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VOEST-ALPINE INDUSTRIAL SERVICES Corp. Ltd.
Postfach 2, A-4010 Linz, Austria

United Nations Industrial
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Purchase and Contract
Service Dept. of Administration (DA/PAC)
Attn.: Mr. D. Gardellin
P.O. Box 300
A-1400 Vienna
Austria


Your reference -
of -
Our reference VAIS-52/He/Le
Extension 2316 / 2209-206 va a
Linz 1987 03 16
Subject Contract No. 87/16
Report on Seminar

Dear Sir,

We are pleased to submit three (3) copies of our report on the Production and Maintenance for Iron & Steel Making Shop, including the Continuous Casting Seminar held February 23 - 27, 1987 in Tunis.

This report has been prepared according to your request and we trust you will find it in order.

Yours faithfully
VOEST-ALPINE INDUSTRIAL SERVICES
Gesellschaft m.b.H.


(E. Reichel)
Vice President


(M. H. Lind)
Senior Project Manager

Enclosure

206

VOEST-ALPINE
INDUSTRIAL SERVICES
Corp. Ltd.
Kronplatz 5
Postfach 2, A-4010 Linz

Tel. (07 32) 986-1*
Telex: 2 209-206 va a

VAIS 43/Donowitz/TA
VAIS 53/Donowitz/Dir

A I S U - S e m i n a r

Duration : 23.02.1986 - 27.02.1987

Place : Hotel EL MECHTEL - Tunis

Lecturers : Mr. Ben Dhiab.....El Fouladh
Mr. Cheniti.....El Fouladh
Mr. Tangl.....VAIS 43
Mr. Dirscher.....VAIS 53

Organization: Mr. Sahouli.....AISU, Algier
Mr. Grebtsov.....UNIDO, Vienna
Mr. Wusatowsky.....UNIDO, Vienna

TABLE OF CONTENTS

1. GENERAL
2. SEMINAR PROCEEDINGS
 - 2.1 Seminar itinerary
 - 2.2 Seminar hand-out
3. SEMINAR EVALUATION
 - 3.1 Seminar programme
 - 3.2 Seminar organization
 - 3.3 Discussions
 - 3.4 Result
4. CONCLUSIONS

- Appendix 1 Seminar itinerary
- Appendix 2 Seminar participants
- Appendix 3 Seminar lecture programme proposal
- Appendix 4 List of major discussion topics
- Appendix 5 List of additional information

SEMINAR REPORT

1. GENERAL

A seminar titled "Production and maintenance for steel melt shop including continuous casting" was held in Tunis from 23rd to 27th of February.

The seminar was organized by AISU and assisted by UNIDO. Works visit as well as technical contributions concerning El Fouladh steel works were organized by the steel works management.

Seminar itinerary: Appendix 1

Seminar participants: Appendix 2

2. SEMINAR PROCEEDINGS

2.1 Seminar itinerary

A seminar lecture programme proposal for the experts lectures was submitted at arrival in Tunis.

The programme was established in taking into account a general seminar itinerary as well as the details of the Tunis seminar issued by AISU and UNIDO.

Seminar lecture programme proposal: Appendix 3

Due to development of time schedule (time shortage due to postponement of seminar start e.g.) the programme had to be modified to the actual seminar itinerary (Appendix 1) to utilize time available.

2.2 Seminar hand out

A seminar hand out was prepared and issued by VAIS. This hand out gives a comprehensive general view of the seminar.

The hand outs have been distributed by AISU. If needed, additional copies can be ordered from VAIS.

In addition a maintenance questionnaire was issued. Due to lack of time proper evaluation and discussion was not possible.

3. SEMINAR EVALUATION

3.1 Seminar programme

In relation to the initial programme the time available seemed to be far to short to deal with the topics in the necessary depth. As already mentioned this was aggravated by the loss of a whole day due to postponement.

Generally it seems to be advisable to reduce programme volume and to deal with more specific topics in more detail as already executed at the seminar. A mutually agreed clear outline of the programme should be issued at least 3 months before seminar takes place to allow lecturers to adjust themselves accordingly and, as far as necessary to initiate changes.

3.2 Seminar organization

Organization occurred to be flexible from point of view of all groups concerned. To save some of the time lost it was mutually agreed to extend daily attendance times for lectures as well as discussions and presentations.

El Fouladi steel works organized a well prepared plant visit and contributed with two presentations, thus giving additional incentives for general discussion.

To improve transfer of ideas translation activities could be treated more professional to prevent misunderstandings.

As a fact impact of language barriers on the success of a seminar should not be underestimated. On the other hand translation activities passed on between seminar participants, as experienced, raised overall engagement significantly.

3.3 Discussions

Throughout the seminar discussions were held following lectures and presentations.

Partially discussions went into detail showing the direct engagement of participants in operation as well as maintenance activities in their companies as well as their interest and technical knowledge. More or less all present participants were involved in the discussions.

List of major discussion topics: Appendix 4

Practically all questions could be pointed out during discussion as far as they did not require too intensive knowledge of a specific situation.

3.4 Result

It seemed that the aim of passing on the principal ideas of the lectures could be achieved successfully. This was also indicated by the abovementioned discussions and facilitated by the high professional level of the participants, though coming from different fields of plant management.

Some of the information given, but not part of the hand out, is added in the list of additional informations.

List of additional information: Appendix 5

4. CONCLUSIONS

Despite of the reasonable response to the passed seminar the following measures should be taken from point of view of the lecturers:

- issue of clear programme in time
- topics of lectures to be chosen in the way allowing handling of the topic in adequate detail within 60 to 90 minutes.
- choice of the topics according seminar time, maximum two topics per day
- improvement of translation activities

This certainly would enable to improve exchange of know-how and ideas additionally.

Principally the organization and result of the seminar has to be seen quite positively due to the flexible and positiv cooperation among the participating groups.


Tangl


Dirscher

D/VAIS 3/Herrn Scherrer
VAIS 5/Herrn Reichel
VAIS 52/Herrn Helmy

Zei-

Appendix 1

SEMINAR ITINERARY

Sunday, 22nd Meeting concerning seminar organi- 16.30 - 18.30 am
zation, presentation VA-seminar
hand out and lecture programme.
Participants:
Mr. Sahouli.....AISU, Algier
Mr. Grebtsov.....UNIDO, Vienna
Mr. Musatowsky.....UNIDO, Vienna
Mr. Dirscher.....VAIS
Mr. Tangl.....VAIS

Monday, 23th Preparation seminar room 07.00 - 09.15 am
Opening session - postponement of
seminar start to next day due to
delay of Algerian seminar participants

Tuesday, 24th Lecture: Mr. Tangl/VAIS 09.00 - 12.00 am
Principles of continuous casting.
steel plant equipment availability.

Presentation Mr. Ben Dhiab/El Fouladh
El Fouladh steel works, production
and equipment

Lecture: Mr. Dirscher/VAIS
Importance of maintenance

Presentation Mr. Cheniti/El Fouladh 02.00 - 07.00 pm
Maintenance at El Fouladh

General Discussion
Specific maintenance questions

Lecture: Mr. Dirscher/VAIS
Costs of maintenance

Wednesday, 25 th	Visit El Fouladh steel plant Introduction Plant visits	09.30 am - 04.30 pm
Thursday, 26 th	Lecture: Mr. Tangl/VAIS Aspects of continuous casting General discussion Specific questions continuous casting	08.30 am - 12.30 pm
	Presentation Mr. Tangl/VAIS Statistical steel plant data, VOEST-ALPINE Linz and Donawitz works	01.30 - 06.30 pm
	Lecture: Mr. Dirscher/VAIS Maintenance planning	
Friday, 27 th	Lecture: Mr. Tangl/VAIS Improvements in LD and EAF technology. Secondary metallurgy	08.00 - 12.00 pm
	Lecture: Mr. Dirscher/VAIS Computer supported maintenance	
	Seminar evaluation, closing addresses.	

Appendix 2

SEMINAR PARTICIPANTS

<u>NAME</u>	<u>TITLE</u>	<u>COMPANY</u>
Aouani Moncef	Directeur d'usine	El Fouladh
Derbal Hosny	Sous Directeur chargé de mission	El Fouladh
Triki Mohamed	Chef de departement acierie	El Fouladh
Cheniti Bechir	Chef de departement	El Fouladh
Baccar Sadok	Chef de departement mouvement	El Fouladh
Mathlouthi Mohsen	Ingenieur d'entretien	El Fouladh
Farhani Abdelkader	Ingenieur d'entretien acierie	El Fouladh
Ben Dhiab Adel	Ingenieur coulée continue	El Fouladh
Haffani Tahen	Ingenieur	El Fouladh
Fliss Hassan	Ingenieur	El Fouladh
Chtioui Fathi	Ingenieur	El Fouladh
Mnif Mahmoud	Ingenieur, Chef departement	El Fouladh
Mamoud Kassem	General manager	Gecosteel
Mhammed Khen Masyry	Technical Director	Gecosteel
Bourouba Ahmed	Directeur d'unité Montage	ENCC

Beldi Hocine	Directeur d'unite Montage	ENCC
Dioulah Said	Assistant d'entretien	ENCC
Guidoum Jovcef	Ingenieur Chef des coulee continue	SIDER
Benemiheud Kebil	Ing. Directeur entre formation de la siderurgie	SIDER
Sahouli N.	Responsable de seminaire	AISU
Haidar Younes	Regional manager	AISU
Grebtsov Yuri	Unido, IDO	UNIDO
Wusatowski Ramon	Unido-Com.	UNIDO
Dirscher Friedrich	Senior advisor	VAIS
Tangl Erich	Senior advisor	VAIS

Evaluation and closing session:

Lachgar	Gen. Secr.	AISU
Whaley	Res. Rep. Algeria	U.N.D.P.
Fouhaladeh	Res. Rep. Tunis	U.N.D.P.
S. Jebali	Repr. Tunis	AISU

Appendix 3

SEMINAR LECTURE PROGRAMME PROPOSAL

Seminar: PRODUCTION and MAINTENANCE

SEMINAR LECTURE PROGRAMME

Monday, 23 rd	am	Steelmaking routes basics	Mr. Tangl
	pm	Importance of maintenance	Mr. Dirscher
Tuesday, 24 th	am	Operation LD-CC	Mr. Tangl
	pm	Maintenance organization, costs and spares management	Mr. Dirscher
Wednesday, 25 th	am	Operation EAF-CC	Mr. Tangl
Thursday, 26 th	am	Maintenance activities and planning	Mr. Dirscher
	pm	Energy conservation and environ- mental protection	Mr. Tangl
Friday, 27 th	am	Computer supported maintenance	Mr. Dirscher
	pm	Facts and needs for improved quality products	Mr. Tangl

Appendix 4

LIST OF MAJOR DISCUSSION TOPICS

Problems encountered in secondary cooling of continuous casting (water treatment and distribution).

Rhomboidity in casting of billets, causes and measures.

Possibilities and influences of implementing bigger dimensions on casters.

Application of hydraulic shears or torch cutters on billet casters.

Hot spots in EAF operation - mechanical and electrical reasons and measures.

Possibilities of scrap preheating.

Behaviour of Mn in steel when adapting bottom stirring practice in LD-converter.

Design and problems encountered in LD waste gas hood cooling.

Spare part keeping - example of 2,2 MW direct starting motor for oxygen plant.

Roof centering EAF and electrode sealing.

Inspection methods of EAF power supply cables.

Mould preparation; plate moulds, tube mould

Crackformation on overhead cranes (bridge beam)

Application of computer supported maintenance.

Appendix 5

LIST OF ADDITIONAL INFORMATION

- Figure 1: Vessel/caster synchronization
- Figure 2: Operation schedule
- Figure 3: Mould solidification
- Figure 4: Endogenous inclusion formation reasons
- Figure 5: Exogenous inclusion formation reasons
- Figure 6: Energy balance UHP-furnace
- Figure 7: Yield, energy consumption and tap to tap time at different DRI rates
- Figure 8: Scrap preheating
- Figure 9: Water cooled panels
- Figure 10: Energy balance LD-process
- Figure 11: Scrap rates in oxygen steelmaking
- Figure 12: Operational results with slag stopper
- Figure 13: Operational results with bottom stirring
- Figure 14: LD-process control diagram
- Figure 15: Availability of subblance system

- Figure 16:** From unplanned to planned maintenance
- Figure 17:** Share of Maintenance Costs
- Figure 18:** Main menu
- Figure 29:** Batch jobs
- Figure 20:** Capacity planning
- Figure 21:** Workload
- Figure 22:** Workload of maintenance
- Figure 23:** Weakpoint analysis
- Figure 24:** Inspection (workload) planning

FIGURE 1

VESSEL/CASTER SYNCHRONIZATION

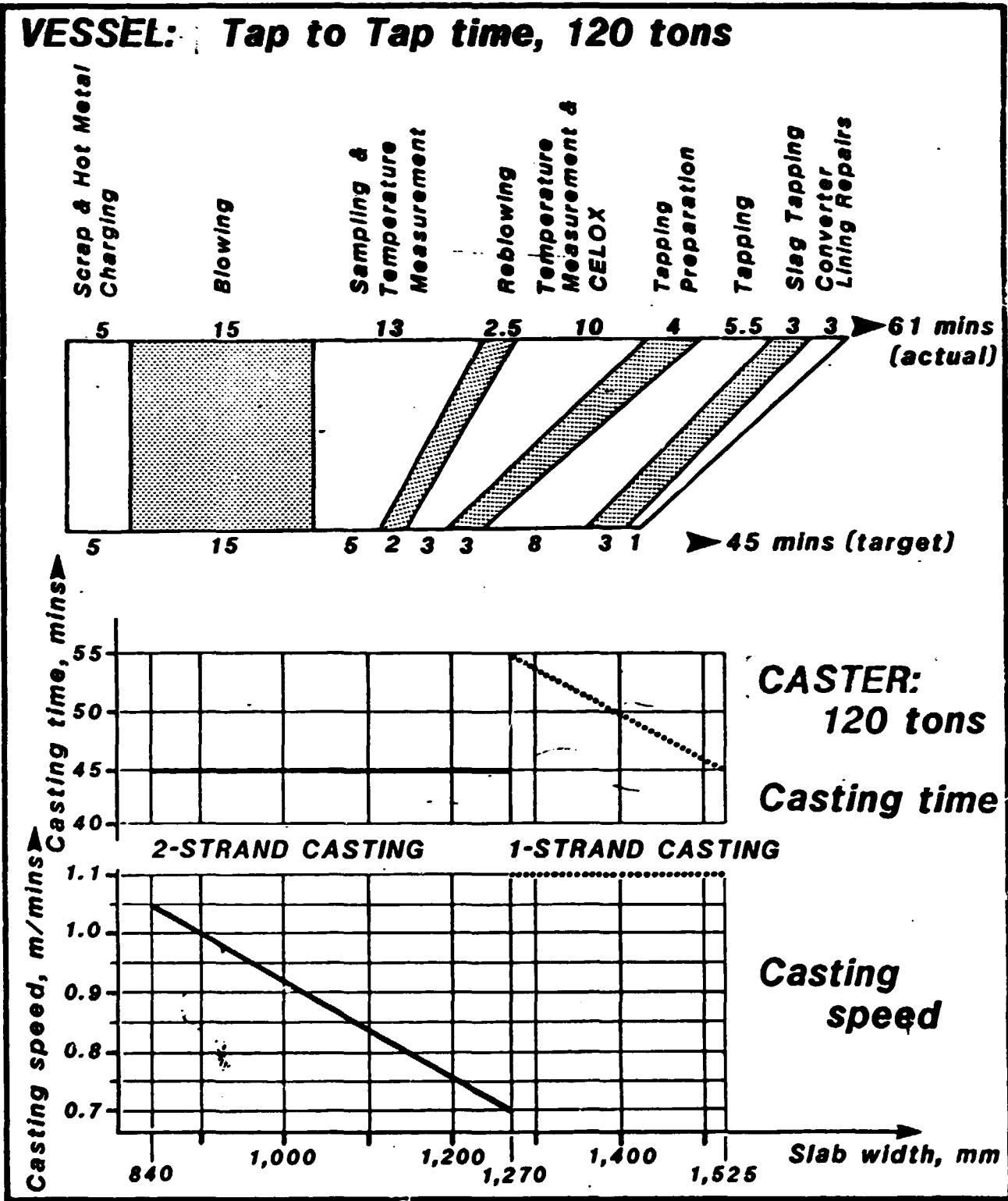
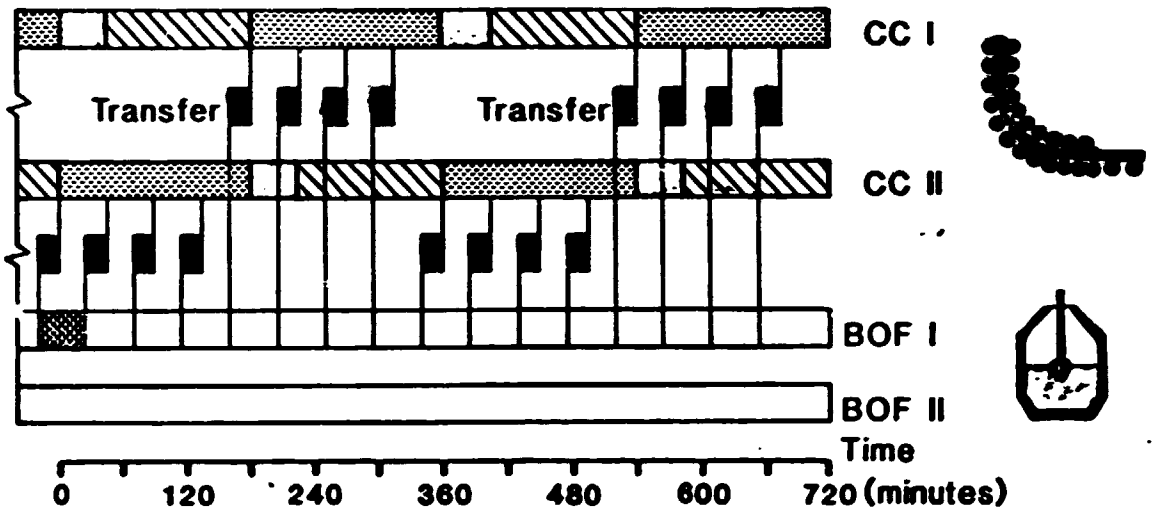


FIGURE 2

STEEL PLANT OPERATION SCHEDULE

Remarks:

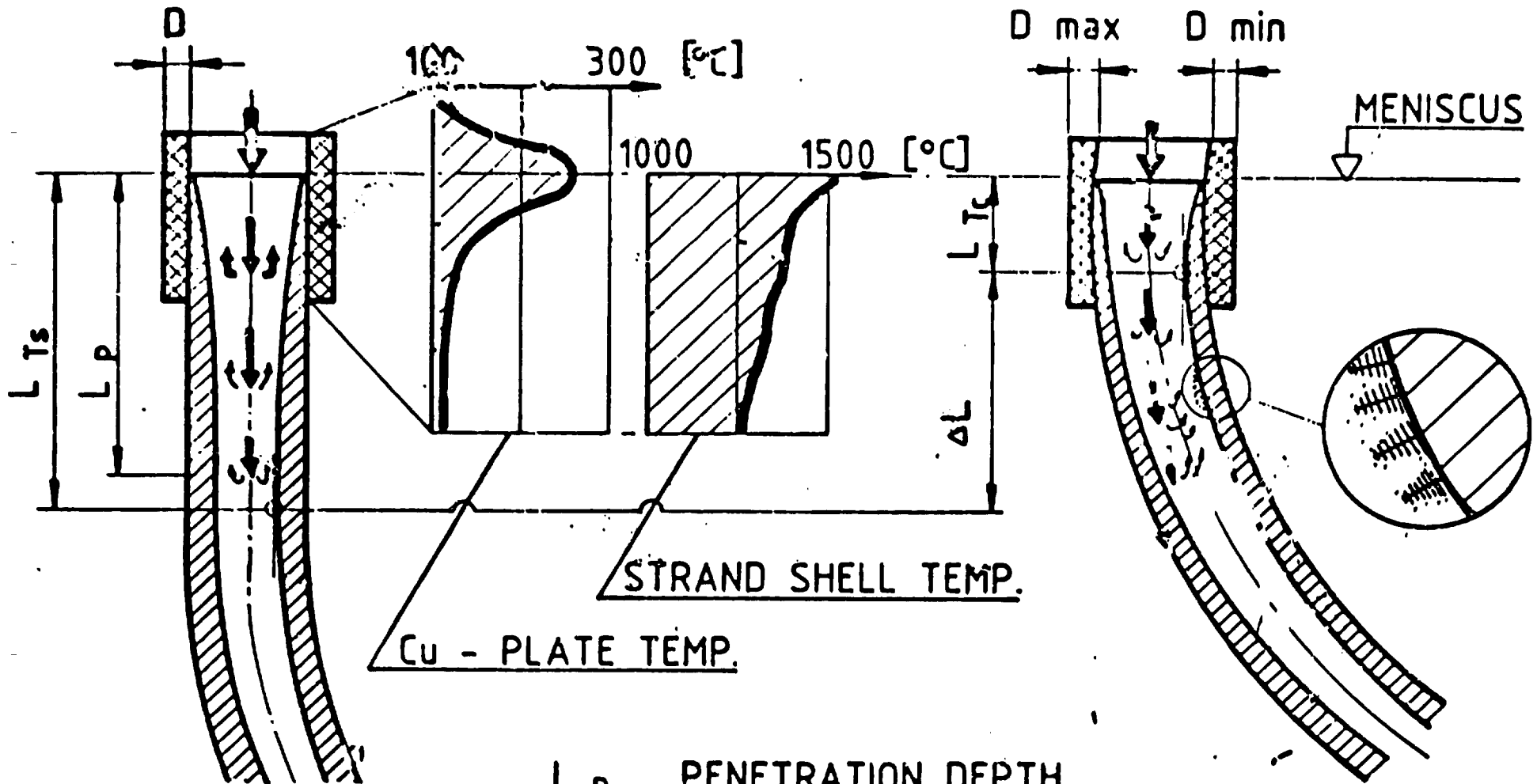
- 1 BOF blowing
- 2 Casters operating
- 4 Heats in sequence



Time consumption:

- | | | | |
|--|--|---|---------------------|
|  180 mins | Casting Time (4 heats) |  20 mins | Ladle Transfer Time |
|  45 mins | Machine Preparation |  45 mins | Tap to Tap Time |
|  135 mins | Waiting, used for checks and maintenance | | |

FIGURE 3



STRAIGHT
MOLD

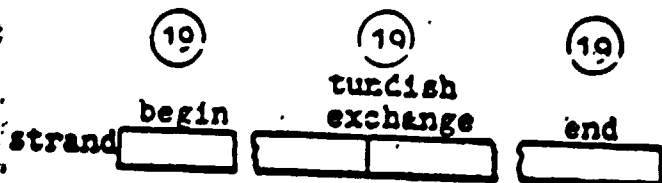
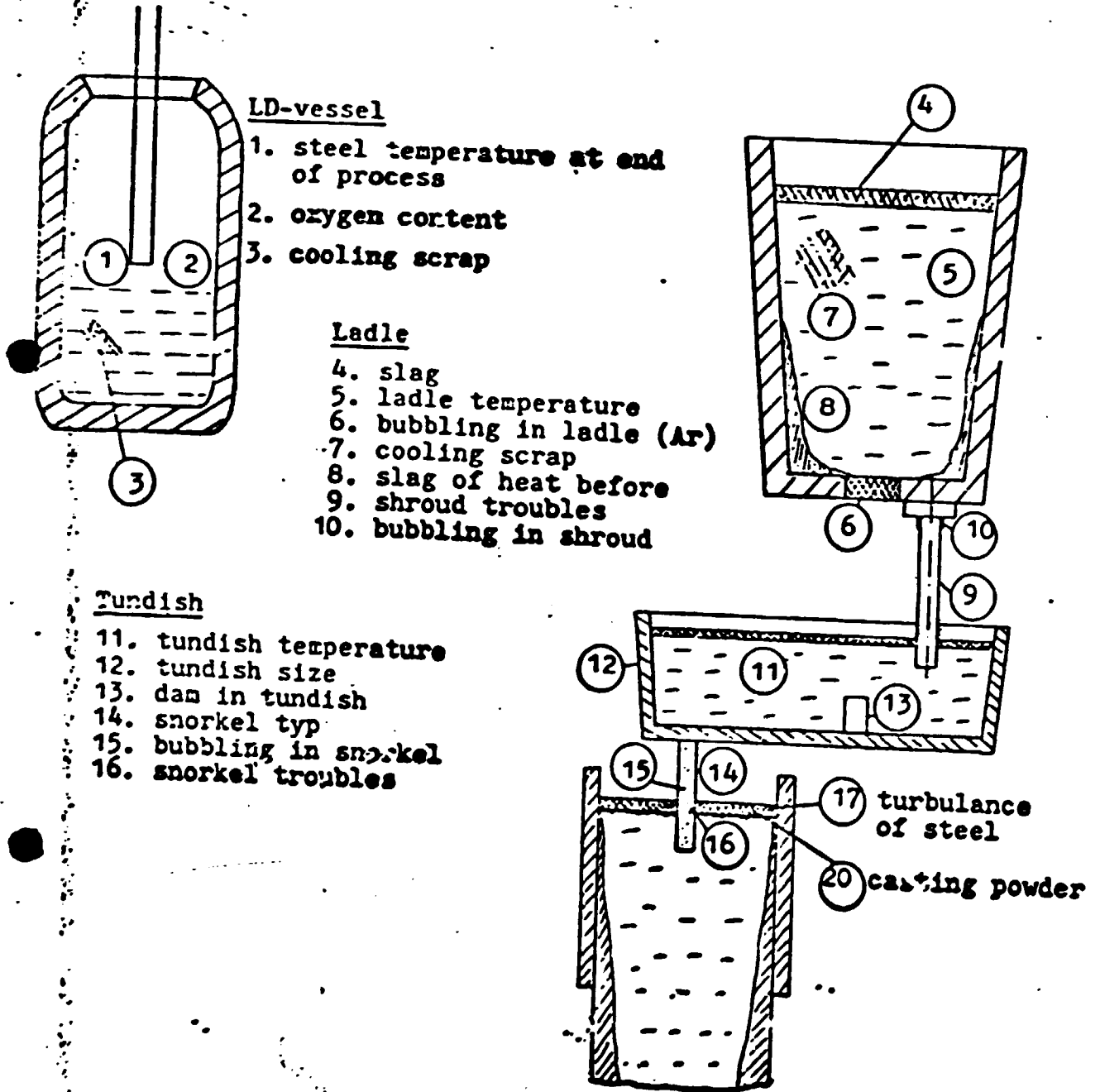
L_p ... PENETRATION DEPTH

$L_{Ts(c)}$... DISTANCE OF TANGENT-
POINT FROM MENISCUS

CURVED
MOLD

ENDOGENIOUS MICROSCOPIC AL-OXYD INCLUSIONS (INCLUSION CLOUDS)

Influence of Production Parameters



18 number of heat in tundish
19 position in strand

EXOGENOUS MACROSCOPIC INCLUSIONS

Influence of Production Parameters

(11) (c) LI vessel

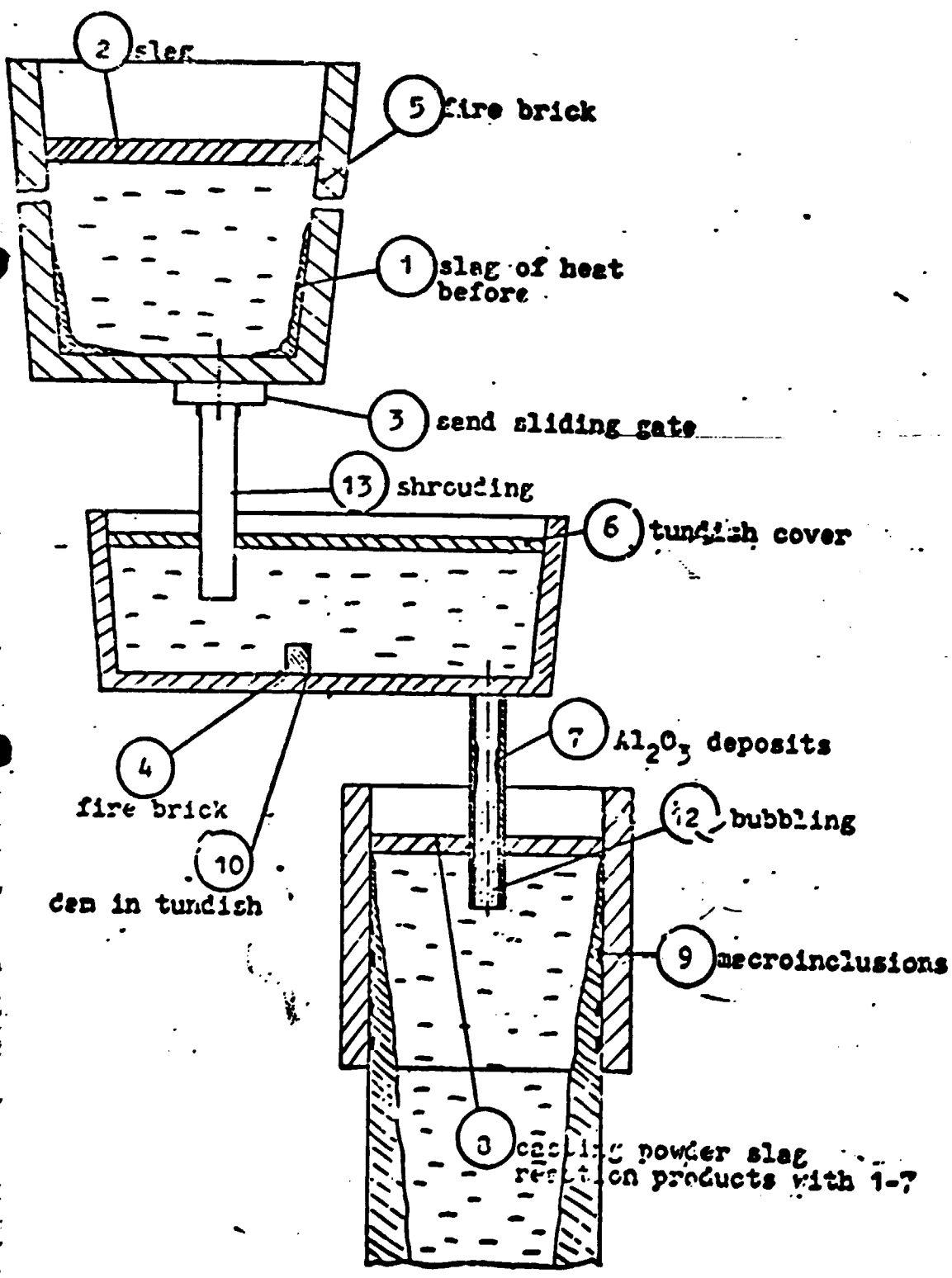


FIGURE 6

ENERGY BALANCE UHP-FURNACE

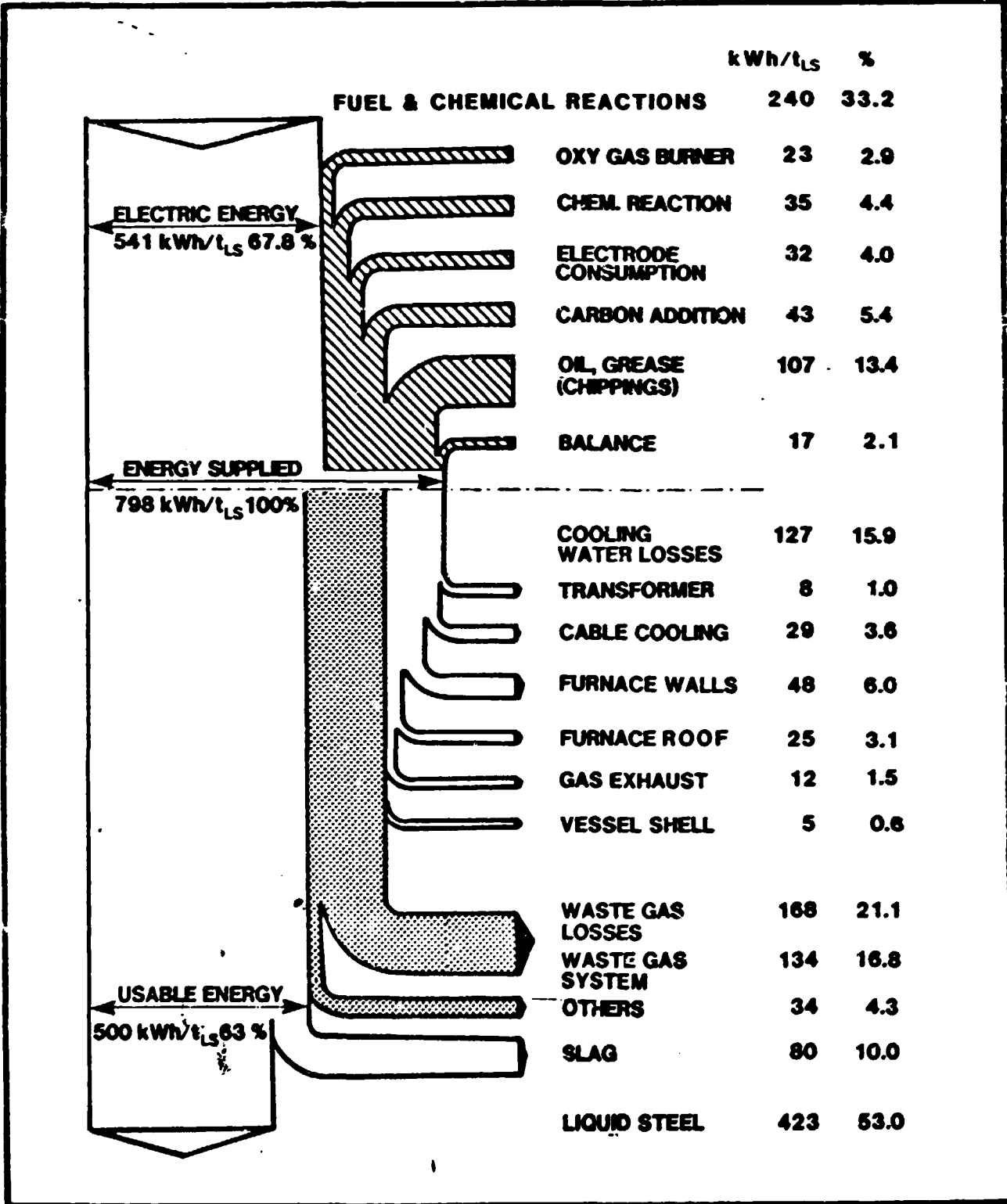


FIGURE 7

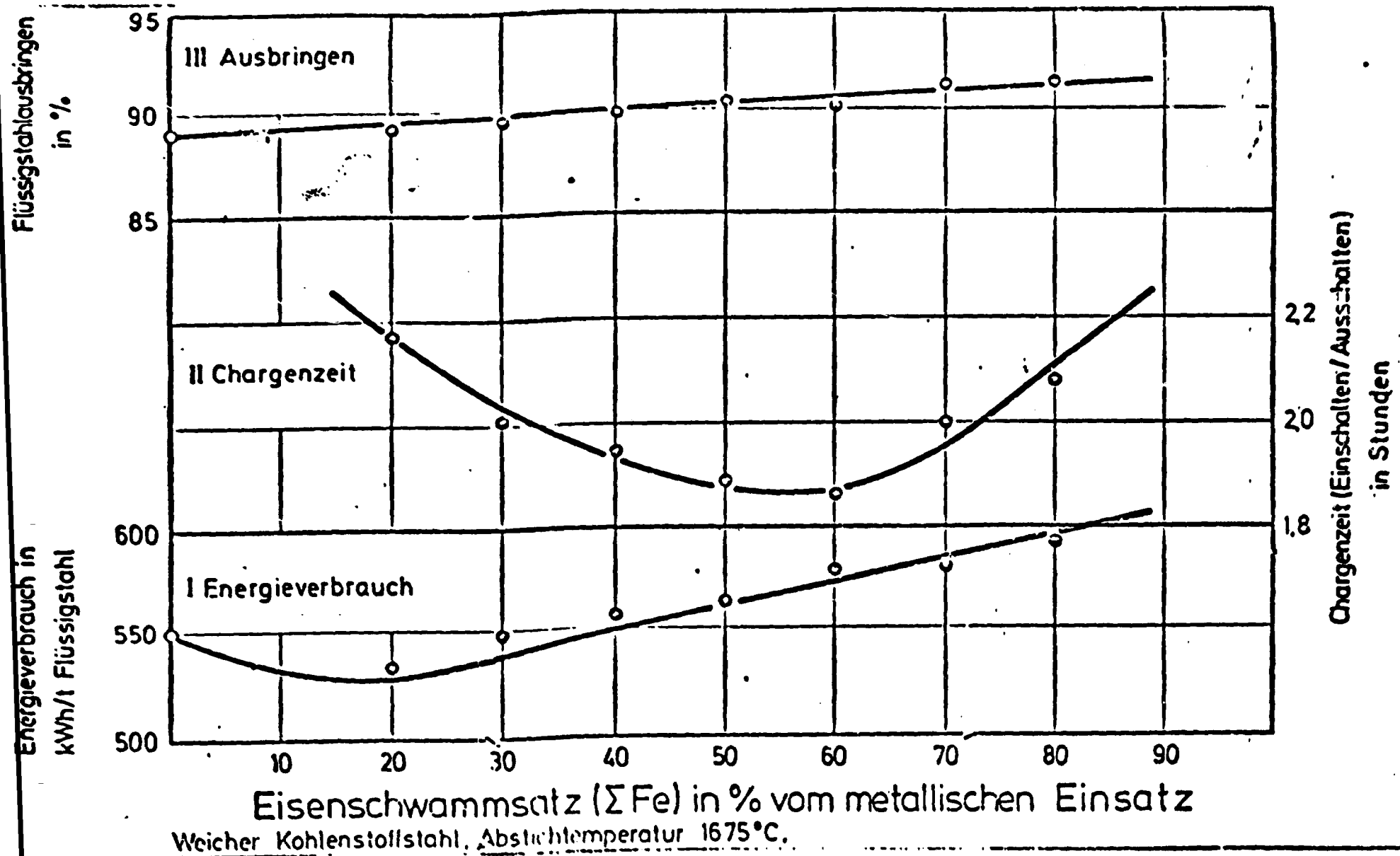
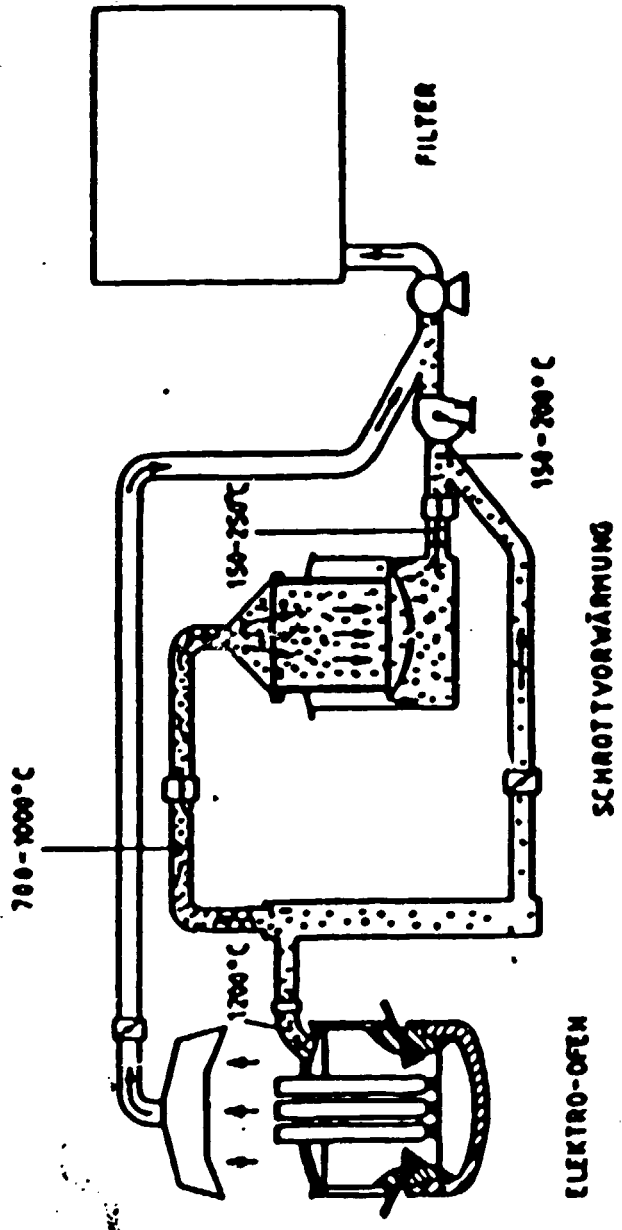


FIGURE 8



Schrottvorwärmung

BILD 12

FIGURE 9

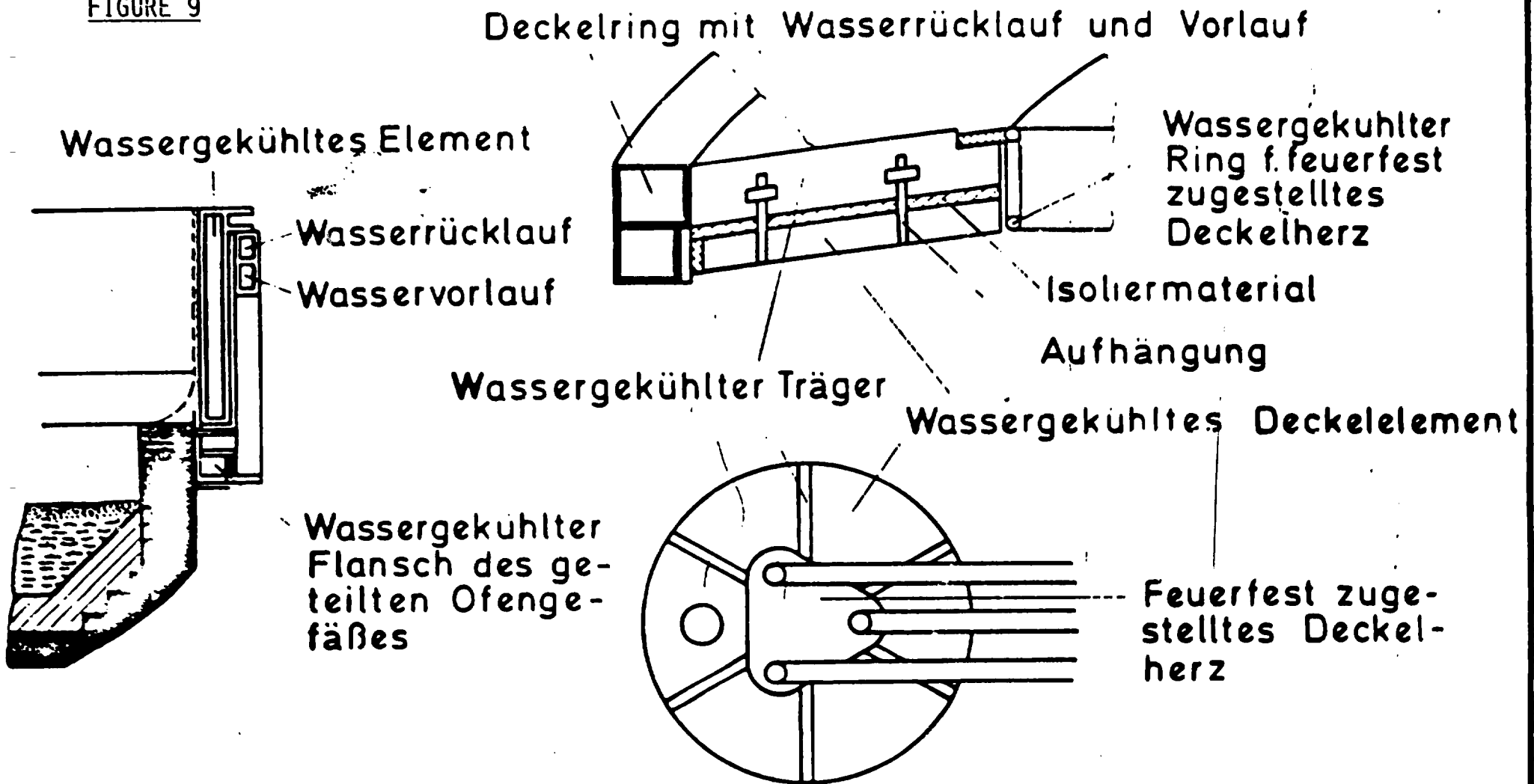


BILD 16

Wassergekühlte Wandelemente und wassergekühlter Deckel



FIGURE 10

ENERGY BALANCE , LD-PLANT

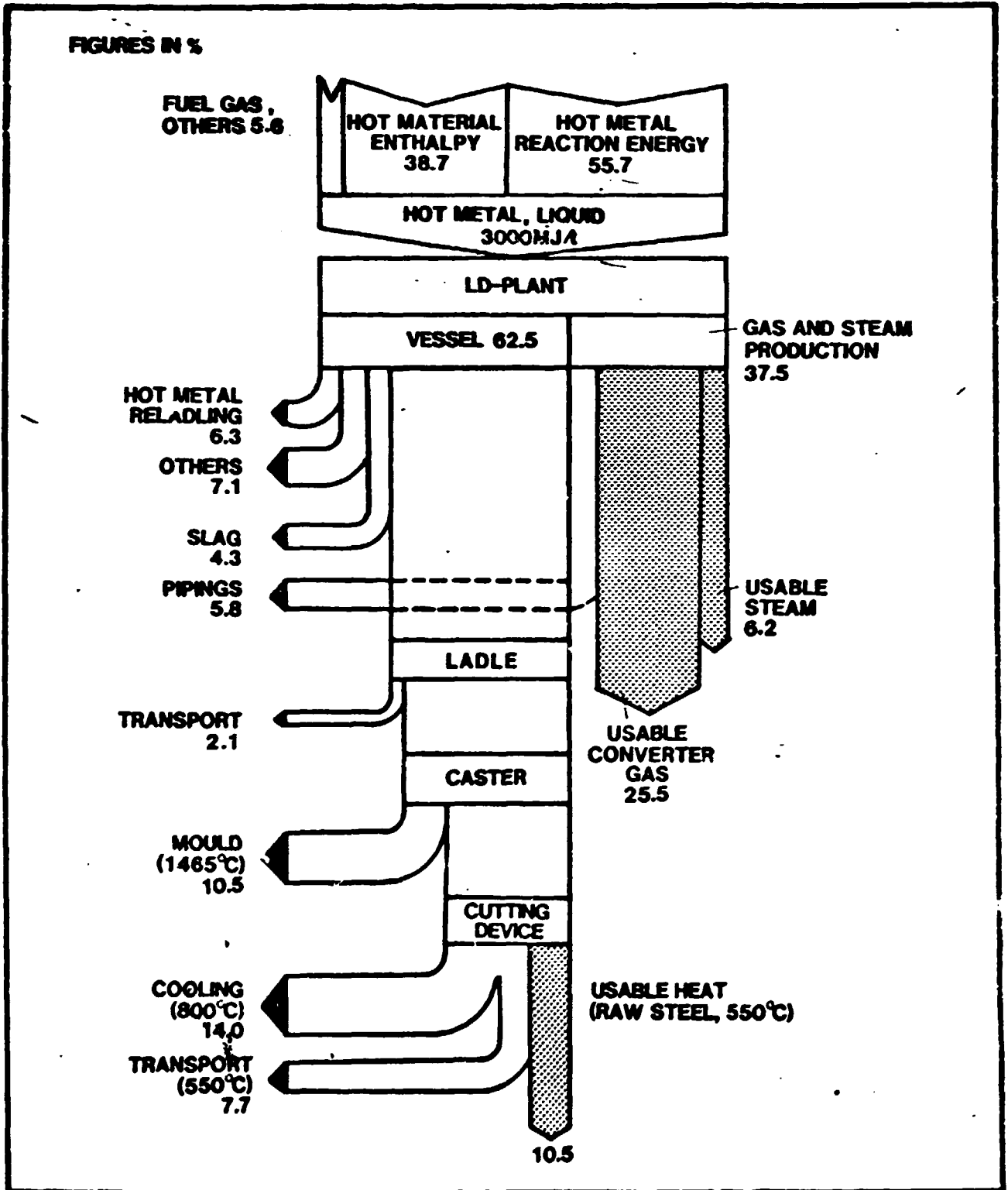
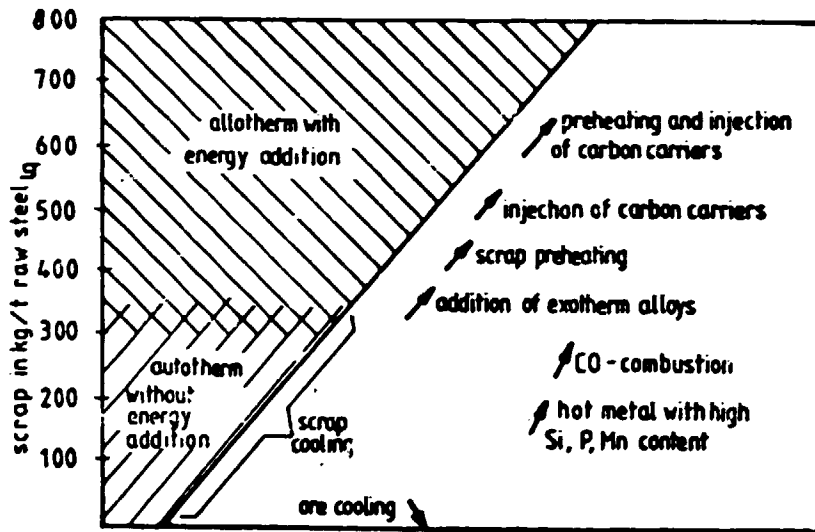
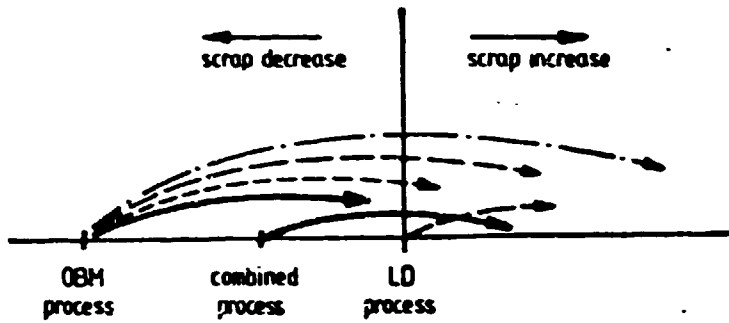


FIGURE 11

- CO - post combustion + scrap preheating + carbon addition
- scrap preheating
- - - CO - post combustion + carbon addition
- CO - post combustion



OXYGEN BLOWING PROCESS

032.0983

FIGURE 12

OPERATIONAL RESULTS	WITH SLAG STOPPER	WITHOUT
Amount of converter slag in steel ladle in kg/t steel	2 - 5 (4 - 8) •	10 - 20 (15 - 20) •
Al O - content after ladle treatment in ppm	0 - 5	5 - 15
Average rephosphorisation after steel desulphurisation in % - x 70	0,002	0,006
Average final sulphur content after steel desulphurisation in % - x 70	0,002	0,004
Life of ladle lining-wall in %	+ 20	
Amount of aluminium addition into ladle in %	- 10	

• Values in brackets apply to a 60 t converter

082.4183

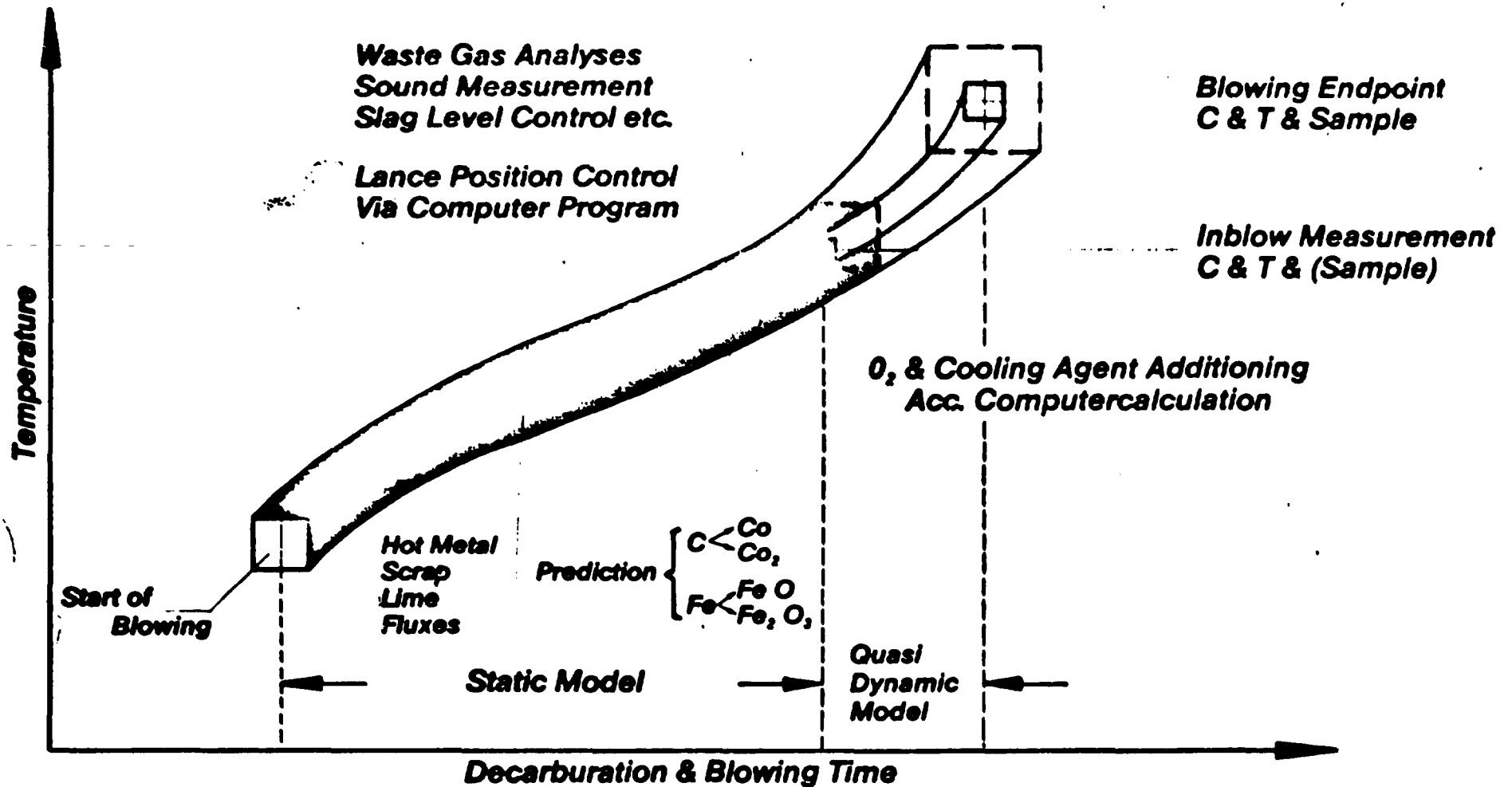


OPERATIONAL RESULTS OF SLAG STOPPER APPLICATION TO 130 T LD-CONVERTER

FIGURE 13

	CONVENTIONAL LD	LD WITH BOTTOM STIRRING
Endpoint analysis in %		
Carbon	0,045	0,040(0,030)*
Manganese	0,25	0,28 (0,27) *
Phosphorus	0,015	0,013(0,008)*
Sulphur	0,016	0,014(0,014)*
● Fe-content of slag in %	24	20 (19) *
Slopping free blowing in % of total heats Spec. converter volume 0,6 t/m ³	75	90
YIELD IN %		+ 0,6
Lime consumption in kg/t		- 5
Aluminium for deoxidation in kg/t		- 0,3
● O ₂ Consumption in Nm ³ /t		- 1
Refractory lining life in %		+ 20
Nitrogen content of steel	Can be controlled by choice of gas	
<p>*Values in brackets apply to additional stirring after end of blow for 3 to 5 minutes Hot metal with 0,4% Si, 1,5% Mn, 0,080% P, 0,020% S</p>		
FIG. 3.2	Comparison of Results of Conventional LD - and LD-Bottom Stirring Process in 130-t-Vessel	

FIGURE 14



026.0483



Steel Making Processes
LD-PROCESS
Control Diagram

FIGURE 15

	TEMPERATURE	LIQUIDUS CARBON	T & C	LAB SAMPLE
IN BLOW	97.3	100	97.3	98.7
END OF BLOW	98.4	95.2	94.5	95.2

SUBLANCE SYSTEM
AVAILABILITY OF MEASURING SYSTEM
AND LAB SAMPLE (%)



157 0855

FIGURE 16

FROM UNPLANNED TO PLANNED MAINTENANCE

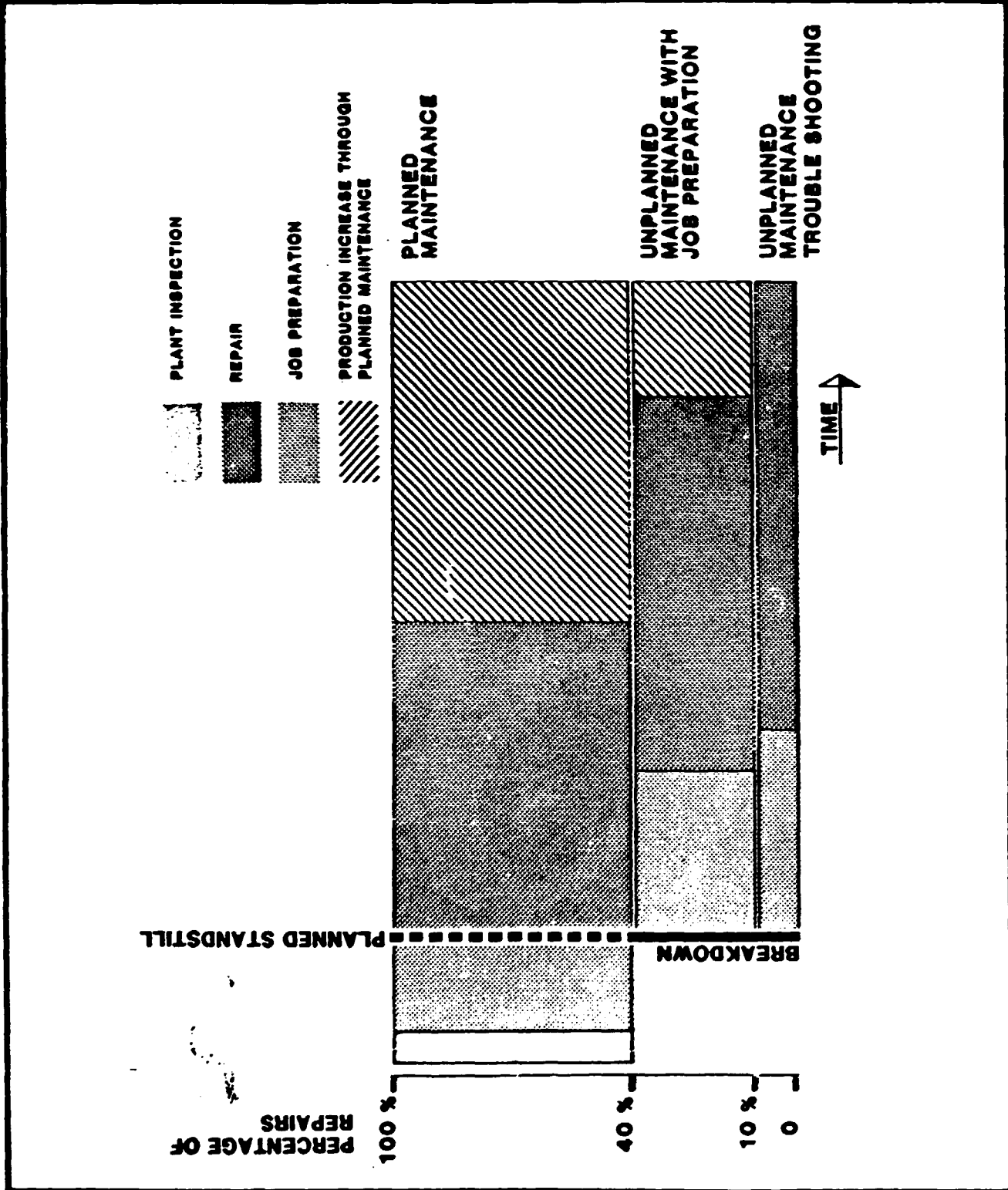
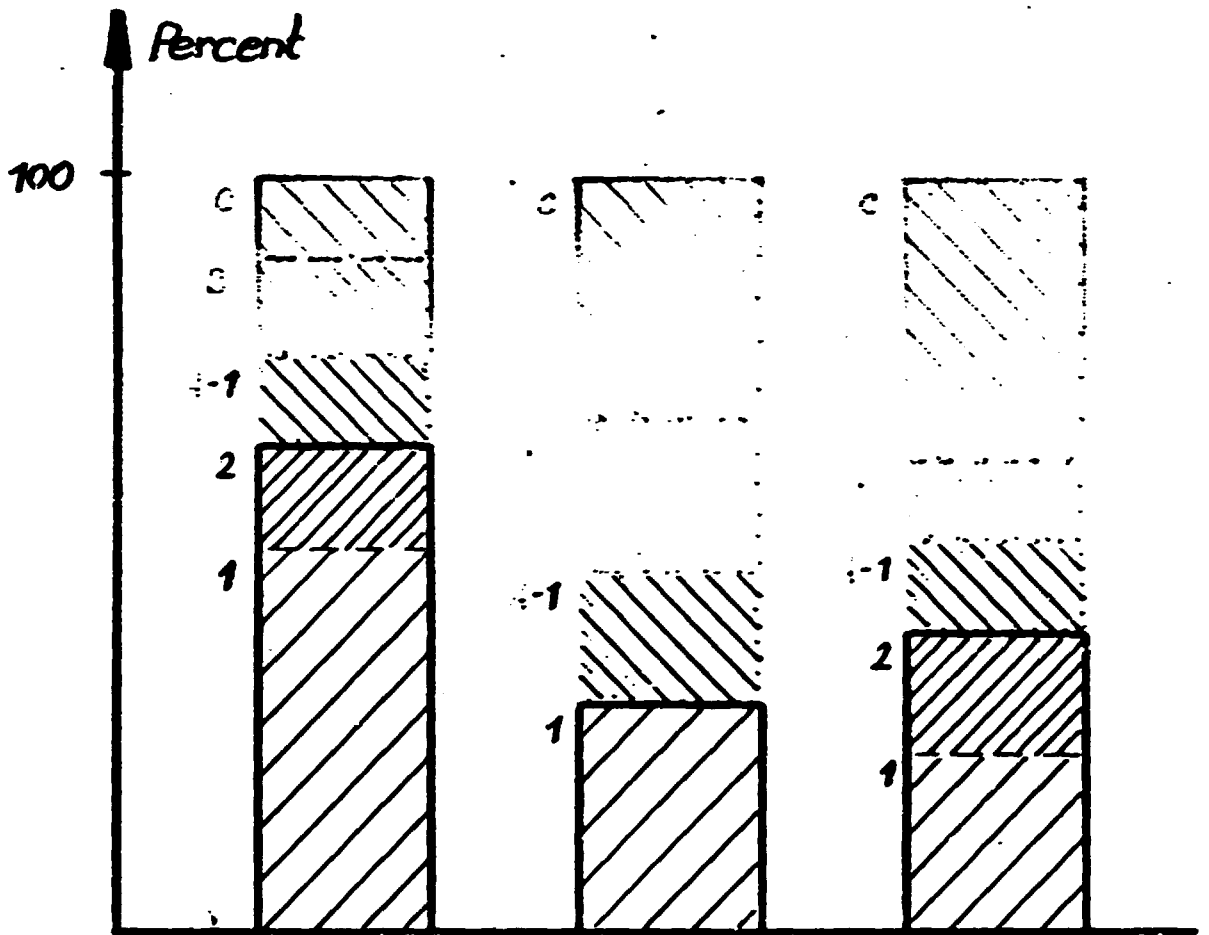


FIGURE 17

VAIS MAINTENANCE SERVICES

Share of Maintenance Costs



Melt Shops

Billet

Bloom

1 - Repairs, Maintenance

A-1

Repair of Spares

2 - Major Modifications

B -

New Spares

C -

Material

VOEST - MAINTENANCE - SYSTEM
MAIN MENU

-
- | *** PROGRAMMES *** | | *** TRANSACTIONS *** | |
|--------------------|----------------------------|----------------------|----------------------------|
| 1 | INSPECTION SCHEDULE | 1 | ADD |
| 2 | RECORD (INSP.) | 2 | UPDATE |
| 3 | LUBRICATION SCHEDULE | 3 | DELETE |
| 4 | RECORD (LUB.) | 4 | INQUIRY |
| 5 | REPAIR: JOBCARD | 5 | CHANGE LINE NO.(INS1&LUB3) |
| 6 | MATERIALS USED | | |
| 7 | PERSONNEL USED | | |
| 8 | WORKSHOP & PURCHASE ORDERS | | |
| 9 | STOPPAGES | | |
| A | DEFECT REPORT | | |
| R | RECORD OF DEFECT | | |

- | | |
|-------------------------------|--------------------|
| P = PLANT INVENTORY STRUCTURE | D = DISPLAY FILES |
| B = BATCHJOBS | C = COPY RECORDS |
| M = MAINTENANCE CODES | E = END OF SESSION |
| S = SYSTEM UTILITIES | |

PLEASE ENTER YOUR CHOICE ..
POS 1 = PROGRAMME POS 2 = TRANSACTION
<HELP> = MORE INFORMATION <2ND>+<PRINT> = SCREEN PRINT

VOEST - MAINTENANCE - SYSTEM

BATCH JOBS

- | | |
|------------------------------|-------------------------------------|
| 1 PLANT INVENTORY STRUCTURE | 11 STOPPAGES |
| 2 INSPECTIONS - LIST | 12 STOPPAGES - BUSINESS GRAPHICS |
| 3 LUBRICATION - LIST | 13 WEAKPOINT ANALYSIS (PERS.&STOPS) |
| 4 INSPECTION SCHEDULE(S) | 14 OUTSTANDING WORKSHOP/PURCH |
| 5 LUBRICATION SCHEDULE(S) | 15 WORKLOAD |
| 6 OUTSTANDING JOB CARDS | 16 SCHEDULE DATA CORRECTION |
| 7 HISTORY OF INSPECTIONS | 17 DEFECT REPORTS |
| 8 HISTORY OF LUBRICATIONS | 18 HISTORY OF DEFECT RECORDS |
| 9 HISTORY OF MATERIAL USED | |
| 10 HISTORY OF PERSONNEL USED | |

- L LIST STORED BATCHJOBS
- I INPUT ERROR-START AGAIN
- P PRINT/DISPLAY BATCH JOB(S)
- R RETURN TO MAIN MENU

ENTER YOUR SELECTION

FIGURE 20

VAIS MAINTENANCE SERVICES

VOEST MAINTENANCE SYSTEM INSPECTION

CAPACITY PLANNING
OPERATIONAL & STANDSTILL TARGET TIMES

DAILY	7 DAYS	14 DAYS	28 DAYS	56 DAYS	84 DAYS	168 DAYS	336 DAYS
0.00	10.70	0.00	44.00	33.30	25.70	31.50	37.00
0.00	13.00	0.00	15.40	3.70	25.50	162.50	387.60

TOTAL TARGET TIME (HOURS) = 793.50

VOEST MAINTENANCE SYSTEM LUBRICATION

CAPACITY PLANNING
OPERATIONAL & STANDSTILL TARGET TIMES

DAILY	7 DAYS	14 DAYS	28 DAYS	56 DAYS	84 DAYS	168 DAYS	336 DAYS
0.80	6.80	2.30	31.70	6.30	13.90	14.40	14.40
0.20	13.70	0.00	11.30	2.00	22.70	9.20	97.60

TOTAL TARGET TIME (HOURS) = 248.30

FIGURE 21

VOEST MAINTENANCE SYSTEM

1987-02-21

VOEST - W O R K L O A D (INS.)

START DATE: 860421 INVENTORY NUMBER: 4100000000 - A199999999

WEEK NO.	FROM	TO	TOTAL N/HRS	OPERATIONAL						STANDSTILL							
				I	F	SF	HF	HSF	L	TOTAL N/HRS	I	F	SF	HF	HSF		
1	860421	-	860427	0								0					
2	860428	-	860504	6.00	.80			2.70	2.50			0					
3	860505	-	860511	0								.60	.60				
4	860512	-	860518	0								0					
5	860519	-	860525	0								0					
6	860526	-	860601	22.40	.80	8.00	8.00	2.90	2.70			2.00				1.00	1.00
7	860602	-	860608	0								.60	.60				
8	860609	-	860615	2.80	2.20	.60						2.10		2.10			
9	860616	-	860622	0								0					
10	860623	-	860629	6.00	.80			2.70	2.50			0					
11	860630	-	860706	1.50	1.50							35.29	1.10	18.60	15.00	.60	
12	860707	-	860713	.60		.60						1.50		1.50			
13	860714	-	860720	15.50	13.00	.80		1.70				9.50		4.60	4.00	.90	
14	860721	-	860727	11.20	3.70	2.30		2.70	2.50			2.60	2.60				
15	860728	-	860803	8.00	8.00							1.20	.60	.60			
16	860804	-	860810	2.80	2.20	.60						2.10		2.10			
17	860811	-	860817	11.40	9.69			1.70				3.89	2.40	.60		.90	
18	860818	-	860824	11.90	5.90	.80		2.70	2.50			4.00	2.00			1.00	1.00
19	860825	-	860831	25.50	25.00			.50				2.60	1.00	1.60			
20	860901	-	860907	.60		.60						3.50	2.00	1.50			
21	860908	-	860914	20.00	17.50	.80		1.70				3.99	1.50	1.60		.90	
22	860915	-	860921	14.10	6.60	2.30		2.70	2.50			3.60	3.60				
23	860922	-	860928	10.80	10.80							9.40	3.20	3.60	2.00	.60	
24	860929	-	861005	3.10	2.50	.60						2.10		2.10			
25	861006	-	861012	9.40	7.69			1.70				1.50		.60		.90	
26	861013	-	861019	9.70	3.70	.80		2.70	2.50			145.60	1.60	72.00	72.00		

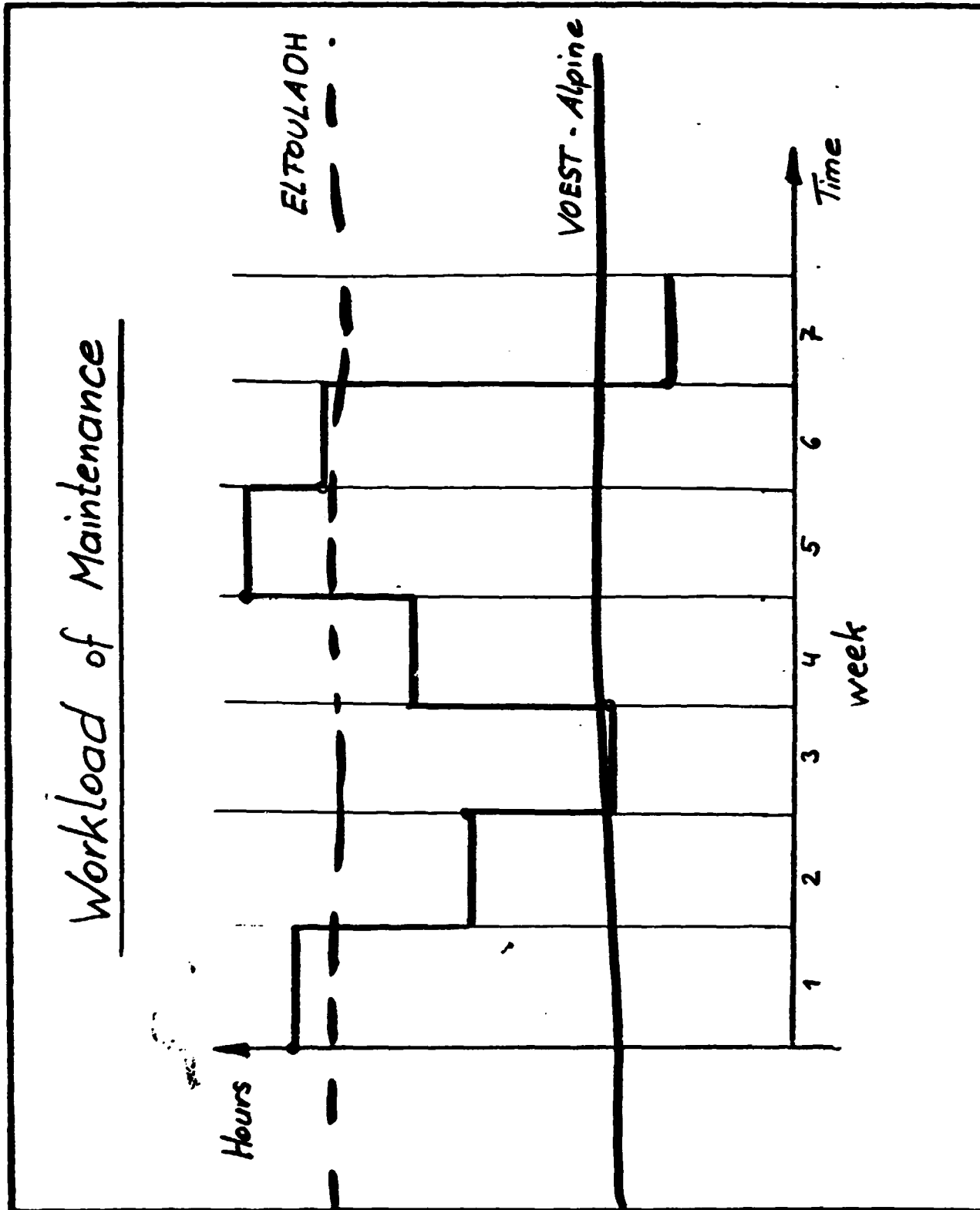
SUM OF MANHOURS 122.40 18.80 8.00 26.40 17.70 22.80 113.10 93.00 6.80 2.00

AVERAGE MANPOWER REQUIRED PER WEEK

	I	F	SF	HF	HSF	L
TOTAL MANHOURS	145.20	131.90	101.00	33.20	19.70	
AVERAGE MANHOURS PER WK.	5.58	5.07	3.88	1.27	.75	
AVE MANPOWER REQD PER WK.	1	1	1	1	1	

FIGURE 22

VAIS MAINTENANCE SERVICES





MAINTENANCE
MELT SHOP & CONTINUOUS CASTING

VOEST MAINTENANCE SYSTEM 1987-02-19

WEAKPOINT ANALYSIS PAGE- 1

DATE: 060101 - 061231 PLANT INVENTORY STRUCTURE: 410000000 - 419999999

INVENT.NO.	INVENTORY DESCRIPTION	O C C U R R E N C E S				D O W N T I M E (HRS)			
		GRAND TOTAL	UNIT TOTAL	ITEM TOTAL	ASSY TOTAL	GRAND TOTAL	UNIT TOTAL	ITEM TOTAL	ASSY TOTAL
41	<u>STEEL PLANT - MECHANICAL</u>	188				3733.57			
411	<u>SCRAP BAY - SCRAP TRANSFER CARS</u>		3			44.00			
411102	No.2 SCRAP TRANSFER CAR			1				24.00	
41110205	WORN GEARBOX				1				24.00
411103	No.3 SCRAP TRANSFER CAR			1				15.00	
41110323	WEIGHT BRIDGE				1				15.00
411104	No.4 SCRAP TRANSFER CAR			1				7.00	
41110425	SHOCK ABSORBER (JARRET BCIG)				1				7.00
4121	<u>MIXERS - No.1 MIXER</u>		5			82.50			
412106	CHARGING SPOUT COVER & DRIVE			3				20.50	
41210607	COVER				3				20.50
412108	MIXER HEATING EQUIPMENT			2				62.00	
41210802	DRIVESHAFT & BEARINGS & COUPLING				1				62.00
41210810	COMBUSTION AIRFAN (out pour.spout burner)				1				
4123	<u>MIXERS - No.2 MIXER</u>		9			1450.00			
412301	VESSEL			2				54.00	
41230102	SPLASH PLATE (charging spout)				1				4.00
41230103	OUTPOURING SPOUT				1				50.00
412303	TILTING DRIVE			4				104.00	
41230312	RACK GUIDE BEARINGS ASSY.				1				74.00
41230313	TOOTHED RACK & SUSPENSION				1				4.00
412306	CHARGING SPOUT COVER & DRIVE			1				112.00	
412308	MIXER HEATING EQUIPMENT			2				120.00	
41230809	AIRDUCTS & VALVES				1				8.00
41230816	GAS SUPPLY PIPES & VALVES				1				112.00
4125	<u>MIXERS - No.3 MIXER</u>		5			87.00			
412501	VESSEL			2				48.00	
41250103	OUTPOURING SPOUT				1				40.00
41250107	TILTING RAN PROTECTION COVER				1				8.00
412506	CHARGING SPOUT COVER & DRIVE			1				6.00	
41250608	COVER				1				6.00
412508	MIXER HEATING EQUIPMENT			2				33.00	
41250802	DRIVESHAFT , BEARINGS & COUPLING				1				21.00
41250816	GAS SUPPLY PIPES & VALVES				1				12.00
4131	<u>LD'S - NO.1 LD</u>		16			117.68			
413101	LD -VESSEL & HEATSHIELD			3				18.00	
41310101	VESSEL SHELL				1				3.00
41310106	SPLASH PLATES (vessel)				1				3.00
41310109	HEATSHIELD (north side)				1				8.00
413102	VESSEL TILTING DRIVE			2				3.68	
41310207	COUPLING (bibby)				1				3.00
41310217	GEARBOX BEARING (east - side)				1				.68
413107	STACK			8				68.00	

FIGURE 24

VAIS MAINTENANCE SERVICES

INSPECTION (WORKLOAD) PLANNING

VOEST MAINTENANCE SYSTEM 1987-02-19 SUMMARY LIST OF INSPECTION INSTRUCTIONS

DATE: 870101-870631 INV.NO.: 000000000-9999999999 STATUS: S

INVENT.NO.	PLANT INVENTORY DESCRIPTION	SCH.NO	S	INT	DATE	ARTISAN	PAGE # 1 TI
1191030000	B.C. 12 (bridge conveyor)	000008	S	336	870609	11	.6
1191040000	BUCKET ELEVATOR & FEEDER V-1 (coke)	000011	S	336	870217	11	.8
1194090000	CHARGING SKIP & DRIVE	000055	S	168	870511	11	1.00
4125030000	TILTING DRIVE	000139	S	168	870427	11	.5
4125030000	TILTING DRIVE	000140	S	336	870427	1F,1SF	3.00
4125060000	CHARGING SPOUT COVER & DRIVE	000144	S	336	870511	11	.7
4131110000	LANCE HOIST SYSTEM (WEST)	000169	S	336	870527	1F,1SF	1.5
4131120000	LANCE HOIST SYSTEM (EAST)	000170	S	336	870527	1F,1SF	1.5
4132110000	LANCE HOIST SYSTEM (WEST)	000195	S	336	870527	1F,1SF	1.5
4132120000	LANCE HOIST SYSTEM (EAST)	000196	S	336	870527	1F,1SF	1.5
4132130000	DRIVE PLATFORM FOR LANCE HOIST	000199	S	336	870527	1F,1SF	8.00
4136010000	NO. 15 BELTCONVEYOR	000220	S	336	870504	11	1.00
4136050000	RAWMATERIAL BUNKERS & DISCHARGE GATES	000226	S	336	870504	11	4.00
4171030000	No.2 TUNDISH CAR & MANUAL STOPPERS	000316	S	336	870427	11	.8
4172110000	OUTGOING ZONE DRIVE "3"	000348	S	336	870310	1F	.1
4172120000	OUTGOING ZONE DRIVE "4"	000350	S	336	870224	1F	.1
4172130000	OUTGOING ZONE DRIVE "5"	000352	S	336	870224	1F	.1
4172140000	OUTGOING ZONE DRIVE "6"	000354	S	336	870224	1F	.1
4173110000	OUTGOING ZONE DRIVE "3"	000384	S	336	870310	1F	.1
4173120000	OUTGOING ZONE DRIVE "4"	000386	S	336	870224	1F	.1
4173130000	OUTGOING ZONE DRIVE "5"	000388	S	336	870224	1F	.1
4173140000	OUTGOING ZONE DRIVE "6"	000390	S	336	870224	1F	.1
TOTAL TARGET TIME (IN HOURS)							29.2