarding fire plaster and less regarding fire-resistant cements.

It is absolutely necessary to use only materials which are free of SiO_2 (99% Al_2O_3) for waste heat boilers. SiO_2 causes corrosion on pipes and pipe-bottoms.
Generally: Materials with a high content of SiO_2 are more acid resistant. With increasing content of Al_2O_3 (35% and more) acid-resistance decreases whereas and resistance to quick changing temperature and high temperature increases.

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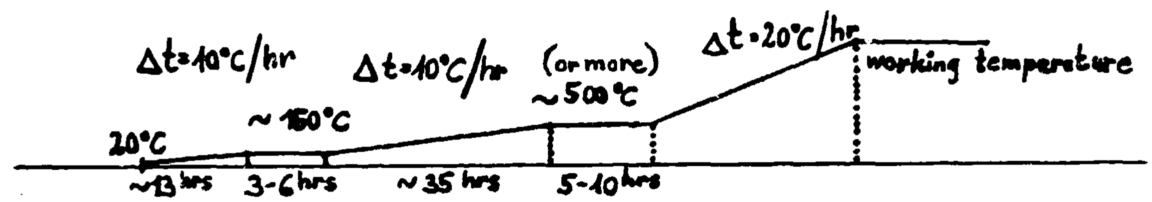
Drying and heating up of new plants

a. drying is necessary for getting out the water of the plaster

b. heating up the first time has to be done very carefully in order not to destroy the lining.
Up to 150°C - the humidity of the plaster evaporates,
up to 500°C - the chemical boundet water evaporates.
Due to these facts it is necessary to stop the increasing of the temperature for a while at the above mentioned temperatures.
The duration of these stops depends on different things (material, insulation, thickness, largeness of the boiler)

c. The time-temperature-diagram shows an increase of about 10°C per hour up to 150°C, then a stop (see item b.), once again 10°C per hour up to 500°C, a stop again, and then 20°C per hour up to the working temperature.



Attention: Please use the time-temperature-diagram of the flue-gas and not the diagram of the crack-gas.

Heating up of an already used lining

The diagram depends on the time during which the plant stood still. If it was only for a few days: 10°C up to 150°C about 5 hours, stop, 20°C up to 500°C, stop for 5 hours, 20°C up to working temperature.
If the stillstanding time is longer of there is a wet climate the diagram is similar to that to heating up a new plant.

Storing the materials

It is necessary to store different qualities at different places (the different materials often are looking similar). Please protect materials from water and temperatures under 0°C and liquids for cements from sun.
Do not use materials which are older than $\frac{1}{2}$ - 1 year (except bricks). Good bricks should not differ more than 1% in length, they must not have cracks and broken edges.

FIRE RESISTANT MINERAL WOOLS

They are used for filling tension joints and joints between steel pipes and fire material and for heat insulation. They are resistant to temperatures up to 1 250°C.

Trade marks: CERAFELT, KAOWOOL

THE ENGINEERING DEPARTMENT OF CHEMIE LINZ AG is a section of the TECHNICAL DEPARTMENT (T)

- T TECHNICAL DEPARTMENT
  - TKB Engineering Department (and Construction Office)
    - TKB - Engineering Sectioons
    - TKB-RL - Piping Section
    - TKB-NR - Standard Office
    - TKB-KN - Costcontrol and time control (network)
    - TKB - Pump Section
    - TKB - Model Section
    - TKB - Copies Workshop
  - THW Workshop,Erection
  - TBW Architect. Dept
  - TME Instrument Dept
  - TEL Electr. Dept.
  - TMP Material Test.D
  - TRV Techn. Rev. D.
  - TVE Transport Dept.
  - TLT Laboratory Dept

ORGANIZATION SCHEDULE - T E C H N I C A L   D E P A R T M E N T

Managing Committee

↓

Planning Department

↓

Engineering Department

↓

Activity of the Engineering Department:

Basic Engineering

Design Basis (see CO_2-liquefy)
Basis datas of the process (e.g. Melamine or Urea-Fibel)
Process Flow Diagram (see CO_2-liquefy)
Material balance
Plot plan
Process P and I-Diagram
Time schedule (CO_2-liquefy and urea plant)
Project medium key
Description of the plant
List of motors and
Specifications for the machines and apparatuses (e.g. V-340)
Specifications for the instruments
Data sheets (A/B 6)
Cost estimation for the project

Detail Engineering

P and I-Flow Diagram (see CO_2-liquefy and Instrument syr)
Quotation for machines, apparatuses, pipes, etc.
Orders " " " " "

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Plant model

Pipework isometrics

Measuring and regulation (control) diagram

Checking of the orders

Checking of the workshop drawings

Orders for the erection

Manual handbook

Commissioning and testrun

Control of the project cost and control of the time schedule

(e.g. Melamine plant, Urea plant)

Instrument symbols

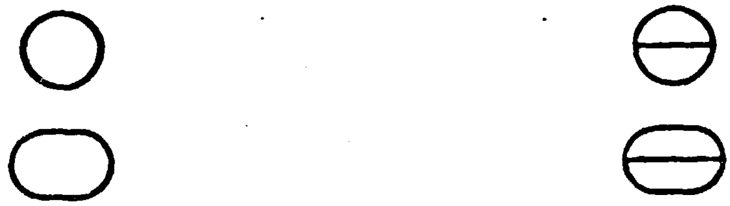
Meßstellen-Symbole

Kurzbezeichnungen short sign

Ausführung:

installed at the apparatus — **Für örtliche Messungen**

installed at control plate or control room — **Für Einbau in Meßtafel od. Meßwarte**



Die Buchstaben bedeuten:

	at first position / an erster Stelle	at second pos. / an zweiter Stelle	at third or next pos / an dritter od. höherer Stelle
A	Analyse analyses	Alarm alarm	Alarm alarm
C	Leitfähigkeit conductin'	Regler controller	Regler controller
D	Dichte specific gravity		—
E	—	Element	—
F	Fluß flow rate	—	—
G	—	Glas glass	—
H	Fernbedienung durch Hand remote control by hand		
I	—	Anzeiger indicator	Anzeiger
L	Stand level	—	—
M	Feuchtigkeit moisture	—	—
P	Druck pressure	—	—
R	—	Schreiber writer	—
S	number of Drehzahl revolutions	Schaltung circuit	Schaltung
T	Temperatur	—	—
V	Viskosität viscosity	—	Ventil
W	Gewicht weight	Hülse shell	—

Weitere Buchstaben

d	Differenz	AH	Alarm hoch high
h	mech. Thermometer	AL	Alarm tief low
r	Verhältnis proportion		
pH	pH-Wert		
Q	Zähler counter		

SCOPE OF SUPPLY FOR EXTENDED BASIC ENGINEERING

The following documents will be supplied according to a time schedule to be agreed upon for the procurement, construction and acceptance of the plant and its elements. All documents will be kept up to date and will be elaborated in German (perhaps English) language according to the metric system (international system of units according to DIN 1 301). Symbols or designations shall correspond to the Chemie Linz AG standards, to Austrian standards or DIN standards in respect to the Chemie Linz AG short designations. Documents will be submitted in the form of copies and one reproducible copy each.

a) Process Flow Diagram with quantities of the materials and their composition within the different phases of the process, operating data, thermal balance, consumption of raw materials and energy as well as yields. Above data will be indicated for minimum, normal and maximum throughput Description of the process.

b) Draft layout indicating platform loads (forces, weights and moments) and ceiling break-throughs, according to which construction drawings can be prepared. Final installation drawings, foundation drawings, pipe bridge drawings, indicating weights, forces and moments.

c) Piping and Instrument Flow Diagram with all process and energy pipe networks comprising all machines, apparatus, fittings as well as measuring and regulating equipment. The diagram will be established in such a way that the relation between process flow diagram, installation drawings, model, isometrics and measuring and regulating

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diagram will be clearly shown. As far as possible the dimensions and levels of apparatus and machinery will be shown according to scale. Material data lists, media codes, classifications for pipework, fittings and seals.

d) Specifications (descriptions and dimensional sketches, data for the pipe connecting sockets, i.e. quantity, nominal widths and nominal pressure, material, static and dynamic loads, permissible pressure loss, amounts of heat, temperature, pressure and the like) for all machines and apparatus including required steel structures herefore, if any, to permit relevant design drawings to be prepared and/or the equipment to be built. Workshop drawings with parts lists or equivalent documents with apparatus data or apparatus details for equipment which require special design.

e) Plant model in a scale of 1:25 (details possible 1:10) consisting of structural framework with stairs, platforms and ladders, all apparatus and machines, pipe bridges, process and energy pipework, main routing of measuring and regulating lines as well as of electric cables.

f) Pipework isometrics with parts lists for all pipelines with fitting lengths in all three levels. Indication of sliding and fixed points and/or determination of pipe supports indicating static and dynamic values as far as they have to be specified by the engineering company. Determination of pipe connecting sockets on the apparatus in plan form with level indication. Provisional list of materials at the beginning of planning for the complete pipework including fittings and accessories. Specifications for special pipe material not yet included in the documents of Chemie Linz AG.

g) Specifications for insulation and painting of machines, apparatus, pipework and steel structures.

h) Measuring and regulating (control) diagram with specification list for the measuring and control devices with indication of nominal values, measuring and regulating (control) range and relevant permissible deviations, information on material coming in contact with the media as well as indication of physical values (pressure, temperature, density, viscosity, etc.), safety settings for the regulating and/or control fittings, interlock diagram and alarms for the instrumentation of process engineering. This documentation must be detailed enough to permit ordering of the corresponding equipment items.

i) Specification of electro-technical equipment.
Draft of distrubution system (one-line diagram), provisional motor list, power mains and lighting facilities. Summary of critical points in regard to explosion proofing (drawing of explosion hazard zones) control and interlock diagram and alarms.

j) Checking of our drawings and of technical order specifications for all plant equipment from the process engineering point-of-view.

k) Description of the plant, start-up and operating instructions, control and analysis procedures.

l) Commissioning and test run by competent persons of the engineering company.

Time-table for the delivery of the particulars for an enlarged Basic Engineering

	months
Process Flow Diagram and process description	....
Draft layout with waste gas- and waste water particulars	....
Final installation drawing 1 month after receiving the last particulars	....
Simple Piping and Instrument Flow Diagram (Process-P and I-Diagram)	....
Piping and Instrument Flow Diagram (P and I-Diagram)	....
Media codes, classifications for pipework, fittings and seals	....
Provisional list of materials for the complete pipe material	....
Specifications for equipments with longer terms of delivery (reactors, compressors, etc.)	....
Specifications for equipment with the shortest terms of delivery	....
Plant model	....
Pipework isometrics with parts lists	....
Specifications of the measureing and regulating devices	....
Provisional motor list	....
Draft of the electric-distribution systems	....
Plan for explosion- and hazard zones	....
Control and interlock diagram and alarms	....
Start-up and operating instructions (operating instruction book)	....

CHEMICAL WASHING (PICKLING) OF:

1. Pipelines
2. Natural-Circulation boiler
3. Storage-tanks

General: At Chemie Linz all pickling treatments were done by a pickling contractor:

Therm-Service GmbH
D-7035 Waldenbuch
Bahnhofstr. 34
Germany

other contractors are:

Keller u. Bohacek
D-4000 Düsseldorf-Rath
Liliencronstr. 64
Germany

Deutsche Derustit GmbH
D-6057 Dietzenbach
Emil von Behring Str. 4
Germany

Röhsler & Co.
A-2338 Vienna
Gebirgsgasse 24
Austria

ad 1. Pickling of pipelines

a) Thrust through system
This method was used at the long pipes on the pipe bridges. There the pickling solution (for ex. hydrofluoric-acid) was injected into a temporal limited water-flow.

b) <u>Closed circuit system</u>

This method was used at pipes which were connected temporary to closed circuits. See fig. 1. All valves were left installed.

Hoses, pumps, mixing tank with steam heating and some valves were the contractor´s account.

During the design of the pipes there should be a communication with the pickling-contractor to set the right nozzles and flanges in the pipes for filling pipes with pickling-solution. So you can pickle the pipes every time again also after repairing the pipes.

Before asking a pickling contractor you should know the diameter nominal, length, volume and the inside surface of the pipes, (area) you want to have pickled.

Before pickling all pipes ready have to be welded and water pressurized. If you would not have done this before there would be a new surface oxidation.

<u>Performance procedures at Chemie Linz</u>

a) Flushing with water.

b) Degrease in addition with not-ionic-activ solution.
t = 60 - 80°C

c) Pickling with a solution of 1% inhibited hydro-fluoric-acid
t = 40 - 50°C

d) Stabilization with a solution of 0,1% citric acid

e) Passivation in addition with ammonia and H_2O_2 until the pH of effluent is 10,2.

f) After drainage of the system the surface was dried by nitrogen and pressurized by nitrogen.

The effluent solution was neutralized with lime ($Ca(OH)_2$) to the required pH.

Time required

This procedure has needed following times (without preparation-time)

Flushing pos a)	some hours
Degrease pos b)	12 hours
Pickling pos c)	5 hours
stabilization pos d)	14 hours
Passivation pos e)	24 hours

ad 2. Pickling of a natural circulation boiler

acts:

steam volume:	40 t/h
pressure:	42 bar
temperature:	450 °C
volume of the water tubes: (without economicer and superheater)	22,5 m^3

Pickling by the auto-circulation-system

The performance procedures were the same as written in the part of pickling the pipes with the closed circuit system.

To have the required pickling-speed, air was blown through lances into the falling-water tubes.
The auto-circulation is caused by inserting air-lances into the tubes. The lances were taken through the upper-water-drum into the tubes.

3. Pickling of storage-tanks (see fig. 2)

These tanks were pickled with a solution of cold 4 - 5% hydro-cloric-acid.

4. Blow out of high-pressure steam pipes from the boiler to the turbine
   (see fig. 3)

After the chemical cleaning, the pipes were blown out with steam which was generated in the boiler.

There we tried to have a great steam-speed in the long pipe (400m/s).
So we had a good mechanical cleaning.

Stress Analysis of Piping System

Basic steps of calculation:

1. Procedure of design starts with making a freehand isometric piping-sketch.

2. Spot preliminary locations of hanger or supports, locate hangers at or near any concentrated loads (heavy valves, risers ....)
Pick up all horizontal bends, tc prevent any excessive overhang.
Hanger spacing must be close enough, to prevent excessive sagging.

3. Study building steel

4. Check for interference (pipes, constructions)

5. Calculate distribution of weight
important to obtain zero load at equipment flange

6. Summarize hanger loadings

7. Calculate distribution of expansions to hanger

8. Calculate distribution of equipment movement

9. Summarize movements

10. Choose hangers or supports for loadings and movements

CHEMIE LINZ MELAMINE PROCESS

1. Process Description

Melamine, a raw material for the plastic industry, has been so far produced from calcium cyanamide via dicyandiamide, but is now mainly produced from urea.

The CHEMIE LINZ AG succeeded in developing a continuous process at atmospheric pressure for the production of melamine from urea, thus achieving a technical progress solving all problems satisfactory.

The CHEMIE LINZ AG - melamine process operates at atmospheric pressure. The formation of melamine proceeds - in the same way as in case of all other processes starting from urea - according to the overall equation:

$$6\ CO(NH_2)_2 \longrightarrow C_3N_3(NH_2)_3 + 6\ NH_3 + 3\ CO_2$$

The reaction is endothermic.

The melamine is produced in two steps. First, urea is thermally decomposed into an equimolar mixture of isocyanic acid and ammonia:

$$CO(NH_2)_2 \longrightarrow HNCO + NH_3$$

H = + 780 kcal/kg urea (solid), endothermic reaction.

./2

This gas mixture is diluted with additional ammonia, and led to a catalytic reaction. During this second step the isocyanic acid is converted into melamine and carbon dioxide.

$$6\ HNCO \longrightarrow C_3N_3(NH_2)_3 + 3\ CO_2$$

H = - 714 kcal/kg melamine, exothermic reaction.

These separate process steps permit carrying out each reaction within the optimum temperature range. Consequently the formation of unwanted byproducts is reduced to a minimum; and a recrystallization is not necessary.

The first reaction takes place in a heated fluidized sand bed. These is practically no abrasion and therefore the reation gases need not to be filtered. The second reastion is effected in a fixed catalyst bed. There is no contamination of the product gases due to catalyst dust. Such contamination would necessiate filtration and crystallization. The reaction heat is used for preheating ammonia. The melamine formed in the catalyst bed is gaseous at reaction remperature. It is condensed in a subsequent cooler, where melamine crystals are formed in a aqueous suspension. The remaining components of the reaction gas mixture can thus be separated from the suspension very easily.

The melamine can be easily separated from the mother liquor by a centrifuge or a filter. Due to this wet separation as well as the subsequent drying melamine with high bulk density is obtained. High bulk density is an advantage for storage, transport and further processing.

According to the overall equation, 2,86 tons of urea are theoretically needed fot the production of 1 ton of melamine with 0,81 tons of ammonia and 1,05 tons of carbon dioxide as by-product.

As the formation of melamine from isocyanic acid has a yield of 91 - 95 % in practice 3,1 tons of urea are required to produce 1 ton of melamine.

The unreacted isocyanic acid is hydrolized into ammonia and carbon dioxide or rebuilt to urea.

Process Description of a Melamine Plant

If the urea to be treated is available in solid form this is first melted with steam (1,2). If urea is available in liquid form the melting is of course waived. The melt is delivered to the decomposer (3) by pumps. The heat required for decomposition of the urea is obtained from a circulation salt bath which is maintained at the right temperature. The reaction takes place in a sand bed reactor, fluidized with hot ammonia. In the decomposer (3) a gas mixture consisting of isocyanic acid and ammonia is formed. This is delivered to the catalyst reactor (5), where the isocyanic acid is converted to gaseous melamine, and carbon dioxide is set free. The reaction heat is used to preheat ammonia.

The mixture of gaseous melamine, ammonia and carbon dioxide goes to the separator (6), where fine-crystalline melamine, suspended water is obtained by direct cooling.

Due to extraction of heat by water evaporation the separation gases entrain water vapore'.s. A great part of this water vapour is condensed in the following off-gas-cooler (7) and returns to the separator (6). The offgas is sent to the off-gas treatment unit.

The suspension from the separator (6) is pumped into a collecting tank (8) and cooled via cooler (9), whereby part of the dissolved melamine will crystallize.

The suspension is pumped to the centrifuge or filter (10) where melamine crystals and liquid are separated. The mother liquor is recirculated to the melamine separator where it served as a cooling agent.

To obtain the desired moisture in the final product, the melamine from the centrifuge of filter is dried in drier (11). The cooling zone in the drier cools the melamine so as to be suitable for storage.

Subsequent sieve (12) and mill (13) enable removal of agglomerats formed in the drier.

The product from the drier is ready for sale. It is weighed (14), bagged and stored.

Off-Gas Uitilization

The off-gas consists of carbon dioxide, water vapour, inert gases and a lot of ammonia. The major part of this ammonia was fed to the catalytic reactor in the synthesis for the fluidization. The minor part was set free during reaction.

There are different alternatives available for utilizing the off-gas and mother liquor economically.

The following possibilities may be mentioned:

a) Separation and return of the ammonia from the synthesis and absorption of the redidual off-gas to produce an ammonium carbonate solution.

This carbonate solution can be delivered to fertilizer plants for conversion into ammonium nitrate, ammonium sulphate or ammonium phosphate.

When passing this ammonium carbonate solution to an urea plant, consideration should be paid to the fact that the high percentage of water reduces the efficiency of conversion into urea.

An improvement is obtained through conversion of the ammonium carbonate into an ammonium carbamate solution, thus reducing the water rate.

A better alter native would be, however, according to a process, developed by Chemie Linz and used in several plants.

b) Obtain an ammomium carbonate solution as in a) above and separate this into ammonia. carbon dioxide and water which only marginal increase in investment and utility requirements.

Thus the melamine plant is independent from any other plant, because the pure ammonia can be exported in liquid form or used anywhere.

Process Description of an Off-Gas Treatment Unit

The off-gas goes to the ammonium carbonate column (= NH_3-separation, 21) where CO_2 is washed out forming an ammonium carbonate liquor supersaturated with ammonia. The surplus of ammonia is cooled and dried with liquor ammonia on the top of the column. Bulk of this ammonia is compressed (16), preheated (4) and returned directly to the melamine plant for re-use. A small part of this ammonia stream is further compressed (17), liquified (18), separated from residual inert gases and fed to the top of the ammonium carbonate column (21).

The balance of the ammonia gas obtained at the top of the column (21) leaves the plant and is available for further use in other units. This quantity corresponds to the ammonia produced during the melamine synthesis.

The ammonium carbonate solution is stripped off from the free ammonia in the NH_3-stripper (15) and delivered to the lower stage of the CO_2-stripper (19), which operates under elevated pressure. In the lower steam heated stage, the ammonium carbonate solution is decomposed. In the upper stage the NH_3 is scrubbed with water and the pure CO_2 leaves the plant for further use. The ammonia water, obtained in the sump, which still contains slight amounts of carbon dioxide, transfers its heat in the NH_3-CO_2-stripper (20). A main part goes to the ammonium carbonate column (21). The remainder is decomposed in the NH_3-CO_2-stripper (20). Gases expelled in this column are recycled to the ammonium carbonate column (21). The separated water can be used as washing water or purged.

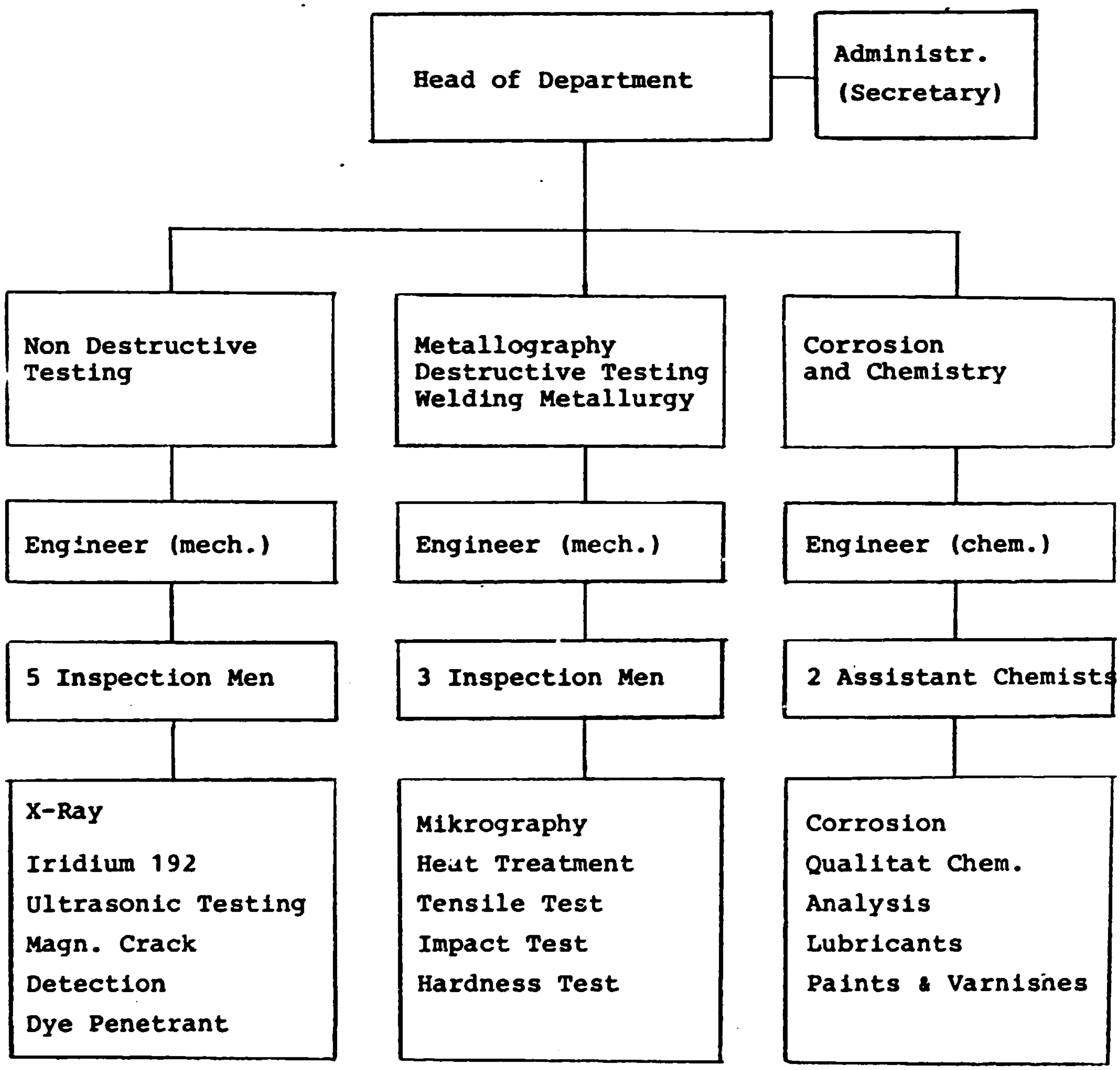
Consumption Figures per Ton (Metric) of Melamine

Consumption		Expected
Urea (100 %)		3,10 t
NH_3 liquid		0,3 t
Process water		
(condensate)		1,2 t
Catalyst		
(2 years life-time)		2,50 kg
Electric power	6 kV	500, kWh
	500 V	280 kWh
Fuel		14,4 Gj
Steam	15 bar	3,0 t
	6 bar	4,0 t
Cooling water	15°C	800 m^3
Nitorgen	5 bar	40 Nm^3
Instrument air		40 Nm^3
Compressed air		400 Nm^3

Credit		
NH_3 gas	1 bar	1,2 t
CO_2 gas	20 bar	1,10 t
Condensate		5,00 t

Effluent	
Mother liquor	
from recrystall	0,03 m^3
with 1 kg melamie	
20 g NaOH	
90 g Na-ammelide	
Cooling water	800 m^3

Organisation of the Department for Testing Materials



The following handbooks were handed over

"Böhler Steel Manual"

"Böhler Welding Manual"

Department for Testing Materials in Chemical Industry - Scope of Work

The work of a department for testing materials can be described as follows:

1. The department is reponsible for all materials which are used in the plant on vessels, pipelines, engines, structures.

2. It has to secure that the right material is supplied for a given process or service conditions.

3. It has to control the vessels and installations in service in view of damages, suggest measures to avoid such damages.

4. It has to secure, that construction and maintenance work is done properly in view of the applied material and the service conditions.

Materials used in chemical industry:

1. Most widely used are the metallic materials
   a) Within this group iron and steel and its alloys have the broadest application, for instance:
      Carbon steel, cast iron,
      steels for boilers and heat exchangers, where no or only small corrosion is to be feared;
      steels for low-temperature service,
      stainless steels, ferritic and austenitic, for corrosive environments,
      steels for high-temperature service,
      steels, resistant against attack by hydrogen, and so on.

./2

b) Nickel and its alloys, for instance, nickel-molybdanium-alloys of the Hastelloy-type and nickel-chromium-alloys of the Incoloy- and Inconel-group, for corrossive environments or high-temperature service, nickel-copper-alloys in plants for water treatment.

c) Copper andcopper alloys
These materials are mot as far used, as the above mentioned. For instance, heat exchangers in the oilsystems of turbines and compressors are made of these materials.

d) Aluminium and its alloys, mainly for storage-tanks and pipelines for not to corrosive media.

e) Lead is not used any more on a wider scale, one will find them in some parts of sulphuric acid plants.

2. Non metallic materials

a) Enameled vessels, valves and pipes for high corrosive service or where high purity of the product is demanded, i. e. in the pharmaceutical industry.

b) Rubber lined vessels
Natural and synthetic rubber is a very good corrosion-resistant material, which can be used in a rather wide range at ambient or slightly elevated temperatures, i. e. up to 80 degrees centigr. at the utmost.

c) Thermoplastics, for instance polypropylene, polyethylene or others, have as nearly all organic materials a temperature limit of application.

d) Fluorinated plastics, as Teflon and Viton, which have a high corrosion resistance and a high temperature limit.

e) Resines-phenolic, epoxydes e.t.c.-, which can be used as corrosion-, or weather - resistant overlays on the inside and outside of tanks, vessels, even heat exchangers.

To deal with materials successfully the expert has to know

the chemical composition
the metallographical structure,
the mechanical values,
the influences - mechanical, thermal, chemical - upon the material under service conditions.

Therefore we have in our department three main kinds of tasks:

1. mechanical and metallurgical,
2. non-destructive testing,
3. chemical, that is on the field of corrosion.

For the above mentioned problems it is necessary to use a certain range of investigations.

1. Identification of materials:
   At repair and maintenance of engines it can become necessary to replace damaged pieces, for instance bolts, small axles etc., the material of which is unknown. Therefore one has to make some identification tests: hardness, metallographic structure, tensile- and yieldstrength. That kind of test has also to be done, when there is no connection between the delivered material and the certificates of the manufacturer.

2. Investigation of damages:

Here the visual investigation of the damaged parts under a binocular microscope is one of the most important method. For instance in case of rupture the operator can find out, whether fatigue of the material, corrosion or mechanical force initiated the cracking of a piece under investigation.

3. Non destructive testing:

Non destructive testing is mainly applied as a control of construction and repair work, that means control of the welding. It is also used for detecting failures in the material, as sheets, pipes, castings, etc.
Such defects may be cracks, slags, piping in castings, e.t.c.
In the case of welding-control the investigations have to assure the welding has been done properly, that there are no unduly big and many pores, slags and no cracks.

The methodes in this field are:

radiography, X-rays or radio-isotopes,
ultrasonic measurementes,
crack detection by magnetic mithode or dye penetrant,
control of temperature in case of heat treatment - preheating and post weld heat treatment.

4. Corrosion:

Control of vessels running under severe conditions by means of visuel investigation, ultrasonic measurements, control coupons, which are installed inside the vessels.
Selection of the right material for given process-conditions by tests in the laboratory or with coupons in the vessels.

It must be pointed out however, that none of the above mentioned methods can be used single, but it is necessary to apply two or more methods to clear a case. Therefore the expert in material investigation has to keep in mind all these possibilities.
Further the material testing department has to make proposals upon the application of materials in new installations or plants, up-on issuing standards for material quality, welding procedures, control and investigation-work.

As manifold as the work to be done is, as manifold is the equipment.

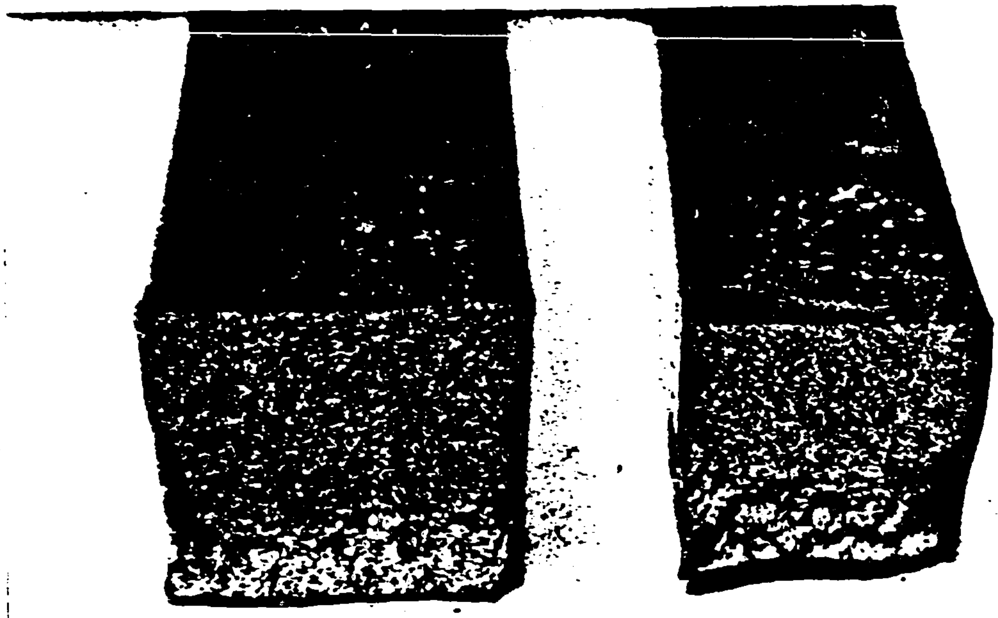
1. Mechanical and metallurgical testing
   Here our department can do the following investigations and tests:
   a) Measure of yield- and tensile - strength by a testing machine with a load of 20 tons.
   b) Measure of hardness by two hardness-testers one for Vickers (H_V) and one for Brinell (H_B).
      The Vickers-tester works with a diamond, shaped like a pyramid with a quadratic base, which is impressed in to the surface of the material. Whereas the Brinell-tester works by means of a sphere made of hardened steel. One gets on impression in the form of a circle
   c) Measure of impact-strength.
   d) For metallographical work we have grinding and polishing devices, to manufacture test pieces, which are to by investigated under a metal microscope.
   e) A binocular microscope for visual investigation of damaged pieces of equipment.

2. Non destructive testing
   a) Radiography
      For this kind of work we have 2 apparatus for X-ray with 160, and 240 kilovolts respectively, as well as 3 apparatus with radio-isotopes. We use Iridium 192.

3. In the field of corrosion there is the usual laboratory equipment. But as already told, we do much investigation work by control coupons in the vessels, which method gives better results, as the coupons are tested directly under service conditions.

Case Description 1

Type of Damage: Nidriding



1. Description of damage
   Embrittlement in various parts of the reactor.

2. Material
   1/2 % Mo-steel (15 Mo 3)

3. Conditions of service
   Approx: 360 - 370°C
   service time: 17.500 hs
   media: gasses of ammonia,
   carbon dioxide.

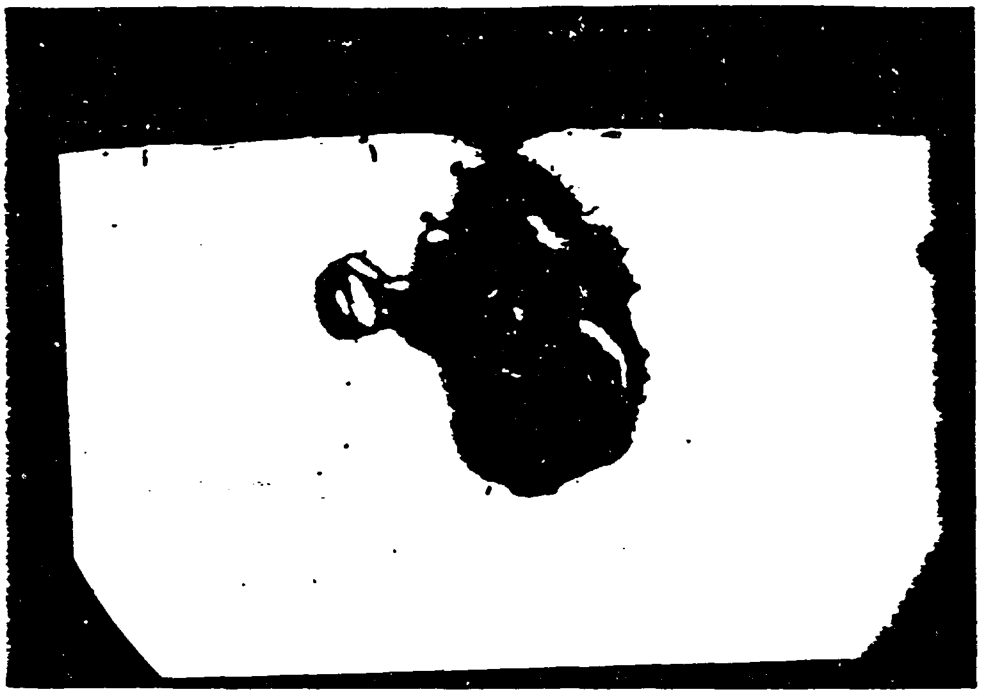
4. Examination
   Tension test, hardness test, bending test.

5. Type of corrosive attack
   The increase in hardness at the product side of the material and the reduced yield strength suggest nitriding

6. Remedial measures
   Replacement by austenitic material.

Case Description 2

Type of Damage: Pitting



1. Description of damage

Leakage in an acid cooler.

Remark: The leakage caused contamination of the cooling water with acid.

2. Material

tubes: 18/8 CrNi steel

shell: carbon steel

3. Conditions of service

tube side: nitric acid 45 %

temperature 85°C

shell side: cooling water

15°C

4. Examination

Chemical analysis on sulfide, visual and microscopic inspection, preparation of a polished cross-section.

5. Type of attack

The attack was proceeding from the outside of the tubes. The presence of sulfide suggests bacterial corrosion due to nearly stagnant conditions on the shell side.

6. Remedial measures

It is proposed to increase the flow of cooling water to avoid bacterial growth.

Case Description 3

Type of Damage: Stress Corrosion Cracking

1. Description of damage

   Leakage in heat exchanger.

   Tubeside: sodium nitrite and potassium nitrate.

   Shell side: urea and ammonia.

2. Examination

   Dye penetration test, microscopic examination.

2. Material

   Hastelloy B

5. Type of attack

   Intercrystalline stress corrosion cracking by sodium-hydroxide due to unrelieved welding stress.

3. Conditions of service

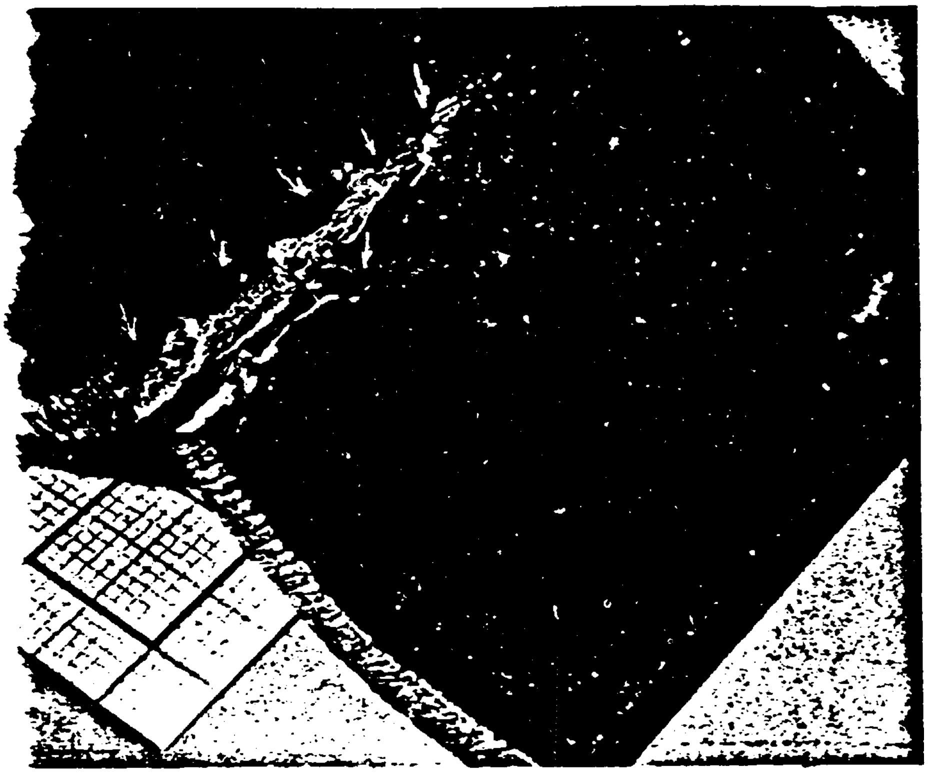
   Nominal operating temperature 450°C, formation of sodium-hydroxide due to overheating.

6. Remedial measures

   a) A better stabilized alloy, namely Hastelloy B 2 used.
   b) Better temperature control to avoid overheating in order to keep the sodium-hydroxide content al low as possible.
   c) Repair welding have to be carried out under water cooling.

Case Description 4

Type of Damage: Fatique Fracture



1. Description of damage

   Cracks in heat exchanger tubes.

4. Examination

   Visual inspection.

2. Material

   Carbon steel

5. Type of attack

   Fatique fracture due to constant exposure to high temperature and alternating evaporation and condensation.

3. Conditions of service

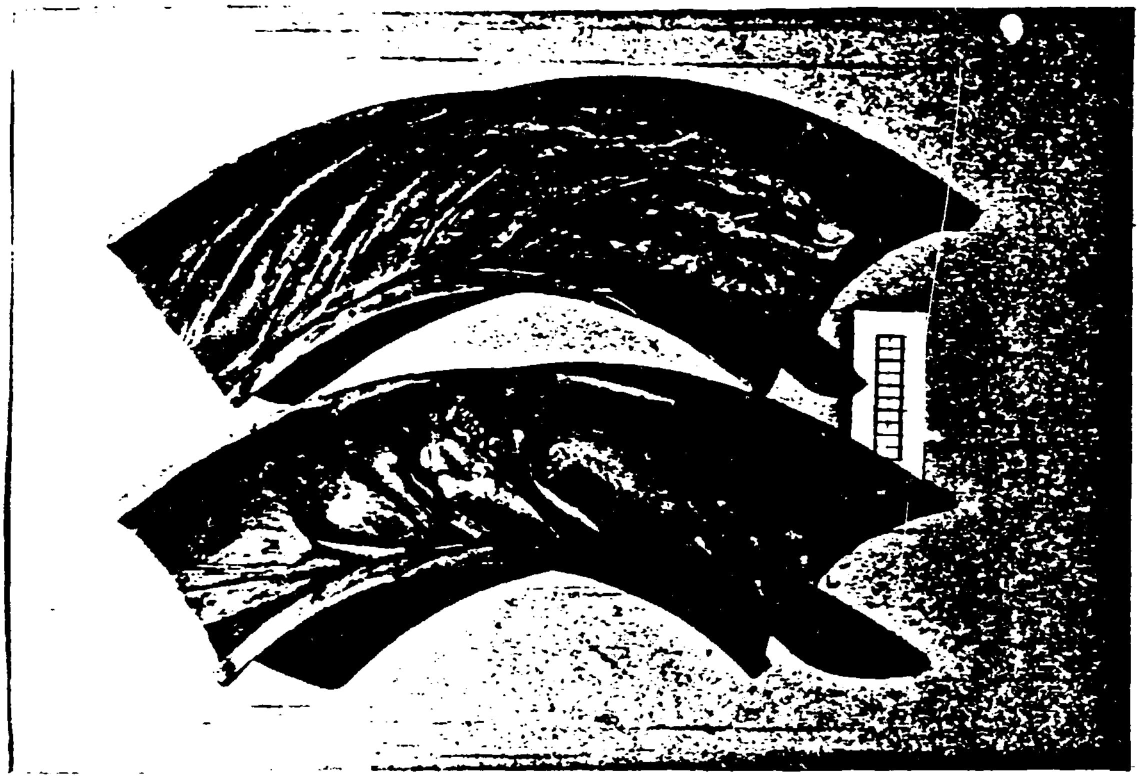
   Medium tube side: water and steam at 250°C and 20 bar. Medium shell side: salt melt, approx. 400°C, in service for 60 000 hs.

6. Remedial measures

   The cracked tube was replaced by a new one made of low alloy steel.

Case Description 5

Type of Damage: Erosion Corrosion



1. Description of damage

Leakage in sulfuric acid pipeline

2. Material

Carbon steel

3. Conditions of service

Sulfuric acid 96 % at room temperature, service time approx. 8 600 hrs.

4. Examination

Visual inspection

5. Type of attack

Erosion corrosion connected with acid corrosion due to turbulences.

6. Remedial measures

New design: Avoidance of sharp bends and protruding weld seams.

Name of Equipment	Producer Name and Adress	Purchase Price ÖS
Härteprüfgerät nach Vickers Hardness testing machine "Vickers"	Wolpert-Werke GmbH *) Kopernikusstraße 11 D-6700 Ludwigshafen	ca 350.000,- (1941)
Härteprüfgerät nach Brinell Hardness testing machine " Brinell"	- " -	ca 300.000,- (1941)
Schlaghärteprüfgerät "Equotip" Portable hardness tester (digital reading)	Gebrüder Bach GmbH Oswald Redlich Straße 5 A-1217 Wien	30.000,- (1979)
Kleinlasthärteprüfer "Durimet 2" Hardness tester (small load instrument)	Leitz-Austria Postfach 62 Dr. Karl Lueger Ring 12 A-1014 Wien	128.800,- (1980)
Zerreißmaschine Tensile testing machine	Wolpert-Werke GmbH *) Kopernikusstraße 11 D-6700 Ludwigshafen	ca 1,000.000,- (1941)
Pendelschlagwerk PSW 30 Impact strength testing machine	Mohr & Federhaff & Losenhausen Prüf- und Meßsysteme GmbH Postfach 1502 D 68 Mannheim 1	95.000,- (1975)
Techno-Endoskope, Modell D 2 e Technical-Endoscope	Deutsche Endoskopbau-Gesell-schaft Sass, Wolf & Co mbH Ritterstraße 12 D Berlin	15.991,- (1959)
Technisches Endoskope "TeKZ 5000/S" Technical-Endoscope	Technokontroll AG **) Imbisbühlstraße 144 CH-8049 Zürich	53.000,- (1978)
Gleichspannungs-Porenprüfgerät Poroskope, Type H 3 d "Poroskope"-direct voltage tester for pores	Fischer GmbH & Co Postfach 4 D-7032 Sindelfingen 6	30.000,- (1974)
Schichtdickenmesser "Diameter", Type SM 1b Overlay thickness measuring instrument	List-Magnetik Viehweg 17 - 19 D-7022 Leinfelden	4.000,- (1973)
Mettler-Makro-Analysenwaage H 10 W Analytical balance "Mettler H 10 W"	Comesa KG Tegethoffstraße 26 - 28 A-4020 Linz	9.601,- (1970)
Mettler Präzisionswaage PC 4400/19 Precision balance "Mettler PC 4400/19"	- " -	25.300,- (1980)

*) Vendor for Austria: Otto Dohmen
Argentinierstraße 42
A-1041 Wien

**) " " " Eichler KG
Pernerstorfergasse 5
A-1101 Wien

Equipment for Non Destructive-Testing

Name of Equipment	Producer Name and Adress	Purchase-Price ÖS	
Industrie-Röntgeneinheit "Eresco" 160 kV/5 mA Eresco Directional Radiating Unit 160 kV/5 mA and Eresco Directional Radiating Unit 240 kV/5 mA	Rich. Seifert & Co Röntgenwerke *) Bogenstraße 41 D-2070 Ahrensburg	181.000,- (1965)	
Gammaradiographie-Anlage "Gammamat TI" Gamma-Radiographic Equipment "Gammamat TI"	Sauerwein GmbH *) Postfach 150088 D-4000 Düsseldorf 1	70.900,- (1974)	40 Ci Ir 192
Gammaradiographiegerät "Teletron SU 100 A" Gamma-Radiographic Equipment "Teletron SU 100 A"	Nuclear GmbH Florastraße 16 D-4000 Düsseldorf 1	86.900,- (1976)	100 Ci Ir 192
Dosisleistungswarngerät "Gammatest 1" Dose Rate Alarm "Gammatest 1"	Graetz Vertriebsgesell-schaft mbH *) Postfach 294 D-5990 Altena 1		
Dosisleistungsmeßgerät "X 50 B" Dose Rate Meter "X 50 B"	Graetz *)	15.100,- (1978)	
Dosisleistungsmeßgerät "EMB 3" Dose Rate Meter "EMB 3"	Landis & Gyr Breitenfurter Straße 148 a 1230 Wien	15.100,- (1978)	
Digital-Wanddickemeßgerät "DM 1" und "DM 2" Ultrasonic Wall Thickness Gauge "DM 1" and "DM 2"	Krautkrämer GmbH *) Luxemburger Straße 449 D-5000 Köln/Klettenberg	46.700,- (1978)	
Ultraschallgerät "USM 2" Ultrasonic Flaw Detector "USM 2	Krautkrämer GmbH *)	63.000,- (1974)	
~~Impulsschallgerät "USIP 10"~~ Ultrasonic Flaw Detector "USIP 10"	Krautkrämer GmbH *)	128.100,- (1959)	
Statiflux for Nondestructive Electrified Inspection	Magnaflux Corporation 7300 West Lawrence Avenue Chicago 31, Illinois	3.700,- (1971)	
Handmagnetflux-Gerät Minchom Sempun Flaw Detector	R.P.R. Patents LTD. Alexandra Palace Station London 10	8.000,- (1958)	
Härteprüfgerät "Equotip" Hardness Tester "Equotip"	Proceg SA Riesenbachstraße 57 CH-8034 Zürich Switzerland	29.700,- (1979)	
Tragbares magnet.-elektr. Rißprüfgerät Tiede "TWM 42" Magneto-electric Crack Tester Tiede "TWM 42"	Tiede KG Bahnhofstraße 96 D-7081 Essingen	29.000,- (1974)	

*) Vendor for Austria: Mittli KG

Hegergasse 7
1030 Wien

CHEMIE LINZ AG

RADIOGRAPHIC EXAMINATION RECORD No.

Plant:

Medium:

Unit:

Operating pressure: bar

Project No:

Operating temperature: ^{o}C

Drawing No:

Cons. No.	Identification of film	Diagnosis *)															Weld thickness	Welder	Result		
		A			B				C	D			E		F	FF			within code	not within code	Notes to
		Aa	Ab	Ac	Ba	Bb	Bd	Bf		D	Da	Db	Ea	Eb							

X-ray tube voltage:
Current:
Isotope:
Intensity:
Format of film:
Focus length:
Exposure time (dose):
X-ray film:
Screen:

Material:
Wall thickness:
Welding process:
Shape of seam:
Electrode:
Joint efficiency:
Rating:
Evaluation:
Nominal diameter:
Nominal pressure:
Temperature:

Diagnosis: *)
A -gas inclusions
Aa -pores
Ab -pores funnel shaped
Ac -nest of pores
B -slags
Ba -slags of different forms
Bb -scale rokes
Bd -slags or scale due to bad grinding cut
Bf -slags in a weld crosing
C -binding defects
D -root defects
Da -hollow section in the root
Db -grooves at the edge of the root
E -cracks
Ea -longitudinal cracks
Eb -circumferential cracks
F -grooves
FF -film defects

Welding defects *)
• slight
∘ medium
○ significant
× must be repaired
+ within code

Date:	Acceptance by NDT-department:	Acceptance:

CHEMIE LINZ AG	INSPECTION CERTIFICATE Ultrasonic testing of welding seams	Factory order:
		Examination order:
		Construction:
Sketch (cross section)	Testing device:	Division:
	probe: Cycles: MHz	Testpiece:
	Quality: Electrode:	Drawing:
	Heat treatment:	Inspection by:
	Form of weld: Thickness: mm	Examinations required:
	Side of testing:	
seam	Welder:	

	Result:	Inspector:
	Date: Examiner:	

CHEMIE LINZ AG

Factory order No. ____________________

Suborder No. ____________________

EXAMINATION RECORD No. [ ] Page ____ of ____

Project: ____________________ Component: ____________________

Manufacturer: ____________________ Farication No· ____________________

____________________ Drawing No: ____________________

Fort of construction: ____________________

Welding procedure: __________ Weld No.: ____________________

NDT-procedure: __________ Specification: __________ Part No.: __________

material: __________ Sheet No: __________ Heat No.: __________

thickness: __________ Block No: __________ Modell No.: __________

Examinations:

LIQUID PENETRANT EXAMINATION:	Magnetpulverprüfung	Ultraschallprüfung
Test specification:	Prüfvorschrift	Prüfvorschrift
Surface condition:	Oberfläche	Oberfläche
Penetrant:	Gerät	Gerät
Cleaner:	Magnetisierung Prüfverfahren	Prüfkopf Frequenz
Develope:	Stromstärke Amperewindungen	Prüfumfang
Penetration time:	Magnetisierungsdauer	Anzeigeempfindlichkeit Maßstab mm
Developing time:	Pulver Suspension	Ankoppelung
	Feldstärke Polabstand	Dämpfung

Result: no diagnosis: O within code: O not within code: O

Remarks:

date:

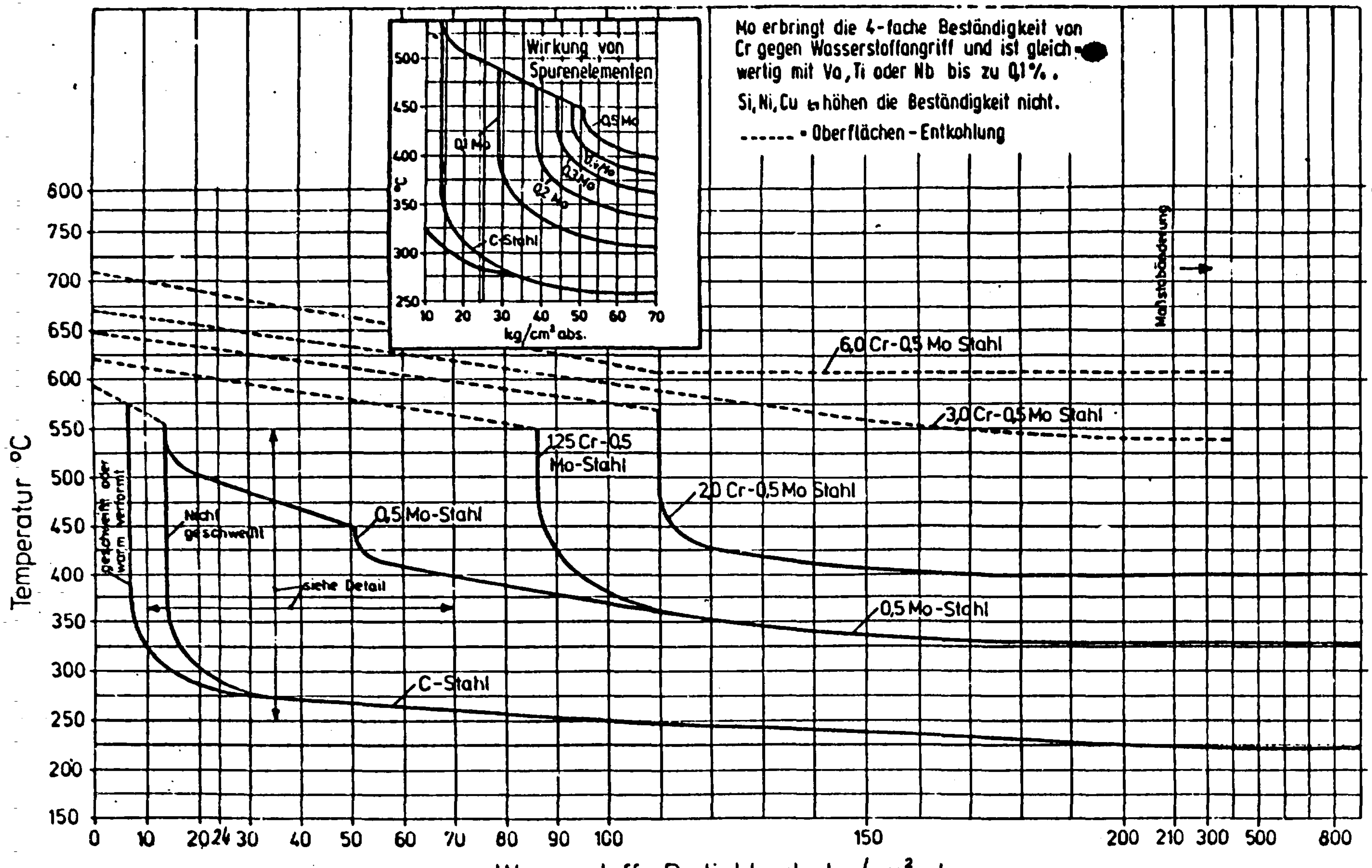
FRIEDRICH UHDE GMBH

Behälter
Anwendungsgrenzen für Stähle bei Betrieb mit Wasserstoff

UN 20-20

Blatt: 2 von: 2

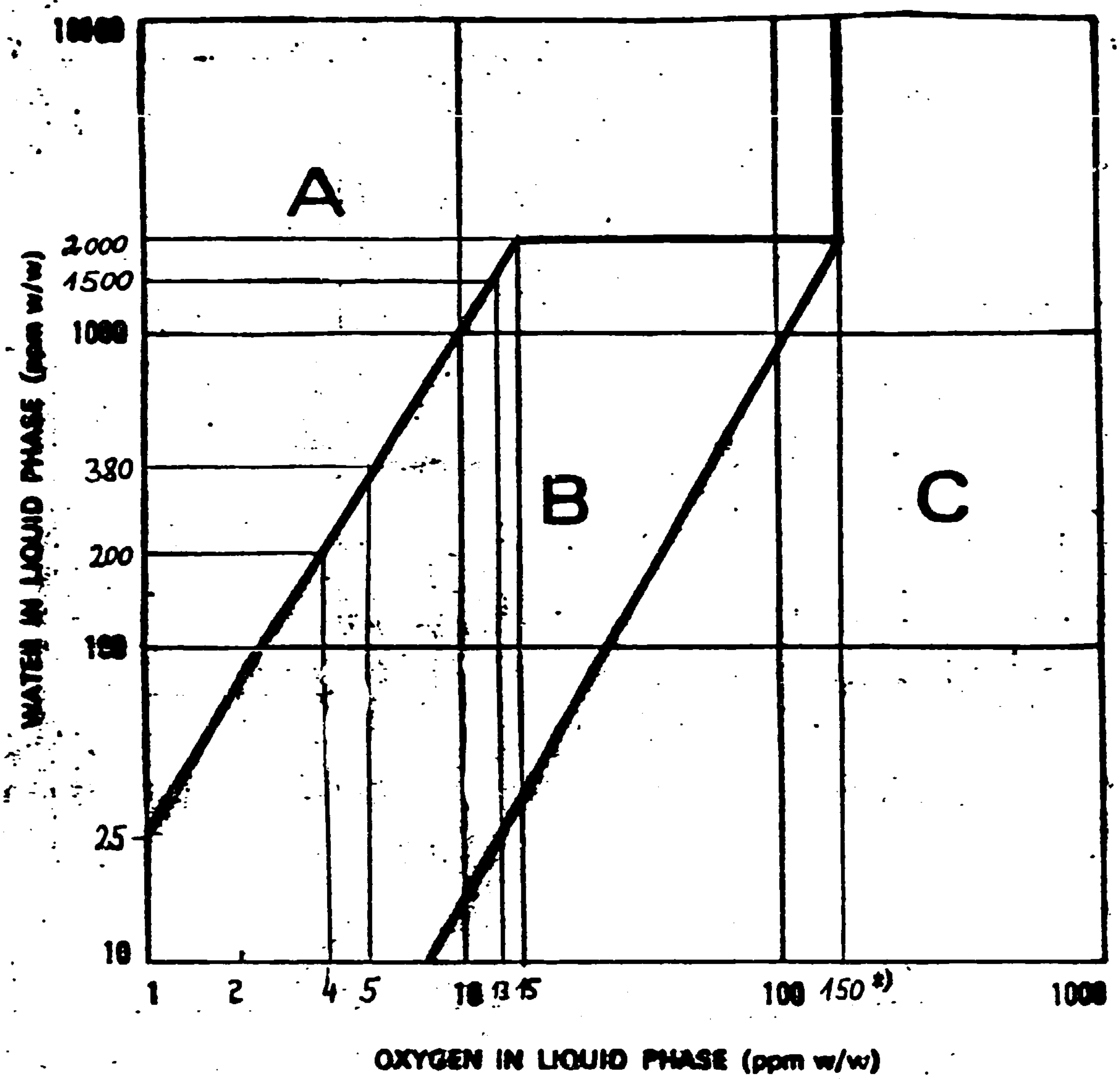
Ausgabe 2.69



Bemerkungen: 1.) Als Temperatur ist die maximale Arbeitstemperatur +30 °C einzusetzen.
2.) Rostfreie austenitische Stähle sind für alle gezeigten Drücke und Temp. beständig.
3.) Bei plattierten Blechen ist auch der Grundwerkstoff entsprechend dieser Kurven auszulegen.

Quellenangabe: NELSON-Kurve aus Hydrocarbon Processing May 1965

Figure 1



A Low risk of stress corrosion cracking

B Significant risk of stress corrosion cracking

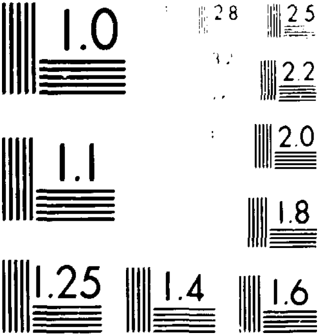
C Do not operate in this area.

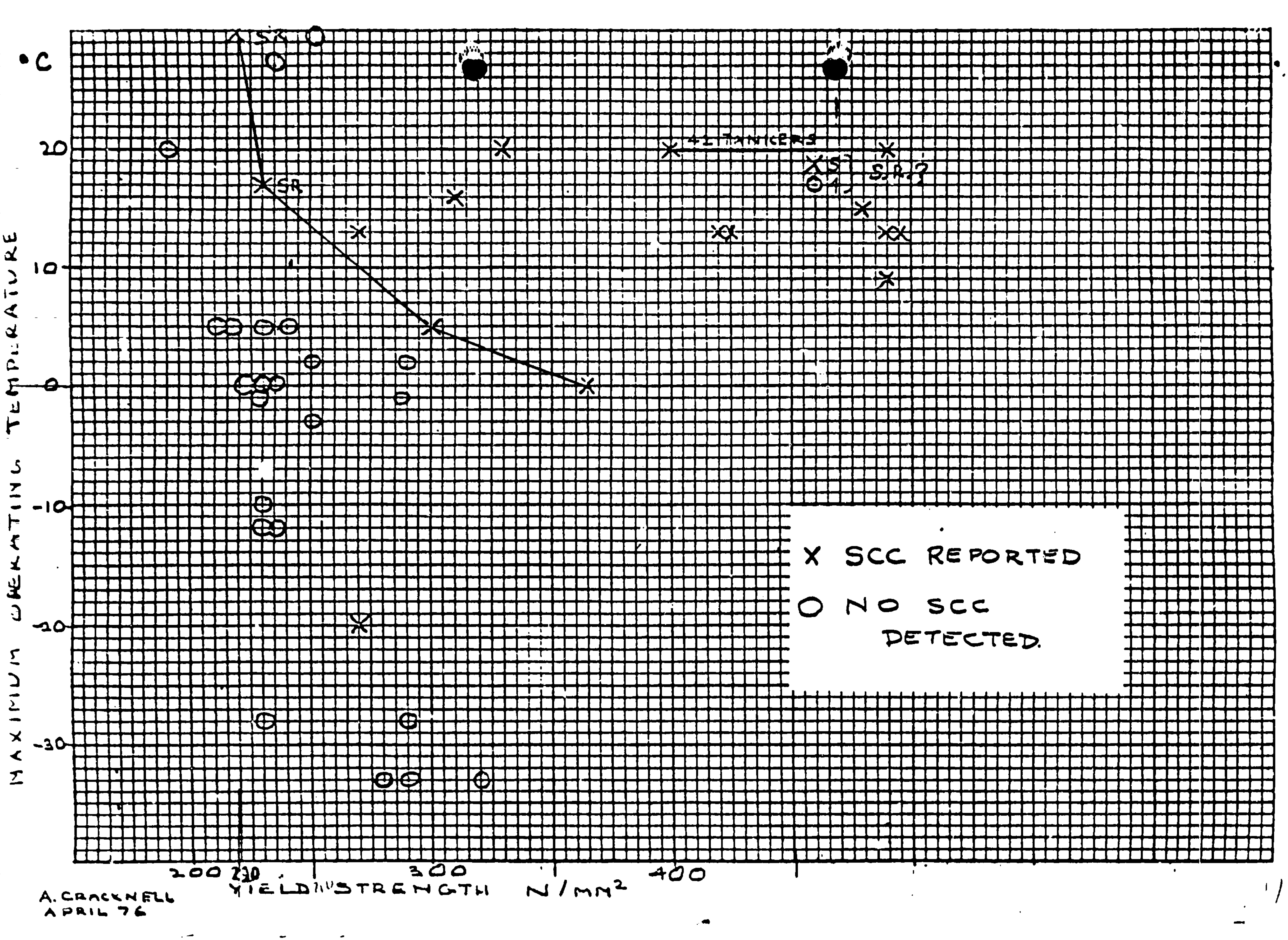
Either reduce oxygen level or add water 1) to bring operating conditions into Zone A or B.

---

1) When water is added deliberately it should either be distilled water, or plant condensate of equivalent quality.

*) durch TMP ergänzt


1.0
2.8
2.5
2.2
2.0
1.1
1.8
1.25
1.4
1.6


°C
MAXIMUM OPERATING TEMPERATURE
20
10
0
-10
-20
-30
200
210
300
400
YIELD STRENGTH N/MM²
SR
42 TANKERS
S.R.?
X SCC REPORTED
O NO SCC DETECTED.
A. CRACKNELL
APRIL 76

BALANCING AND MEASURING VIBRATION

1. Balancing

1.1. Introduction

Unbalanced centrifugal forces and momentums are not wanted for:

- high dynamic bearing forces -- reduce of useful life
- vibrations -- fatigue-breakings
- reduction of friction
- reduction the value of produce (employment)
- noisy machines
- influence to personnel

Balancing is the process of attempting to improve the mass distrubution of a body so that it rotates in its bearings without unbalanced centrifugal forces.

1.2. Measuring of unbalance

Unbalance is a vetor therefore the amount and the angle of unbalanced must be measured.

1.2.1. Centrifugal balancing machines: (a balancing machine that provides for the support and rotation of a rotor and for the measurement of once per revolution vibratory forces of motions due to unbalance in the rotor)

a) Soft bearing (above resonance) balancing machine
(having an operating speed above the natural frequency of the suspension-and-rotor system)
-Resonance balancing machine: a balancing machine having an operating speed at the natural frequency of the suspension-and-rotor system.

BROCHURES AND LEAFLETS HANDED OVER BY "TEL"

Are magnetic currents destroying your machinery?

Hydrocarbon Processing
April 1979

Pipe Vibration and Pressure Detection

Brüel & Kjahr

Acoustic noise measurements, vibration and shock measurement - list of standards in different countries.

Static and Dynamic Balancing - application notes

Brüel & Kjahr

Vibration Signature Analysis - Techniques and Instrument Systems

Brüel & Kjahr

Variable Speed Drives

Siemens

Inverter - Controlled A.C. Motordriver

Elin

System-based Drive Technology

Siemens

-Compensating (null force) balancing machine: a balancing machine with a built-in calibrated force system with counteracts the unbalanced forces in the rotor.

-Direct reading balancing machine: a balancing machine which indicates the unbalance directly.

b) Hard bearing (below resonance) balancing machine: a balancing machine having an operation speed below the natural frequency of the suspension and rotor system. It is to use dynamometer and to use very rigid foundation and construction of the machine.

c) Field balancing: The process of balancing a rotor in its own bearings and supporting structure whith full rotation. Measure are given with field balancing equipment.
Under such conditions the information required to perform balancing is derived from measurements of vibratory forces or motions of the supporting structure and/or measurements of other responses to rotor unbalance.

1.2.2. Indicating systems

- Wattmetric indicating system
- Voltmetric indicating system with phase-sensitive rectifier
- Voltmetric system with stroboscope and filter
- Voltmetric indicating system with marking of ungular position on the rotor itself
- Compensator with mechanical or electric indication

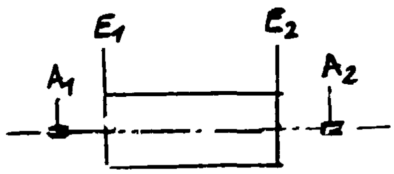
1.2.3. Motion transducer

- piezzo-motion transducer: measure voltage is proportional of the acceleration
- electrodynamic-motion transducer: measure voltage is proportional of the velocity.
- inductiv- motion transducer: measure voltage is proportional of the displacement.

1.3. Balancing proceeding

1.3.1. Static balancing: (is a condition of unbalance for which the central principal axis is displaced only parallel to the shaft axis)
For disk-shaped rotors the use of only one correction plane may be sufficient, provided the bearing distance is sufficiently large and the disk rotates with sufficiently small axial run-out. Single plane balancing can be done on a pair of knife edges without rotation of the rotor (gravitational - non rotating - balancing machine) but is now more usually done on centrifugal balancing machines.

1.3.2. Dynamic balancing: (is a condition in which the central principal axis is not coincident with the shaft axis)



$E_{1,2}$ ... Correction plane

$A_{1,2}$ ... Measuring plane

1. Run: is a run with the original unbalance. Measuring the vectors.

$\overrightarrow{V_{1,0}}$ and $\overrightarrow{V_{2,0}}$

./4

2. Run: a known trial mass (m_1) is mounted in plane E_1. Measuring the vectors $V_{1,1}$ and $V_{2,1}$. Remove the trial mass and note the position with 0°.

3. Run: a known trial mass (m_2) is mounted in plane E_2. Measuring the vectors $V_{1,2}$ and $V_{2,2}$. Remove the trial mass and note the position with 0° too.

Evaluation

Graphic evaluation: it is used rare because it is protraced and fallible.

- Numerical evaluation: equations see at "Static and Dynamic Balancing". It's calculating by programable calculating machine in the best way.

1.4. Balance Quality of Rotating Rigid Bodies

Even after balancing, the rotor will possess residual unbalance. By means of the measuring equipment available today unbalance may now be reducded to rather low limits. However, it would be uneconomically to exaggerate the quality requirements. To what extent the unbalance must be reduced, and where the optimal economic and technical compromise on balance quality has to be struck, can, in individual cases, be correctly determined only by extensive measurement in the laboratory or in the field.
General we can say:

The residual unbalance force: $P = m.r.w^2$ m = unbalance mass

Acceptability limit: $P = G/10$ G = rotor weight

./5

It follows: $m \approx 10 \cdot \frac{G}{r.n^2}$ m(kg); G(N); r(m); N(min $^{-1}$)

For example: G = 100 kg

$r = 100$ mm $\quad m \approx 10 \cdot \frac{1000}{0,1.6000^2} \quad 3.10^{-3}$ kg = 3g

$n = 6000$ min^{-1}

Terms of reference are given by VDI 2060:

On the basis of section 1.4. balance quality grades have been established which permit classification of the quality requirements. Each quality grade Q comprises a range of permissible residual unbalances (e.w.). See figure 1.

The quality grade Q equivalent to the centre of gravity-velocity. The centre of gravity-displacement is given by:

$e = \frac{Q}{w}$ Q (mm/s); w (s^{-1}); e (mm)

The permissible residual unbalance:

$m = \frac{e.G}{r}$ m(g); e (mm); G (kg); r(m)

For example: G = 100 kg

r = 100 mm $\qquad$ e = 0,004 mm

n = 6000 min^{-1}

Q = 2,5 $\qquad$ m = 4 g

In general, for rigit rotors with two correction planes, one-half of the recommended residual unbalance is to be taken for each plane. For disk-shaped rotors the full recommended value holds for one plane.

./6

2. Measuring Vibration

2.1. Introduction

High vibrationsare not wanted at the arguments like 1.1.

2.2 Hints for Measuring

It's possible to measure displacement, velocity or acceleration.

For evaluate

$$(s;\ v = \frac{ds}{dt}\ ;\ a = \frac{d^2 s}{dt^2})$$

the vibration it's best to measure the rms-value of vibration velocity v_{rms}.

$$V_{rms} = \sqrt[2]{\frac{1}{T} \int_0^T V^2 (t)\ dt}$$

The vibration severity of a machine is to be measured at operational speed. For variable-speed machines the measurements should be made at many speeds in order to locate the resonance frequencies which may possibly occure.

The machine support may significantly affect the vibraticn levels measured on the machine. During testing the machine should be either mounted on its operational foundation or - in case it is a small assembly - soft mounted respr. suspended on springs.

Test should be made preferably in x, y, z directions (choose the bearings of the machine)

2.3 Evaluation Standards:

Comparing the measured values with the limit values specified in the Recommendations, will permit an estimation of the severity of vibration to be carried out readily.

A machine may be qualified according to the examples of Quality Judgement (see "Vibration Signature Analysis-Techniques and Instrument Systems"). At first the tested machine has to be classified according to one of the six specified machine classes. Subsequently the limit values for the quality groups "good", "allowable", "just tolerable" and "not permissible", can be taken from the appropriate table. By comparing the measured vibration severity with these limit values an easy evaluation of the vibratory state can be made. Up to now, Examples of Quality Judgement have been established by the International Standard Organization VDI 2056 for the Machine Classes K to T. The machines in Classes D and S vary considerably in their vibration characteristics and for this reason a classification in the same manner as with the first four classes has not yet been possible. For further explanations refer to the detailed description of the proposed VDI 2056, ISO 2372, BS 4675.

Specifying of Machine Classes

Class K: Individual parts of engines and machines, integrally connected with the complete machine in its normal operating condition (production electrical motors of up to 15 kW are typical of machines in this category).

Class M: Medium-sized machines (typically electrical motors with 17 to 75 kW output) without special foundations; rigidy mounted engines or machines (up to 300 kW) on special foundations.

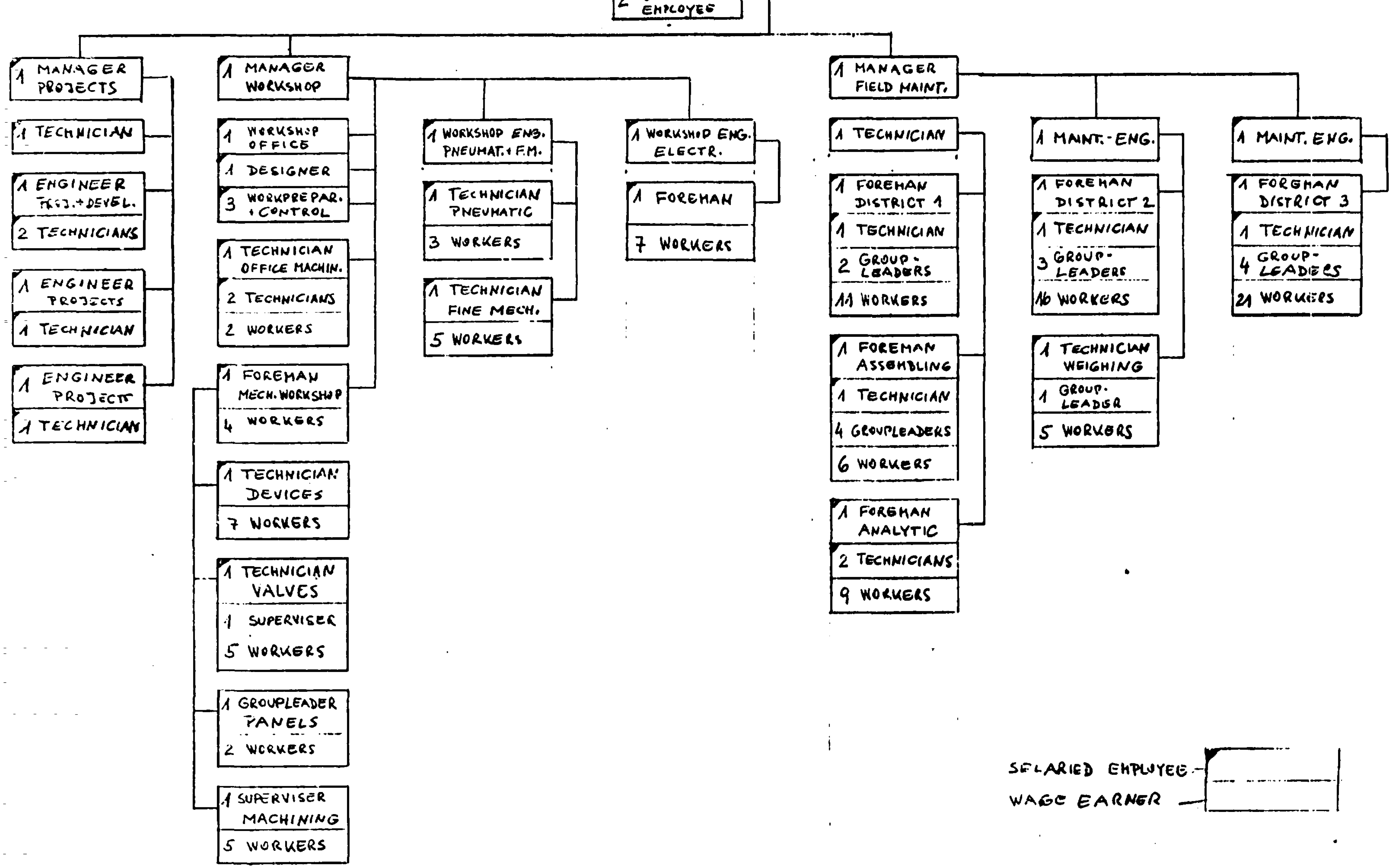
Class G: Largeprime movers and other larger machines with rotating mass mounted in rigid and heavy foundations which are relatively stiff in the direction of vibration measurement.

Class T: Large prime movers and other large machines with rotating mass mounted on foundations which are relatively soft in the direction of vibration measurement (for example, turbogenerator sets, especially those with lightweight substructures)

Class D: Machines and mechanical drive systems with unbalanceable inertia effects (say, due to reciprocating parts), mounted on foundations which are relatively stiff in the direction of vibration measurement.

Class S: Machines and mechanical drice systems with unbalanceable intertia effects (say, due to reciprocating parts), mounted on foundations, which are relatively soft in the direction of vibration measurement; machines with rotating slack-coupled masses such as beater shafts in grinding mills; machines, like centrifugal machines, with varying unbalances capable of operating as selfcontained units without connecting components; vibrating screen, dynamic fatique-testing machines and vibrationexciter used in processing plants.

ORGANISATION TME
(INSTRUMENT DEPARTMENT)



Some leaflets and brochures were handed over to the participants:

- Analysis in Single-train plant
  (methods, gas preparation process, suppliers of appliances)
- Methods for measurement, types of appliances, vendors for flow measurement of sulphuric, phosphoric and nitric acid, as well as slurry in NPK-plants
- vendors of 7-staged pneumatic cables.

Leaflet

"Subsynchronous current directing cascade (cascade converter)"

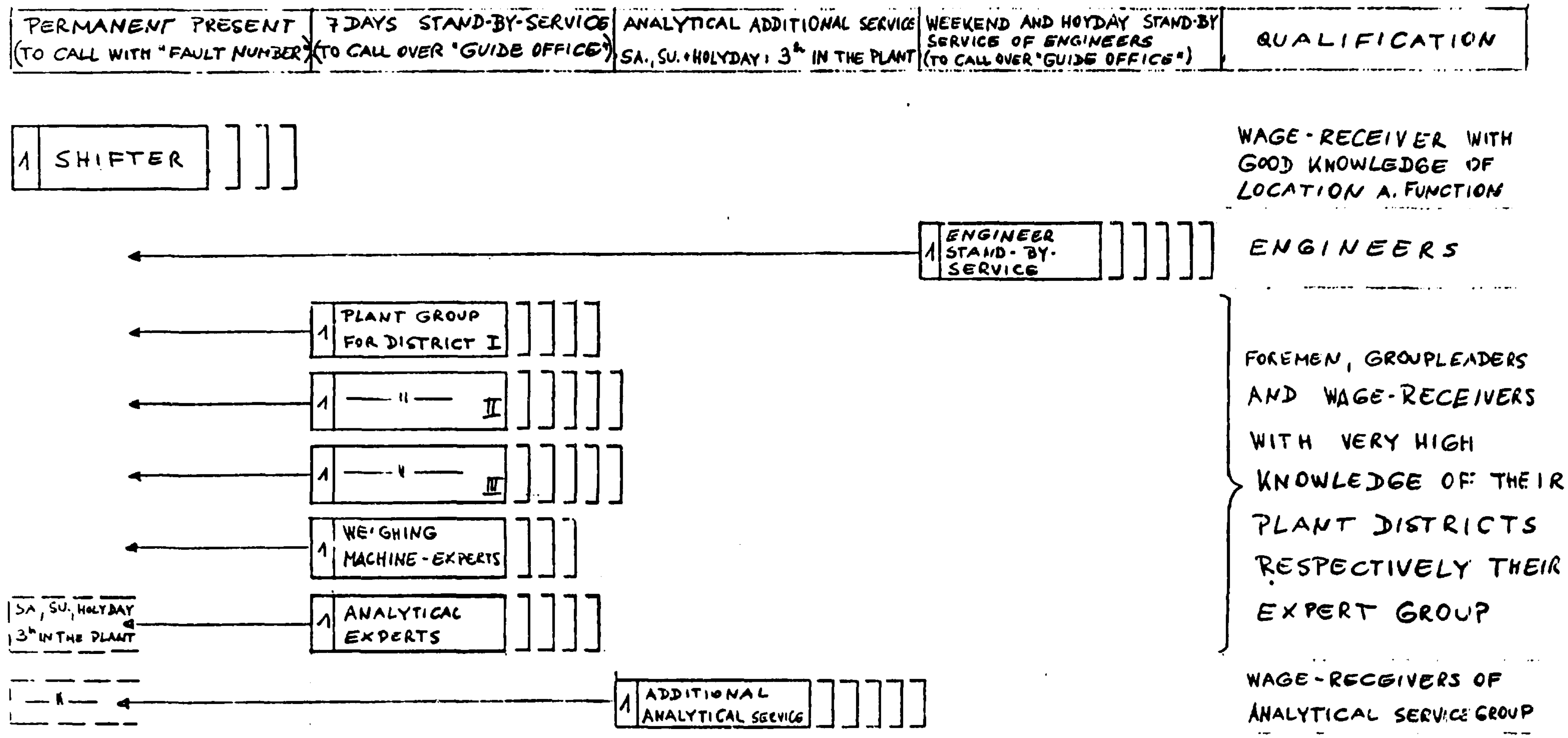
handed over to the participants.

chemserv
CONSULTING GES.M.B.H.

Empfanger | Unser Zeichen*) | Blatt | Tag

Several drawings of electrical circuits of Single-train plant handed over to the participants.

TME - SHIFT - AND STAND - BY - SERVICE



SHIFTERS ARE CHANGED YEARLY AND PARTICULARY INFORMED BEFOR SERVICE IN SHIFT.
CHANGE OF STAND-BY-SERVICE AT TUESDAY, 6h; SCHEDULE FOR 6 WEEKS IN ADVANCE
INFORMATION FROM "GUIDE-OFFICE": PER TELEPHONE, WIRELESS, TAXI

STUDY VISIT TO TRAINING INSTITUTE OF CHEMIE LINZ AG
==

- Structure of vocational schools in Austria with special attention given to training programmes of Chemie Linz for

  - fitters
  - locksmiths
  - welders
  - machinists
  - tool makers
  - electricians
  - electrical mechanics

- Job rotation from training institution to rep[illegible] and into the diverse plants.

Visit to all workshop sections of the training institute.

INDUSTRIAL MAINTENANCE AND COST ACCOUNTING

Why do you need detailed maintenance-cost information?

There are a lot of decisions to be made, for example:

- Which kind (type) of machine or which materials should be used in a new plant?
- How many spare parts should be bought?
- Should maintenance-works be performed by your own work-shop or should you buy it out (using foreign services)?
- Should an old machine (plant) be repaired or replaced by a new one?
- Should you limit or stop production because of a bad price-cost-ratio?

For accounting and planning you need some information, for example:

- In the case of valuation of semi-finished and finished goods you need the production cost (including maintenance cost) per unit.
- In a business planning with detailed budgets you should forecast maintenance cost for each cost center.
- Maintenance planning is not only necessary for budget but to plan capacity usage of own workshops and to look for available foreign services you plan to use.

./2

What kind of information cost-accounting can supply with?

At Chemie Linz AG we get monthly:

* information about maintenance-cost
  - in total
  - per plant (cost center)
  - per work order (with all details)

* information about own workshops in a cost distribution summary with all cost details

* information about cost differences (actual cost - budget) per cost center and per cost group.

The more detailed and the more actual you want these information the higher your information-cost will be.

But cost-accounting will never be able to supply you with the whole information you need to make decisions because it is not enough to know the acual cost. (It is necessary to look forward by using also values of past experiences.)

Enclosure: Maintenance-cost and cost of own workshops at Chemie Linz AG

1. Own workshops-rates per hour (calculation)
2. Way from job-order to cost distribution summary
3. Maintenance cost-budget per cost center

Enclosure 1

Own workshops-rates per hour (calculation)

Each workshop has an individual rate per hour. The calculation of these rates is estimated in advance (according to the year's budget) and adjusted at year-end to actual cost.

The calculated rate per hour is including the cost for
the hour of men (direct cost)
and the indirect cost for men:

machinery
energy
fringe benefits
auxiliary material
depreciation and interest

The following pages show a cost distribution summary of a workshop and the cost details, we give monthly to each workshop-manager.

Betriebsabrechnungsbogen

Cost distribution summary								Actual cost	Budget	Differences
Cost center		HOLZWERKSTATT								
		*) Nachweis liegt bei FKR auf	Nachweis	OKTOBER	NOVEMBER	DEZEMBER	PER DEZEMBER	PER VORSCHAU	ABWEICHUNG	+ -
Quantity: Cooling water	005	Nutzwasser m³	101*							+
Treated water	006	KEWA, KOWA, vollentsalztes Wasser m³	101*							+
Steam	007	Dampf t	101*							+
	008	Strom 6 kV kWh	101*							+
Electric power	009	Strom 500 V und 380 V kWh	101*	12.423	12.599	12.639	142.990	145.000	2.010	-
Gas	010	Heizgas, Heizöl, Heißwasser Mio Wc	101*							+
Compressed air	011	Druckluft, Instrumentenluft m³	101*	25.000	25.000	25.000	300.000	300.000		+
Effective working days of workers	012	Anwesenheitstage	110*	323	290	251	3.068	3.090	22	-
Extra hours of workers	013	Überstunden h	110*				216	20	196	+
	014									+
Cost groups: Wages	115	Monatslohn + Zulagen	110*	199.742	201.729	203.166	2.361.337	2.524.000	162.603	-
Extra hours of workers	116	Überstundenvergütung	110*			258	43.351	2.000	41.351	+
Supplementary costs to wages	117	Lohnnebenkosten	-	113.452	114.696	82.548	1.332.865	1.435.000	102.135	-
Salaries	118	Gehälter	121*	63.553	63.632	63.630	720.792	670.000	50.792	+
Supplementary costs to salaries	119	Gehaltsnebenkosten	-	35.208	35.252	37.372	401.938	371.000	30.933	+
		Personalkosten	-	411.956	415.509	387.474	4.860.283	5.002.000	141.717	-
Cooling water	221	Nutzwasser	101*							+
Treated water	222	KEWA, KOWA, vollentsalztes Wasser	101*							+
Steam	223	Dampf	101*							+
	224	Strom 6 kV	101*							+
Electric power	225	Strom 500 V und 380 V	101*	6.498	6.590	6.637	74.788	76.000	1.212	-
Gas	226	Heizgas, Heizöl, Heißwasser	101*							+
Compressed air	227	Druckluft, Instrumentenluft	101*	1.675	1.675	1.675	20.100	20.000	100	+
		Energiekosten	-	8.173	8.265	8.312	94.888	96.000	1.112	-
Maintenance	328	Instandhaltung	170	6.711	12.220	10.441	87.947	153.000	65.053	-
Other internal services	331	Sonstige innerbetriebliche Leistungen	143	12.083	12.083	12.083	144.996	145.000	4	-
Auxiliary material	432	Betriebsmaterial (ab Lager und Direktbezug)	133	3.672	1.223	980	24.397	25.000	603	-
	433	Betriebsmaterial aus Eigenerzeugung	143				75	2.000	1.925	-
Overheads for material	434	Materialgemeinkosten	•	417	417	417	5.004	5.000	4	+
		Betriebsmaterialkosten	-	4.089	1.640	1.397	29.476	32.000	2.524	-
Travel expenses	635	Reisekosten	143							+
Carriage, customs duties	636	Fracht, Zoll- und Transportkosten	143							+
	637	Fahrbetrieb (Lkw und Pkw)	143							+
Internal railway	638	Schleppbahnbetr. (Rangierung, Waggonleihe)	143							+
Other internal transportation	639	Karrendienst, Transportbetrieb und Kran	143	2.974	7.454	6.659	68.220	110.000	41.780	-
		Verkehrskosten	-	2.974	7.454	6.659	68.220	110.000	41.780	-
Other foreign services	641	Verschiedene Fremdleistungen	143							+
Overheads for chemical and technical plant management	642	Betriebsleitung	•	4.917	4.917	4.917	59.004	88.000	28.996	-
laboratory	643	Betriebslabor- und Analysenkosten	143							+
	I	DIREKT BEEINFLUSSBARE KOSTEN	-	450.903	462.088	431.283	5.344.814	5.626.000	281.186	-
Depreciation	744	Abschreibungen	•	4.860	4.860	4.360	58.320	59.000	680	-
Taxes and insurance	746	Steuern, Versicherungen, Beiträge	143	667	667	68	7.405	9.000	1.595	-
General services	849	Werksallgemeine Kosten	-	41.417	41.417	41.417	497.004	497.000	4	+
Total cost	II	GESAMTKOSTEN	-	497.847	509.032	477.628	5.907.543	6.191.000	283.457	-
	950	Gutschriften für Lieferungen u. Leistungen	143							+
Credits for allocations and services	951	Gutschriften aus Leistungsabrechnungen	143	595.437-	546.367-	506.844-	5.887.615-	6.191.000-	303.385	-
	952	Kostenumlage und Kostenüberträge	•							+
Differences between allocations and real costs	953	Kosten-Über- (+) bzw. -Unterdeckung (-)	-	97.590	37.335	29.216	19.928-		19.928	+
	954	Leistung auf Kostenträger	-							+
Output and some other dates: Output (units)	955	Leistung	-	2.344	2.151	1.995	23.179	24.400	1.221	-
(Unit price)	956	Fertigungskosten je Einheit	-	212	237	232	255	254	1	+
Number of workers		Ø Anzahl der Arbeiter		15	15	15	15	16	1	-
Average day's wages	957	Ø Lohn pro Anwesenheitstag	-	618	696	809	770	817	47	-
Number of employees	958	Ø Anzahl der Angestellten	-	3	3	3	3	3		
Average salary per month	959	Ø Gehalt		21.184	21.211	21.210	20.022	18.511	1.611	

BC040BC0230A04*********************BC040BC0230A04************************BC040BC0230A04************************BC040BC02

INSTANDHALTUNG-KOSTENSTELLE 0923 HOLZWERKSTATT NACHWEIS 170 CL 80
****

POS	HPT-AUFT	DAT.	W/A NR BELEG	KA	AUSF KOST	W-A	KOST ART	TEXT	Hours Quantity STUNDEN MENGE	Manufacturing cost FERTIGUNGS KOSTEN	Material MATERIAL KOSTEN	Foreign services FREMD LEISTUNG	Total GESAMT
000	0000	8312	600009	01			434	MATGEM	4,000.00	333			
000	0000	8312	600010	01			328	VERT DAUERAUFTR	29,000.00	2,417			
								LFD		2,750			2,750
								VORTRAG		30,250			30,250
								PER		33,000			33,000
		Year			Cost center of the workshop			Ordered job ...					
000	0101	Month		98	0922	0501		REP TISCHLEREI					
000	0101	8312		77	0922	0501		LFD MONAT	3.50	949		6,742	
	Number of job order							Current month					
								LFD	3.50	949		6,742	7,691
								VORTRAG Cost carried forward	142.30	39,246	299	7,711	47,256
								PER Total (since start of job)	145.80	40,195	299	14,453	54,947

BC040BC0230A04*********************BC040BC0230A04************************BC040BC0230A04************************BC040BC0230A04*

KOSTENZUSAMMENSTELLUNG 0923 HOLZWERKSTATT NACHWEIS 170 CL 80 12
****

	STUNDEN MENGE	FERTIGUNGS KOSTEN	MATERIAL KOSTEN	FREMD LEISTUNG	GESAMT
KOSTENTRAEGER 5 LFD	3.50	1,282		6,742	8,024
KOSTENTRAEGER 8 LFD					
WERKSALL.DAUER. LFD		2,417			2,417
G E S A M T LFD	3.50	3,699		6,742	10,441

Details to cost group: Maintenance (328)

K.STELLE 0023 CL 80 12

NACHWEIS 133 ZUM BAD/BOGEN

POS	BELEG	S-KTO/GR	TEXT (Kind of material)	MENGE E (Quantity)	WERT (Cost)
	101005	32210 13	TOPPSCHRO.5X.25	100 8	32
	021058	32210 13	HBOHRSCHRBSPX40	400 8	76
	021058	32210 13	SFKHOSCHRB6PX25	400 8	28
	101005	32210 13	SFKHOSCHRB35X15	400 8	20
	021058	32210 13	SFKHOSCHRB31X10	200 8	9
	101005	32210 13	6KTMUTTER....M.5	400 8	24
	101005	32210 13	BAUSTIFT.25X.60	5 1	49
		13			236S
	013016	32210 16	PUTZLAPPEN GL.	10 1	120
		16			120S
	021057	32210 17	SPIPALBOHRER.25	3 8	14
	021057	32210 17	SPIPALBOHRER.2.	5 8	20
	021057	32210 17	HARTMETBOHR.IC.	2 8	96
	021057	32210 17	HARTMETBOHR.P..	4 8	140
	021057	32210 17	SAEGEBL300X13	10 8	146
		17			416S
	013016	32210 33	OELFARBE.WEISSI	1 1	26
	013016	32210 33	MASCHINENLACK.5	1 1	37
		33			63S
	365027	32210 93	GUMMISCHUERZE..	1 8	145
		93			145S
			GESAMT		[illegible]

(Mat. from store)/ - LAGERMATERIAL 980

(Direct mat.) - FREMDLEISTUNG

Details to cost group:

Auxiliary material (432)

K.STELLE 0023 CL 80 12

NACHWEIS 143 ZUM BAD-BOGEN

POS	KA	BELEG	KTG	K/ART	S/KTO	TEXT	WERT (Cost)
	01	630033	2	331		MIETE B 22	12,083
				331			12,083S
	01	600028	2	539		01 LKW ARB STD	976
	01	600029	2	539		03 ANH STD	210
	01	600030	2	539		04 ARB STD	2,657
	01	600037	2	539		00 ARB STD	2,816
				539			6,659S
	01	1746		746		AUFL VERS STEUE	599-
	01	1746		746		KALK STEUERN	500
	01	2746		746			167
				746			[illegible]S
	01	ES		951		GUT-PLOHN 323	15,698-
	01	FB		951		GUT-PLOHN 328	491,146-
				951			506,844H
				GESAMT			488,034H

Details to cost groups:

Other internal services (331)

Transports (539)

Taxes, insurances (746)

Credits (951)

Enclosure 2

Way from job-order to cost distribution summary

The following example shows the way from ordering a job (f. maintenance) to the final amount of maintenance cost in the cost distribution summary of the ordering cost center.

It is including:

- job-order
- material requisition form
- material issue analysis sheet
- time record sheet
- cost of the job-order
- maintenance cost of ordering cost center
- summary of maintenance cost of ordering cost center

Job order

Werksauftrag — Über ausführenden Betrieb an Kontierung

Apparatenummer	Schätzwert	Auftrag Nr.	Kostenträger order for cost accounting				Termin JJ MM TT
		0 1 0 0	51201	000	0100	-	
8 – 13	18 – 27	28 – 31	32 – 43				44 – 46

An ATP — number and title of job-order → Reparatur Monsanto 607 610 611

Bezeichnung der Leistung

DAUERAUFTRAG

Durchführung von Reparaturarbeiten an der Monsanto-Anlage in den Bauten 607, 610 und 611.

Nach Fertigstellung Verständigung an: Hausruf: Rückfragen sind zu richten an H. Offenzeller Hausruf 2425

Arbeit begonnen	Vermerke der ausführenden Stelle	Tag 1974 12 05
Arbeit beendet	performing cost center (workshop) / ordering department	Aussteller ATP/ma
Kostenst.-Nr. (Stamp.) u. Unterschr. 1316		Abteilungsleiter — Stempel und Unterschrift

Material requisition form (from store)

Materialentnahmeschein — Abzuliefern bei Haltepunkt 608 — Liefertermin:

Lager-Nr.	Kartei-vermerke	Auftrag-Nr.	Projekt-Nr.	Bezeichnung (ev. Kostenträger)	Best. Menge	Einheit	Ausgefolgte Menge	E
3		4		5 *)			6	7
130a171		0100		Schrauben M20 x 70	60	8	60	8
130a138		0100		— M16 x 65	100	8	100	8
130a137		0100		— M16 x 60	200	8	200	8

E: 0=st, 1=kg, 2=100 g, 3=m, 4=m², 5=m³, 6=Liter, 7=cm³, 8=SL, 9=100 SL

number of job-order

Kostenstelle	Aussteller	Ruf-Nr.	Tag	Abteilungsleiter	Material übernommen	Lagerkto.	Ausgabe Tag und Beleg-Nr.
1							2
1316	[illegible]	1484	80 11 19	ATP Werkstatt [illegible]		21	191060

Bei Entnahme von Lager zu Lager hier 2stelliges Lagerkonto des empfangenden Lagers eintragen! — X-Loch über Spalte 55

A 33.7b — *) Hier zutreffende Kostenstellenuntergruppe einstempeln!

Number, title and quantity of material needed — User of material (workshop) — Reference — Quantity of material handed out

Materials issue analysis sheet:

MATERIALNACHWEIS PER 1980 11 30   FIRMA: CHEMIE LINZ AG

3221/13 BEFESTIGUNGSTEILE   BLATT:

User (cost center) J/KS	DAT.	Reference BEL.NR	WANR KOSTENTRAEGER	LWO	PREIS	Quantity MENGE	Material number LAGERNR.	E
8010	MUSCHRBE.I6X.60			8	2.24	1,859.00	1330137	8
0922	0311	031070				20.00-		
0922	0611	061085				50.00-		
0922	0611	061056				50.00-		
1913	0611	061048				50.00-		
0922	1011	101040				16.00-		
2912	1711	171026				50.00-		
0922	1811	181018				100.00-		
0922	1811	181001				24.00-		
1916	1911	191060				200.00-		
1915	2011	201066				100.00-		
0922	2411	241057				200.00-		
0922	2511	251028				25.00-		
1[illegible]2	2611	261042				50.00-		
0922	2811	281018				32.00-		

ANL.VERBR.PER	S.VERBRAUCH PER	Quantities issued (current month) VERBR.LFD.MONAT	Actual stock
1,252.00	5,462.00	967.00	892.00 S BESTANDSMEN

J/KS	DAT.	BEL.NR	WANR KOSTENTRAEGER	LWO	PREIS	MENGE	LAGERNR.	E
8010	MUSCHRBE.I6X.65			8	2.22	2,100.00	1330138	8
0922	1211	121045				25.00-		
2912	1211	121037				100.00-		
4911	1311	131011				100.00-		
1914	1311	131014				25.00-		
1913	1711	171008				100.00-		
0962	1711	171060				50.00-		
0922	1811	181018				50.00-		
1916	1911	191060				100.00-		
1914	2011	201034				25.00-		

ANL.VERBR.PER	S.VERBRAUCH PER	VERBR.LFD.MONAT	
524.00	5,446.00	575.00	1,525.00 S BESTANDSMEN

J/KS	DAT.	BEL.NR	WANR KOSTENTRAEGER	LWO	PREIS	MENGE	LAGERNR.	E
8010	MUSCHRBE.I6X.70			8	2.34	2,165.00	1330139	8
2912	0411	041053				75.00-		
[illegible]22	0511	051028				50.00-		
0922	0511	051028				25.00		
1914	1311	131014				25.00-		
0922	1911	191019				8.00-		
0922	2011	201016				50.00-		
0922	2511	251028				25.00-		
0922	2511	251025				50.00-		
0922	2611	261044				10.00-		
0922	2711	271011				16.00-		
0962	2711	271039				25.00-		

ANL.VERBR.PER	S.VERBRAUCH PER	VERBR.LFD.MONAT	
479.00	4,477.00	309.00	1,856.00 S BESTANDSMEN

J/KS	DAT.	BEL.NR	WANR KOSTENTRAEGER	LWO	PREIS	MENGE	LAGERNR.	E
8010	MUSCHRBE.I6X.75			3	2.52	610.00	1330140	3
0922	0311	031078				25.00-		
4911	1311	131011				100.00-		
1914	1311	131014				25.00-		
0922	2511	251028				25.00-		

ANL.VERBR.PER	S.VERBRAUCH PER	VERBR.LFD.MONAT	
240.00	1,709.00	175.00	435.00 S BESTANDSME[illegible]

ENABRECHNUNGSBLATT FÜR

WOCHE VON: 3 11 BIS: 7 11

Time record sheet (hours)

1316 | 00

Kadarl Walter / Meister		D	FZ	spez.	SEG	D 1	D 2	0100	0101	0102	0104	010[illegible]	0125	0127	0128		
4 Summe Std. (44–52)								96,4	94,7	/	32,8	16,4	4,2	13,7	4,-		
								Std.	Std.	Std.	Std.	Std.	Std.	Std.	Std.	Std.	Std.
				Mo	12				8,2								
				Di	16				8,2								
				Mi	10				8,2								
				Do	8				8,2								
				Fr	8	✓			5,7								
Number of job-order				Sa													
				So													
				Mo	12				8,2								
				Di	6				8,2								
				Mi	6				8,2								
				Do	10	5 ✓		8,2									
				Fr					5,7								
Total amount of hours				Sa													
				So													
			K	Mo													
			K	Di													
			K	Mi													
			K	Do													
performing cost center (workshop)			K	Fr													
				Sa													
				So													
				Mo	12						8,2						
				Di	16						8,2						
				Mi	8			8,2									
				Do	8			8,2									
KRIEGER JOSEF				Fr	4	✓		5,7									
				Sa													
				So													
				Mo	12						8,2						
				Di	6				8,2								
				Mi	6				8,2								
				Do	[illegible]	5		8,2									
				Fr	4	✓		5,7									
				Sa													
				So													
				Mo	16				8,2								
				Di					8,2								
				Mi	8			8,2									
				Do	8			8,2									
				Fr	4	✓		5,7									
				Sa													
				So													
				Mo	16				8,2								
				Di	16	7						8,2					
				Mi	6				8,2								
				Do	12	5 ✓		8,2									
				Fr	4	✓			5,7								
				Sa													
				So													
				Übertrag:				22,1	70,4	/	8,2	8,2	4,2	13,7	4,-		

Cost of the job order "Reparatur Monsanto":

CL RO 11 INNERBETRIEBLICHE

BAU/APP.NR. REPARATUR MONSANTO 607

Reference BELEG	KA	K/ART	Title BEZEICHNUNG	Quantity/Hours MENGE/STD
191060	21		MUSCHRBE.I6X.65	100.00
191060	21		MUSCHRBE.20X.70	60.00
181027	21		SA4.SCHRBI0X.35	50.00
181029	21		SA4.SCHRB20X.70	60.00
181027	21		SA4.6KTMUTTM10.	50.00
191063	21		MUSCHRBE.16X.60	200.00
181029	21		SA4.SCHRBI6X.60	21.00
205619	21		DRAHTSKL......6	10.00
065604	21		TREVSEIL.10MM..	25.00
351501	21		FLAVENTILI6..20	5.00
101510	21		WOVSCHIEBER..80	1.00
205619	21		DRAHTSKL 5	10.00
100018	21		WINKELST..50X.5	75.00
60014	21		FLACHSTL.60X.8.	67.00
81182	68		TRANSPORTBAND	7.00
41106	69		RIESENKUEHLROHR	2.00
81107	69		TRAGROLLEN55GT	4.00
00	70		LOHN	27.80
05	70		LOHN	22.10
00	70		LOHN	13.90
00	70		LOHN	6.50
00	70		LOHN	3.00
05	70		LOHN	8.20
00	70		LOHN	1.00
00	70		LOHN	96.60
00	70		LOHN	5.00
00	70		LOHN	23.40
00	70		LOHN	16.40
			LFD.MT. (current month)	223.90
	8		VORTRAG (cost carried forward)	2,091.20
			PFR (total since start of the job)	2,315.10

LEISTUNGSABRECHNUNG — WA-NR. 1916 / 0100

610 611 (= job-order) — KTG. 5 1201 000 0100

Manufacturing cost, LOHN	Material MATERIAL	Foreign services FREMDLSTG	Total GESAMT
	222		
	244		
	148		
	1,451		
	69		
	448		
	273		
	19		
	231		
	1,696		
	1,116		
	17		
	454		
	393		
	1,890		
	6,526		
	972		
6,978			
5,547			
3,489			
1,632			
753			
2,058			
251			
24,247			
1,255			
5,873			
4,116			
56,199	16,169		72,368
524,901	280,633	74	805,638
581,100	296,802	74	877,975

Maintenance cost in the cost distribution summary (look to encl. 1):

Betriebsabrechnungsbogen 1980 CL

	SCHWEFELSAEURE MONSANTO									1201
			OKTOBER	NOVEMBER	DEZEMBER	PER DEZEMBER	PER VORSCHAU	ABWEICHUNG	± %	KA
	Energiekosten	-	331,721 +	304,497 +	347,821 +	3,951,324 +	3,557,000 +	394,324 +	11	[illegible]
325	Instandhaltung	170	215,188 +	215,313 +	215,570 +	3,985,753 +	3,621,000 +	364,753 +	10	328
331	Sonstige innerbetriebliche Leistungen	143	46,275 +	50,723 +	53,744 +	523,751 +	420,000 +	103,751 +	25	331

Details to cost group "Maintenance" (look to encl. 1):

INSTANDHALTUNG-KOSTENSTELLE 1201 SCHWEFELSAEURE MONSANTO NACHWEIS 170 CL 80

****

POS	HPT-AUFT	DAT.	B/A NR BELEG	KA	AUSF KOST	W-A KOST ART	TEXT	STUNDEN MENGE	FERTIGUNGS KOSTEN	MATERIAL KOSTEN	FREMD LEISTUNG	GESAMT

Cost of main-job-order "Reparatur (= maintenance) Monsanto":

(= number of main-order)

POS	HPT-AUFT	DAT.	B/A NR BELEG	KA	AUSF KOST	W-A KOST ART	TEXT	STUNDEN MENGE	FERTIGUNGS KOSTEN	MATERIAL KOSTEN	FREMD LEISTUNG	GESAMT
000	0100			98	1914	0100	REPARATUR MONSANTO 607 610 611 (title of main-job-order)					
000	0100	8011		77	0912	0603	LFD MONAT	70.80	17,205	574		
000	0100	8011		77	0932	0114	LFD MONAT	6.20	1,469		4,436	
000	0100	8011		77	0903	0155	LFD MONAT	196.40	42,619	3,160	10,656	
000	0100	8011		77	0942	0607	LFD MONAT	58.90	16,316	278		
000	0100	8011		77	1914	0100	LFD MONAT	223.90	56,199	16,169		
000	0100	8011		77	0922	0160	LFD MONAT	58.60	15,724	149		
				(= numbers of detail-orders)			LFD	614.80	149,532	20,330	15,062	184,924
							VORTRAG	9,002.70	2,332,043	567,068	157,240	3,056,351
							PER	9,617.50	2,481,575	587,398	172,302	3,241,275

Total amount of cost center "Schwefelsäure Monsanto":

TEXT	STUNDEN MENGE	FERTIGUNGS KOSTEN	MATERIAL KOSTEN	FREMD LEISTUNG	GESAMT
KOSTENTRAEGER 5 LFD	618.80	158,421	20,330	15,062	193,813
KOSTENTRAEGER 8 LFD					
WERKSALL.DAUER. LFD		21,500			21,500
G E S A M T LFD	618.80	179,921	20,330	15,062	

....JC050GC0270A03......................JC050GC0270A03......................JC050GC0270A03......................

Maintenance

I N S T A N D H A L T U N G   TRAEGER S + B -   ID   CL   81 02 15

ARBEITSSTUNDEN, BETRAEGE IN VOLLEN S 1000,-

Hours

SCHWEFELSAEURE MONSANTO (= cost center)   1201

Workshop** KOST	Last year VORJAHR	JAN	FEB	MRZ	APR	MAI	JUN	JUL	AUG	SEP	OKT	NOV	DEZ	Current year J/SUMME
1411														
1912														
1913														
1914														
1915	134.0									27.8				27.8
1916	3,427.8	181.5	136.0	175.0	208.5	506.5	79.5	122.5	237.5	313.5	251.2	225.9	134.6	2,410.2
2212														
2912														
3911														
4911														
5976														
0903	1,230.2	93.4	79.1	16.4	82.0	577.3	125.2	52.4	139.3		151.7	196.4		1,646.2
3912	1,307.4		15.1	10.0		335.2	64.2	147.3	33.6	19.0	17.3	70.8	9.3	734.3
3922	2,347.2	948.6	171.2	101.7	439.1	1910.8	259.9	47.0	11.3	90.4	106.6	55.6	22.1	3,791.9
3923				16.1										16.1
0924			140.7			93.0								253.7
3932	332.1	19.8				56.0	71.6	30.7	33.8	22.1	12.9	6.2	17.8	292.9
0942	935.8	49.2	79.9	132.4	75.0	83.1	114.3	42.4	109.7	94.9	65.7	50.9	76.2	951.7
0952														
0957	175.4	13.4	12.2	5.0	11.4		17.2		6.0	7.0	14.7	4.0		90.9
3962														
SONS	26.0	12.0	16.0			10.0			4.9	15.5	2.3			59.5
SUP:	10,135.9	917.7	693.1	438.6	836.0	3672.2	732.9	444.3	576.2	590.2	634.6	618.8	279.7	10,475.2
EIGL *	-2,750	263	198	151	231	995	216	148	182	181	193	180	103	3,059
FR *	700	64	27	73	118	275	29	62	93	38	22	35	115	927
GES: *	3,450	327	225	224	359	1,269	245	[illegible]	275	216	215	215	218	3,986

*) Maintenance cost (amount in AS 1000,-)

**) Number of workshop (cost center) performancing the maintenance works

Enclosure 3

Maintenance cot - budget per cost center

Every year a budget for each cost center has to be made. A part of this is the planning of maintenance cost per cost center.

The following page shows the questions which have to be answered for each cost center.

The total amount of planned maintenance cost and of planned hours from own workshops are also used for capacity planning and - in case of bottlenecks - for planning the use of foreign services.

2. Instandhaltung

in S 1 000,-

a) Instandhaltung lt. Werksauftrag ohne Materialgemeinkosten* und werksallgemeine Daueraufträge* (Kostenart 328, Nachweis 170 der Betriebsabrechnung, Kostenträger 5)

Ist-Wert 1980	....
Ist-Wert der letzten 12 Monate (Mai 1980 - April 1981)	....
Schätzung Ist 1981	....
Voranschlag für 1982 - Gesamt (auf Basis Stundensätze 1981)**	....
- davon: Eigenleistungen	(in Stunden)**
Material	(in S 1 000,-)
Fremdleistungen	(in S 1 000,-)

Annähernde Aufgliederung (wichtigste Positionen):

....

....

....

....

....

Begründung der Änderungen:

....

....

....

....

b) Programmgebundene Instandhaltung (Kostenart 328, Nachweis 170 der Betriebsabrechnung, Kostenträger 8):

Werden 1982 Reparaturprogramme in Anspruch genommen, in welcher Höhe, wofür?

....

....

....

....

*) werden von FBW bzw. FKK ermittelt

**) Neuberechnung bzw. Anpassung mit neuen Stundensätzen Vorschau 1982 erfolgt durch FBW

Maintenance planning sheet for 1982

Maintenance

in ÖS 1 000,-

a) Maintenance cost of ordered jobs

Actual cost 1980	...
Actual cost of the last twelve months	...
Estimated cost 1981	...
Budget for 1982 - total (with rates per hour from 1981)	...
- in detail: from own workshops (in hours)	...
material	...
foreign services	...

Classification
(how many hours from each workshop, maintenance cost for the most important machines and and plants ......)

Reasons for changes
(in relation to the current year)

b) Maintenance cost of repair-projects

- In case of repair-projects with a length of sometimes more than a year and a high amount of cost and job orders we record the cost for the whole project since it is terminated.

COMPARISON of maintenance costs
1. quarter 1981, department ATP

1201 - Sulphuric acid - Monsanto plant -27,4%
General shutdown planned for June 1981

1202 - Gypsum sulphuric acid plant -11,1%
General shutdown planned for September 1981

1203 - Cement +29,8%
Routine check and overhaul in winter time.
General overhaul of clinker crane.

1204 - Superphosphate +14,3%
Wooden front sides of the buildings 621 and 622 are in repair (programme roof-repair by civil dept.). Change of granulation from granulator 1 and 2 to granulator 3 and 4.

1205 - Phosphoric acid - 4.0%

1206 - NPK production +11,7%
Repair and painting of NH_3-, natural gas- and water pipelines, preparation repair of spherodizer III (ring, lifters), installation of new metering device for H_3PO_4.

1221 - Area silo west -39,6%
Repair programme of roof-top not yet realized.

1222 - Area silo south -12,5%

1224 - Cement silos +14,0%
Overhaul in winter time

1227 - Bagging and shipping + 6,0%
Training on and start of palletizing unit - higher costs by departments ATP, TEL, TME.
Repair of reclaimer chain by THW.
More breakdowns on loading vehicles.

./2

1228 - Cement bagging +138,5%

Overhaul of complete bagging and loading station in winter time. Gauge of cement bagging machine.

1229 - Central raw material storage -5,6%

1230 - Department laboratory -5,8%

1916 - ATP-Workshop -5,4%

MAINTENANCE COSTS DEPT. ATP
COMPARISON : PRECAST - ACTUAL , 1. QUARTER 1981

COST CENTER	UNIT	PRECAST 1981 1. QUARTER	ACTUAL 1981 1. QUARTER	DEVIATION AMOUNT	DEVIATION %
1201	SULPHURIC ACID - MONSANTO	1,175.000,-	853.000,-	- 322.000,-	-27,4
1202	GYPSUM SULPHURIC ACID	5,000.000,-	4,443.000,-	- 557.000,-	-11,1
1203	CEMENT	835.000,-	1,084.000,-	+ 249.000,-	+29,8
1204	SUPERPHOSPHATE	985.000,-	1,126.000,-	+ 141.000,-	+14,3
1205	PHOSPHORIC ACID	1,990.000,-	1,910.000,-	- 80.000,-	- 4,0
1206	NPK	5,405.000,-	6,037.000,-	+ 632.000,-	+11,7
1221	SILO WEST	755.000,-	456.000,-	- 299.000,-	-39,6
1222	SILO SOUTH	465.000,-	407.000,-	- 58.000,-	-12,6
1224	CEMENT SILOS	250.000,-	285.000,-	+ 35.000,-	+14,0
1227	BAGGING + SHIPPING	5,005.000,-	5,353.000,-	+ 348.000,-	+ 6,9
1228	CEMENT BAGGING	290.000,-	692.000,-	+ 402.000,-	+138,6
1229	CONTRAL RAW MATERIAL STORAGE	621.000,-	586.000,-	- 35.000,-	- 5,6
1230	DEPT. LABORATORY	120.000,-	113.000,-	- 7.000,-	-5,8
1916	ATP- WORKSHOP	111.000,-	105.000,-	- 6.000,-	-5,4
	TOTAL	23,007.000,-	2[illegible] 450.000,-	+443.000,-	+ 1,9

LEAFLET ABOUT HANDLING OF AMMONIA

1. Properties

1.1 At normal conditions ammonia (NH_3) is a colourless gas with a characteristic pungent odour. It is ready liquefied by cooling or compression. The liquefied ammonia evaporates ready and fast at atmospheric pressure. This gives rise to a strong refrigeration to 40°C below zero. Ammonia is very soluble in water, the saturated solution containing 35 % NH_3.

Synonyms for aqueous solutions: aqua ammonium, water of ammonia, aqua ammonia, ammonium hydrate.

1.2 Liquid ammonia, aqueous solution of high concentration, likewise gaseous ammonia of higher percentage have an irritating effect on the skin mainly the genitals, the respiratory tract and mucous membranes of the nose due to an alkaline caustic action. Liquid ammonia also can cause frostbites. The pungent odour is warning in due time.

Maximum allowable concentration in air (* M.A.C.):50 parts per million (=TLV: treshold limit value).

1.3 Fire and explosion hazard are present but are considered small.

* M.A.C. = that concentration in a working atmosphere of a dust, fume or vapor such that if it is exceeded for appreciable periods damage can be caused to the health of exposed individuals.

2. Handling

2.1 Ammonia, gas or liquid is best removed by spraying with much water into it.

2.2 Explosive limits: 16 to 25 % by volume in air. At certain limitations (15,5 - 27 Vol % NH_3) an ammonia-air-mixture is exposive therefore in rooms where such mixtures might occure the use of open fire or light also smoking is prohibited. In case weldings or jobs with open flames really have to be done during erection or repairing work, this is only permitted with the special approval of the management of the company under adequate supervision and oberving special precautions.

2.3 Poisonousness and danger of explosion need utmost care at all jobs at containers, apparatuses, linings and fittings for ammonia (depressurizing, careful evacuation, blowing out with N_2, repeated rinsing with water, detaching and closing of the pipings). Mines and canals are only allowed to be entered with utmost care and using the suitable breathing equipment. The precautions for accident prevention of the "Berufsgenossenschaft", enc. 4, section A are carefully to be observed.

3. Storage

3.1 Cylinders should be stored away from heat and sunlignt.

3.2 They should never be dropped.

3.3 Connections to these cylinders should be tight. Caution should be observed when opening containers also gas masks worn.

3.4 Recommended storage in fire-resistant structures away from chlorine, bromine, iodine and mineral acids.

3.5 Water is an effective fire-extinguishing agent.

4. <u>Treatment</u>

If liquid ammonia is spilled upon the clothing all clothing should be removed immediately and the body thoroughly drenched with water. If the eye is injured by ammonia it should be washed immediately and copiously with water and this may be followed by the introduction of a saturated solution or boric acid. If pain is severe use local anesthetic such as 0,5 % solutions of pontocaine hydrochloride. Thereafter the application of olive oil or some similar oil is desirable. Continous warm boric compresses to the eyes may be of value. The usual treatment of corneal ulcers should be instituted and an ophthalmologist should be called at once. Respiratory and circulatory measures should be taken if the concentration of fumes has been severe and the respiration affected. Inhalations of from 5 to 7% carbon dioxide in oxygen should be given and if pulmonary edema ensues the use of oxygen by means of a tent or intranasal apparatus is advised.

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5. Precautions

5.1 Ammonia vapours are lighter than air (density = 0,6 refering to air) therefore they escape overhead. Good aeration overhead has to be cared for because of this. At sudden ammonia escapes for instance at breakages of turbines, fittings or containers leave rooms as quick as possible, protect mouth and nose by holding moistened rags in front of them. Even a dry handkerchief or the sleef of a jacket will do at an emergency at fire.

5.2 Leakages can be found by searching with a wooden or glass stick which was dipped into HCl solution of about 15 % (be careful, corrosive!) or with moistened red litmus paper, at a presence of ammonia white mists occure resp. the litmus paper changes to blue.

5.3 Absolute necessary jobs in ammonia poisoned rooms (for instance handling of valves, turing out of machines, saving of hurt people) only using suitable precautions, for instance:
fresh-air, compressed air or oxygen breathing apparatuses and use of an impervious special suit for the protection of the body.

5.4 At the use of the oxygen breathing apparatus the filter K, identification colour green, is to be used. At the storage in rooms with normal humidity, temperature and atmosphere the filter is durable for 3 years in an unused condition when closed by the manufacturers. After expiration of the time of storage also unused filters are not allowed to be used any more.

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5.5 At the work stronger ammoniacal water (ammonia solution) well-fitting safety-glasses have to be used so that nothing can sprinkle into the eyes.

6. Literature

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Recycling

Increasing density of population the formation of overcrowded regions, growing industries with expanding productions and finally welfare of each people lead to an enormous burden on environment. The disposal of growing wastes of industry, traffic and homes had become a worldwide problem which concerns each of us.

Wastes coming from industry, business and house-holds are distinguished belonging to their use in cooling waters, process waters or faecal waters. All these waters burden in various manners the waters in which they are drained off, there are rivers, the lakes, the seas and so on. In this way the natural force of self purification is not sufficient as it is shown by many examples.

Hence, industries and public administration spend a lot of money for purifying waste waters. So the industry of Austria spent 9 billion Austrian Shillings on purifying water in the years 1970 to 1980. That is 41 percent of the whole environmental expenses. To keep the quality of water in good condition or to improve the quality of it, many projects of canalisation, purification plants and control systems are realised. Chemie Linz now spends 300 million Shillings on environmental purposes. 108 million Shillings are related to purifying water.

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Cooling water

The water supply of the industrial plants of Chemie Linz in Linz and Enns is resulting totally from Danube water and not from underground water.

In this connection we have to emphasize that most waters in our plants are cooling waters. I think there are about 95 % cooling waters. This predominating part of our water input is given back to the river as clean water which is a little warmed up by the coolers of our plants. But the warming up of our cooling water is insignificant because waste heat is used with priority in our plant. The warming up of the Danube by our cooling water is only 0,05 to 0,1°C. The warming up depends on the water bearing of the Danube which is various in certain limits. The legal limit in Austria for warming up the Danube is 3°C.

Anorganic process waters

Only a small part of our industrial water given back to the Danube is polluted. Where it is possible all polluted waters are purified and neutralized at the origin of their formation. In our plant there are more than 100 separators and neutralisation units.

From the view of energy where it is possible process- and washing waters are recycled. In doing so two profits are obtained: first, far ranging purification of waste waters and secondly, the production of valuable raw materials.

In this field Chemie Linz developed some internationally well-known recycling processes, for example the production of AlF_3 from fluoride containing waste waters of the phosphate fertilizer production. The AlF_3 is a desired raw material for aluminium electrolysis. The know how of this process was given to many foreign countries and now there are such plants in DDR, Romania, Japan, Sweden and Jugoslavia.

Faecal waters and Industrial organic process-waste waters

It is known that organic substances from industry and households are discharged into rivers and lakes. In these waters the organic substances are eaten by bacteria, existing in the water. By this process CO_2 and H_2O are formed. This reaction is a basic reaction for natural self purification process in our waters. This reaction can only run in the presence of a sufficient amount of oxygen. In absence of oxygen the micro-organism cannot exist. Accordingly purification of waste waters is increasing in cases of decreasing of oxygen. Such reactions caused by micro-organism are used to purify waste waters by biological purification plants. These purification plants are installed before the waste water is running down to the rivers and lakes, so that only purified water is coming into the rivers and lakes. In the purification plant an additional effect is obtained by bringing in much more oxygen by means of mechanical treatment. Besides with this mechanical treatment of waste waters the arising sludge in the biological step is recycled. In this way a purification of waste water is guaranteed and only clean water is drained into the rivers and lakes.

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Regional purification plant Linz

In comparison with many other rivers in densely populated regions the water quality of the Danube is not bad. In Austria we have water quality standards. The Danube in Upper Austria is of the class II and III of a basis of a valuation of four classes. By damming up the Danube in 1979 for erecting a water power station near Linz now better water quality standards are required. Household wastes together with industrial wastes should be purified in the regional purification plant in Linz. This plant can purify all waste waters of the region of Linz including industries. So the waste waters of the Chemie Linz, the VÖEST-Alpine (steel works) and of the Ennser sugar industries are purified in this biological purification plant too.

Outside of waters resulting from house-hold and business organic waste waters are coming from industry. In our plants also organic waste waters are existing. But now we are making great efforts in minimizing waste waters. Generally, people believe that only poisons are dangerous in waste waters. Admitting, poisons are very dangerous to natural self purification processes but even all organic substances like unpoisonous solvents, articles of food and detergents reduce the oxygen contained in the rivers and lakes.

This information should make you understand that pouring out of liquids in drain pipes in laboratories is surely nct the right way of waste disposal.

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In principle all wastes should be separated from water. Furtheron all mother liquors should be recycled and solvents should be recovered, because, as you know the purification of waste waters in mixed and diluted state is much more expensive and technically more difficult. Clean water is nowadays too valuable to be used as means of transportation for waste disposal.

Activities in our works situated in Enns (near Linz)

In our new plants, situated in Enns, acrylonitrile is produced. Most of the waste water is incinerated. Only a small part of waste water whose burning is not economical has to be purified by a biological treatment.
To realize these processes it is necessary to combine recycling steps and enrichment stages by adequate energy consumption. In the past diluting of waste waters by cooling waters was desired in order to reach lower concentrations of emission in the waters. Such a dilution of waste waters is disturbing if a biological treatment of waste water is intended. In our plant in Enns a special sewage system is erected to separate cooling waters from biological treatment plants.

Recycling methods

In various points of my essay you heard of recyclings or recycling methods. As a matter of this principle raw materials are recovered from wastes and can be used to further reactions. Nowadays recycling is of great importance in waste economy.

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In chemical industries the recycle methods have been applied long before environment protection was born. The reason for such application was to improve yields of chemical reactions. An example is the synthesis of ammonia by reacting nitrogen and hydrogen. Once passing of the reactants leads to yields of 30 %. By means of recycling yields can be increased up to 98 %.

Another example is our gypsum sulphuric acid process. By production of high quality phosphate fertilizers a great quantity of sulphuric acid is used to separate an undesired surplus of calcium from raw phosphate. By this reaction $CaSO_4$ is formed, the so-called gypsum. This waste material is utilized to a simultaneous production of Portlandcement and of high quality sulphuric acid. Sulphuric acid is recycled to fertilizer production. This recycling of gypsum prevents the formation of giant waste gypsum heaps. On the other hand more than 100 000 tons per year of calcium sulphate can be saved from natural sources.

A further example from Chemie Linz is the recycling of lubricating oils and the work-off of fibre wastes and polyethylene wastes.

These recyclings by Chemie Linz are the reason that not more than 1 % wastes are produced in comparison to the total production of chemicals. 1 % waste is a very low value in comparison to 10 % in the great chemical plants of Western Germany's industry or other industrial spheres.

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Removal of wastes

Removal of wastes is a great problem. Not all wastes can be carried to refuse pits. In Austria there are only a few possibilities for removal of difficult wastes. Therefore it is necessary to remove these wastes in foreign countries where they are burned in special furnaces. In our plants an organisation for wastes has been installed, it is the organisation-plan for wastes. This organisation-plan fixes each waste from production process and determines its removal or its recycling. If the way of removal is gone there exists a waste book which determines what has to be done with the wastes. In this manner all wastes are registered and their further way is determined.

It is not possible in my time to speak about all this environmental problems. It is the aim of my report to show that chemical industries are able to solve their problems of environment within a sociable limit. New technologies make it possible to realize more extensive laws for the protection of environment. The proceeded development lets us see the future with optimism. This optimism seems to be very necessary, thinking of the great problems of the future, first the growth of the world population and securing of sufficient food for people and secondly to make a natural environment possible in the future.

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PROTECTIVE APPLIANCE; your RIGHT, your DUTY

Dear collaborator, preservation of your health and fitness is necessary for your being well. So you really have to expect that everything will be done for your being safe on your assigned working place and your healthy returning home.

Naturally our company, too, is interested in a permanent production and working course. So protective appliance for Chemie Linz AG is a concern exceeding the frame of legal provision. The special weight apportioned to safety in working derives from the multiple and potentially high dangers in the chemical industry.

Put it is your turn, too, to work exactly and responsibly. At least your and your collegues' safety depends on your behaviour.

So you have to observe all orders, instructions and directions concerning protective appliance. Consider them the result of painful experience which you and others should be saved from.

The legal provisions are ruled by the law for the protection of employees of 1973. This law does not only engage the employers, but the employees, too, (§ 19) to take care of the interests of protective appliance.

Shortly, the items of § 19 are:

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*) Bei Bezugnahme bitte dieses Zeichen anführen! A 1118

Each employee has to follow the ordered precautions, to act conscious for safety and to follow the instructions in this concern.

All protective facilities, arrangements and devices have to be used and carefully handled, and all legal provisions (e.g. "no smoking") are to be observed.

Prior to use the employees have to prove the proper shape of facilities, devices, machines and protective equipment. In the case you find any defect inform the competent master as well as of accidents on the way to and off work.

The employer has to be informed of each accident in working.

The employee must not be affected by alcohol, medicine and so on.

For helpers you are responsible persuant to § 108 of the decree for the protection of workers to inform them of dangers and necessary precautions and to watch their adequate manner of acting.

The confidental person for safety will advise you of all questions concerning protective appliance.

For each area of the plant and for the different departments confidental persons for safety have been nominated. Their names are locally indicated. Inform them of any source of an accident. Thus you can help avoiding accidents.

Observe the prohibition to alcohol

Responsibility, reactivity and attentiveness are remarkable decreased by only little amounts of alcoholic drinks. Consequently the safety in working is decreased and there is a danger for life and health of the employees.

In view of this fact drinking of alcoholics within the plant is forbidden on principle (beer and "Most" included) as well as taking alcoholic drinks into the plant or from the canteen to the several areas.

Breaking of this prohibition will be followed by disciplinary actions and in the case of repeated or serious objection by dismissal from service. The direct master will be made responsible, too, in the case such non-observance of the prohibition will cause accidents or material damage.
The organs of the guard and inspectoral staff are bound to expel every person from the area of the plant showing signs of being alcoholized.

During lunch and dinner-time the consumption of little amounts of alcoholic drinks in the canteen-rooms is allowed until recalled, so far it does not result in negative effects.

Always pay attention to the orders: "No smoking, no firing" within the plant.

Concerning personnel safety and maintenance of the job of each employee as well as on account of the legal provisions there is a general prohibition to smoking for the whole area of the plant.

The prohibition to smoking is obviously concluding any manipulation concluding matches, lighters or other sources for blaze, fire and sparks, respectively.

He, who acts contrary to this prohibition to smoking, does not only injure his and his collegues'safety but, too, break legal provisions. The enterprise is bound to punish such transgressions.

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In case of serious transgression the contract of employment may be set aside without prior reprimand.

Excepted from the prohibition to smoking is only the following:
Those buildings having a board with the inscription:"In diesem Bau is das Rauchen gestattet:" (It is allowed to smoke in this building)
Special rooms of other buildings having a board with the inscription:"In diesem Raum ist das Rauchen gestattet." (Smoking is allowed in this room).
All offices and social rooms so far there is no expressed prohibition to smoking.
The free space of the area between the buildings of NO 1,3 and 4 as well as the parking place of the store-house NO 55/56 (for cash- and carry-customers and trade-trucks) delimited by the notice-board: Grenze der Rauch-Erlaubnis (Limit to smoking).

For particular building and installation sites a limited allowance for smoking may be agreed between the safety engineer and the local advisor on security questions with the reservation as to official consent. Such zones and rooms must be marked clearly.

Naturally these orders on prohibition to smoking are binding for workers of foreign firms and for visitors, too. In placing an order the own employees expressively have to be informed.

Visited persons within the plant have to take care for the non-smoking of their visitors.

Welding, soldering and burning and carrying out of sparking processes is forbidden without prior allowance in writing.

Always use the appropriate protective equipment.

Naturally our company has taken care for the personal protection and suitable protective equipment of our employees while working. The "precautions" NO 11 is ruling all questions concerning protective equipment and protective clothing. An annex to this precautions gives a summary of the suitable protective means for each specific work.

Take special care to protect your eyes.

Only one drop of a corroding liquid, one spark from welding or grinding, one chip or split as well as damaging rays may cause a lasting damage of your eyes.

Where such dangers come into being the usage of goggles or a face shielding is absolutely necessary. Better you put up with the discomfort of wearing goggles than to be blind for the rest of your life.

Unfortunately greenhorns are often empted to renounce given protective equipment as this is more comfortable, and as they often cannot estimate the full extent of a danger. But it is really to the interest of your safety to use the necessary protective means.

So you are bound to wear goggles for the following labors:

Handling of acids and alkaline solutions, specially their transport and decanting from or into bottles, carboys and tank waggons. Laboratory works.

Handling, as described above, of other corrosive, toxic or other not exactly known substances. Laboratory works.

Production work and maintenance of apparat and other equipments containing the above mentioned substances.

Handling of lines containing acids, alkaline solutions or other corrosive, unknown or hot substances.

Disassembling of pumps or similar devices containing acids, a.s.o.

Handling of apparata and containers, where a leakage under pressure could come into being of any of the above mentioned substances.

Handling of substances corrosive to the eyes.

Grinding of metal including drill-grinding and fine-polishing.

Blowing off metal chips; striking off scale formations from welding.

Chipping and calking on metal and concrete.

Autogenous welding.

In carrying out electric weldings the helper, too, has to protect his eyes by wearing goggles.

Protection of the eyes, too, is necessary when shaving iron and cutting brittle material.

Furthermore we urgently advise our employees on wearing goggles permanently, whenever they are in a chemical plant or a laboratory, even when there are only closed equipments. This specially holds true for pipings and apparata under pressure. Sealing of flanges, valves and stuffing boxes, respectively, could suddenly

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leak, and thus acid or alkaline solution could sprit out (liquid ammonia and ammonium hydroxide being most dangerous). Storage flasks or sight glasses may brake, acid could drop through an unnoticed hole, other sources of danger could come into action. Only consequently wearing goggles can reliably avoid damage of the eyes in a chemical plant.

At long wear the usage of so called spectacle pencils or drops will avoid hazing of the glasses.

There are safety glasses to be fastened to correction spectacles to protect them against mechanical damage. Contemporaneously the eyes are protected against lateral entering of corrosive substances or sparks between the frame of the glass and the face.

Little repair work on spectacles will be done by our measuring department. Order for repair has to be given by the competent chief. Spectacles made from plastic may be fitted to the face by thermal bending. Bending is reasonably done under hot water, followed by cooling under cold water.

Helmets

Helmetes should be worn:
for building sites and mounting places,
in areas specially indicated for,
for certain labors, where especially ordered.

Furthermore helmets should be worn:
for all maintenance work and anywhere else, where you are exposed to pushing, where objects could fall down and where any danger else is indicated.

For protective clothing and other protective means take into attention:

When you have to work with bitting agents use a rubber dress and rubber gloves suitably available for each special need, as well as a heat protecting dress against hot substances. Our company's annual disposal for the different kinds of protecting dresses, including protecting shoes and gloves, is more than one mill. Austrian Shillings. These expenses demand your regualr and careful use of the available protecting devices against burning and biting.

Workers in combustible working areas should wear flame retardant dresses (marked by small red ribbons). As they are impregnated do not boil them at washing.

Your skin, too, should be protected against acids, alkalic liquids, enamels, dyes, tar, solvents and other chemicals. For your hands and parts of your body use the available skin protecting creams. To protect your skin against acids and alkalic liquids use the greasy cream and against the other substances the cream not oily. Take attention of the different fields of application the two creams are provided for, to obtain the protection intended.

Hearing protection

The measures for hearing protection are exactly regulated for the several plants. Directions for the suitable and protective means (i.e. protective cotton, air-filled antiphone, protective cotton plug, or capsule hearing protection, resp.) should be exactly followed to.
Never forget this important protection of your hearing or you

will damage it in the course of time. These hearing protections will help you, too, to better understand each other as mainly damaging frequences are blocked off.

Safety belts

will protect you against falling down from high situated working places, but only in the case you will take good care for them. After usage do not leave them lying about in moist corners, but store them dry and exposed to the air. Prior to each usage control the belt, the snap-hook, the loop and the rope.

Take special care of your respirators

In some departments of our plants toxic gas, steam or dust could appear. Exposed personal will get suitable respirating devices from the fire fighting department. They have to be stored well protected against dust and moisture or, if necessary should be placed at the working place. Good fitting and sealing to the face should be controlled continuously. Always keep clean the respirating device and the box in the sideboard, where it is stored to warrant its perfect function, thus, last not least, saving your life. In the boxes for gas masks nothing else must be stored. Filter masks will only give limited protection, that means they are only suitable for less gas concentration, so for stay in higher gas concentration or in air containing nitrogen or nitrous oxid, etc, a heavy gas protecting device will be necessary. Regarding the protection against dust it should be noticed that only a gas mask with fine dust filter will protect you effectively. Rubber respirators or paper will not protect you against the especially injurious fine dust.

You will get an extra pay for impeded work only when using the necessary safety devices.

Special impediment caused by usage of necessary safety devices will be compensated by extra payment. This will only be payed those personnel actually using the necessary safety devices. From the standpoint of safety a payment for injurious environmental influences, whereby possible damaging of worker's health is put up with must be declined.

Last not least everybody must be interested himself to maintain his health and strength and to use the offered safety devices in conscious self-responsibility.

For plants and workshops give attention to the following

A chemical plant is not more dangerous than any other plant but more complex. So dangers arising aren't simply to be seen. If you are a greenhorn take this into consideration. Accept the experience of your chief and your collaborators. Ask them all questions you may have.

If you have anything to do in another department you have to report yourself for service to the competent master as being a stranger you could not make out dangers within unknown surroundings. Having got allowance and knowledge of possible dangers you may begin your work.

Working on electric equipments and facilities is reserved for electricians.

If you are responsible for the work of other people take care for exact observance of the precautions.

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Lubrication, repair and cleaning of machines and conveyer belts is to be done at standstill.

Do not handle machines, devices and apparatus, resp., which you are not responsible for and which you do not know.

Do not put machine into operation prior to having mounted all requisite protective devices.

Never use compressed air hoses to cleam or dust off your work drees. Pressed air will carry along scaling pieces from the fixed piping, as they sometimes already did, thus causing injury of the eyes. Dusting off work dresses may be done dangerlessly by means of blowing devices provided for.

It is not allowed to undress at your working place.

Keep your tool in good order. Remove edges from chisels and beads, to avoid injuries by splittering off pieces. Do not use worne out wrenches as you would be endangered by slipping, specially on high-lying working places. Use every tool only for the purpose it was designed for.

Do not enter tanks and apparatus without having got the yellow permit showing the specific precautions. These precautions are absolutely to be followed. Welding within the plant, too, must only be performed after receipt of this above mentioned permit.

Filled oxygen cylinders and gas cylinders, resp., must not be exposed neither to sun nor to biting frost or any other thermal source. For transport use the trucks provided.

When a piping is clogged do not clear it before having informed your master and having received exact order.

Leaving tools lying about on places where they may be stripped off by a careless movement or even by vibration is the worse lack of consideration against your collegues who all want to finish their work unhurted as you want to.

Only wear tight dresses on your working place, remove your finger rings as they might cause an accident (catching hooks, etc.) and turn up the arms of your blouse only inwards.

On account of their unknowledge in processes, devices and substances greenshorns especially are often unfortunately hurted when they are playing or banting each other.

Damaged or sliding ladders often cause accidents which could be avoided. Do not allow usage of ladders with worn-out, missing or nailed-on steps or repaired spars. Take care for good positioning of the ladders. If necessary it must be either held by a man or be tied. If you have to work in a dangerous position fix yourself by means of a rope or a belt.

Never enter a scaffold or a working platform prior to its having been decontrolled by the master-carpenter.

You are endangered by poison in lead soldering, in minimum brushing, in burning painted constructions, in handling benzene and solvents and sometimes additionally in handling other toxic substances.

You will be supplied in time with precautions against dangers. The fact is pointed upon that poisioning is mainly caused by neglecting the relevant precautions. Keep yourself clean do not neither eat nor smoke with poison contaminated hands, change your working dress before having a meal, have your daily bath, keep your nails clean, and use the gas mask and the respirator, respectively where they are ordered then you need not fear poisioning.

Cleanliness and accuracy are essential facts for safety.

A piece of wire carelessly thrown away has sometimes caused a shunting-man to stumble and to fall onto the metals. We need not explain what may happen in the following.

Year by year collegues of ours are hurted by nails sticking out from boards. Objects carelessly thrown away in traffic areas, workshops and plants cause accidents which may be avoided. Naturally you will not throw away nails or wire loops, but you have to do more: put them aside whereever you will find occasions for accidents. Your good example will be followed.

Do not squawk if you recognize an unfixed ladder, a mounting hole without railing, a damaged canal cover, missing covers or even an open drain shaft. Better you clear away this by your-self or you make a report to the competent person for safety or to your master.

Summary: SAFETY within a plant is a performance which you may essentially influence by your ACCURACY and CLEANLINESS.

The traffic within the work requires your discipline and attention!

The traffic laws are guilty for the traffic within the works, too. Speed limitation to 15 km/h is caused by necessary performance of works in street areas and by the traffic of internal vehicles. These laws do not authorize to go in the midst of the street. Ambulance, fire-brigades, etc. are not bound by this restriction. Take special care in level crossing. There is no legal obligation for safeguarding by shunting-men. In the case a level crossing is blocked by standing wagons it is forbidden to climb over. It is not allowed to enter the permanent way.

Prior to the following labors a permit of the shunting department must be obtained: Working on rails, loading and unloading, blocking of the free passage, repairing wagons, and filling as well as draining of rail tank cars. A "Stop-board" has to be placed on every side of the rails.

Do not walk on rails; it would be dangerous for you and other persons.

Uncoupled wagons must be secured against rolling off by an arresting device.

Taking part in driving on shunting wagons and every kind of vehicle is forbidden. This is only allowed for transfer cars in the case they have a second seat and the load will not imperil the second man.

Fire protection measures make your working place safe.

Extinguishing devices, hand fire extinguishers and hydrants must neither be removed nor abusively be used. Keep clear all ways for escape, traffic areas and exits.

Before you leave your working place dispose of all combustible reminders, close the valves of gas cylinders and gas pipings and switch off the electric apparatus.

Storage of combustible substances and liquids must be done at designed for and marked places.

Do not exceed the amounts of combustible liquids allowed for storage.

The amount of combustible substances and liquids in production rooms must not exceed the daily need.

It is forbidden to pour solvents into sink basins and drains.

How to act in the case of fire.

In the case of fire call out the fire department by telephone number 122 or a fire alarm. Try to combat the fire with a hand fire extinguisher till the fire-brigade arrives.

The right way to act after an accident.

Even small wounds should be trated at once. Our ambulance station is competent for. Bad or undefinable wounds demand for immediate call of tel.no. 122 for an ambulance.

Keep discipline in the case of gas or fire al rm

In the case of gas or fire alarm the local instructions must be followed. Do not use a lift. Stop working and leave the building quickly and quietly through the staircase provided for. Go to the indicated collecting place, so it will be easy to find out whether a person is missing. Take care for the exact installing of the fire brigade.

<u>Conclusion</u>

Protection against accidents and professional diseases can only be overcome by cooperation. The management gives the technical equipment and the organizational prerequisites which serve for your protection. Now it is your turn to justify the necessary expenditures by exact self-responsible compliance with the above mentioned protective instructions.

SOME FIGURES
OF THIS DOCUMENT
ARE TOO LARGE
FOR MICROFICHING
AND WILL NOT
BE PHOTOGRAPHED.