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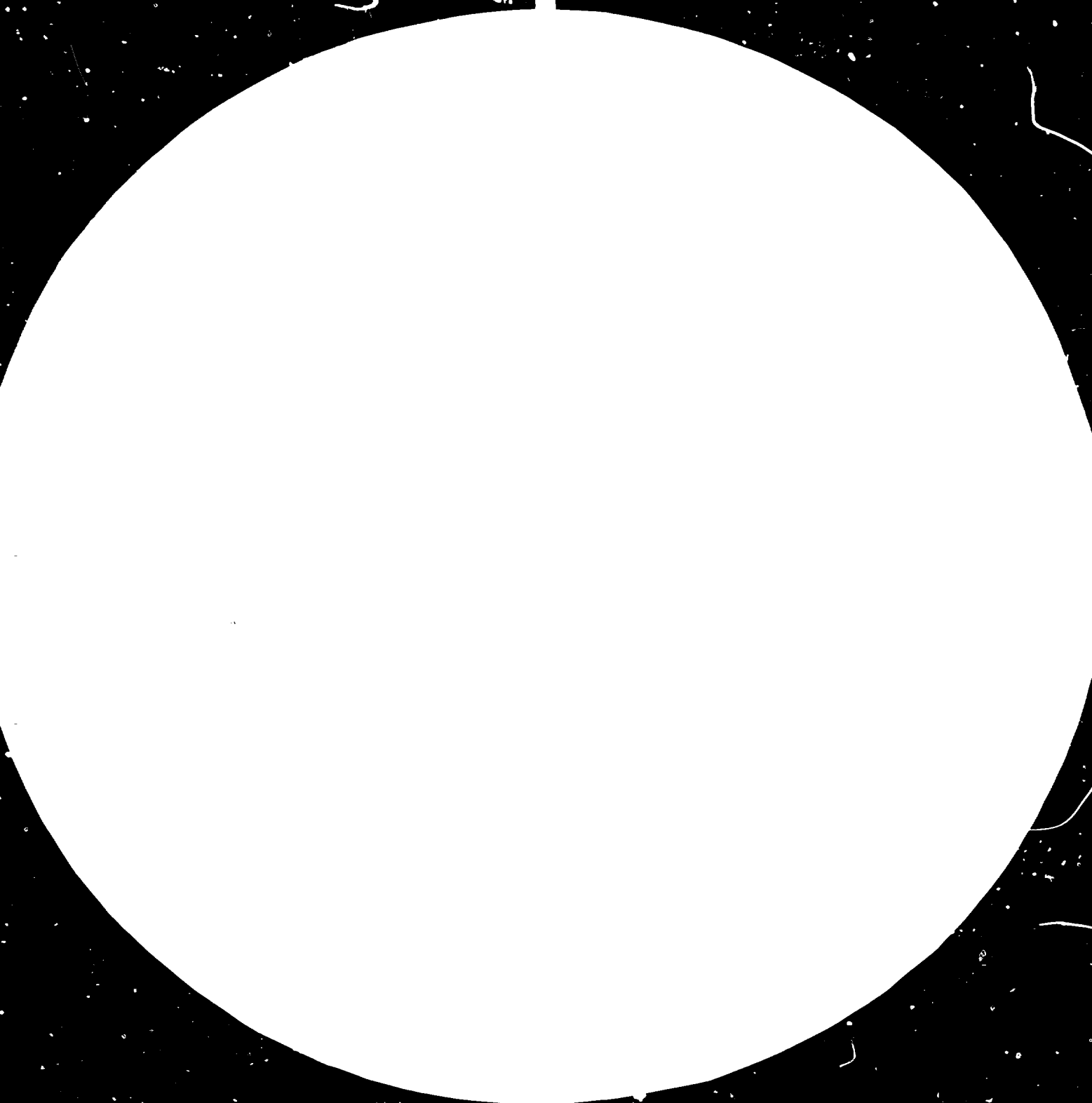

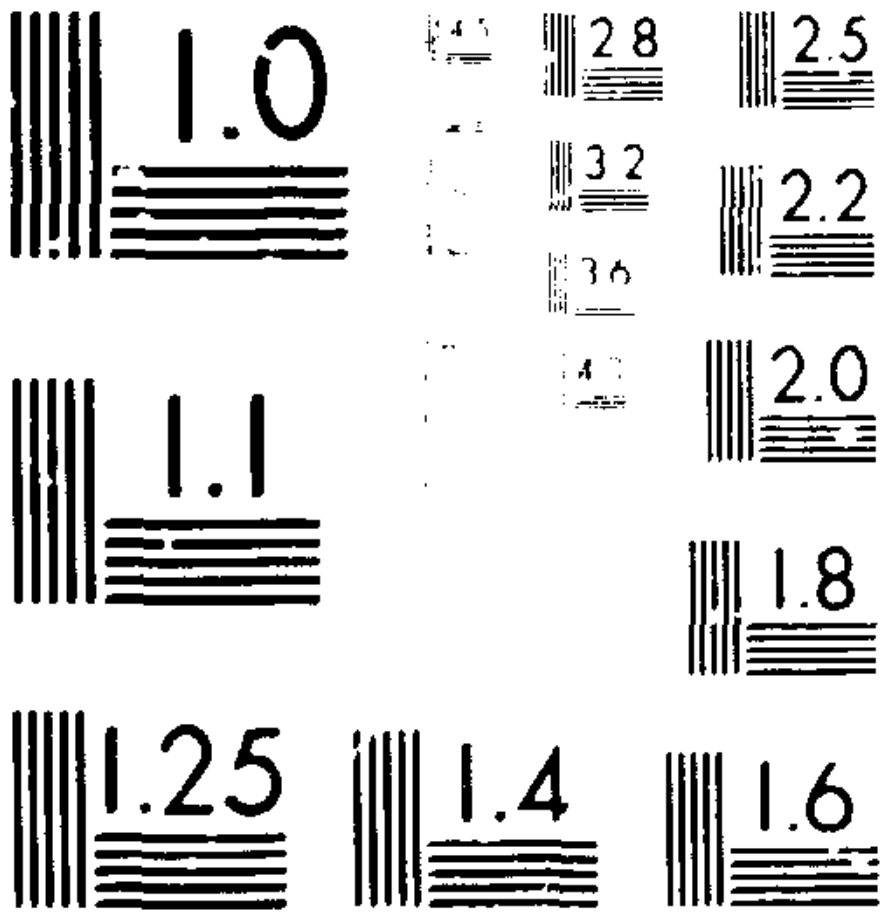

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Technical Conference on Ammonia Fertilizer Technology for Promotion of Economic Co-operation among Developing Countries

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JORDAN PHOSPHATE MINES COMPANY *

by

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Preface

Jordan Phosphate Mines Company (J.P.M.C.) is a"phosphate Rock Producer", which is mainly exported as raw material to fertilizers producers in different countries in Europe and Asia. Also, J.P.M.C., is a partner of "Jordan Fertilizer Industry Company" which will start production of D.A.P. and M.A.P. before the end of this year.

Jordan Fertilizer Industry Company (J.F.I.) depends on the Phosphate Rock produced by J.P.M.C. as the raw material for it's PA (Phosphoric Acid) Plant, while it imports the other raw materials, sulphur, and Ammonia from abroad.

The Arab Potash Company will produce Potash and other chemicals from The "Dead Sea" which is one of the main reservoirs of Potassium, magnesium, Bromine, ... and other salts in the world.

So, Although Jordan has not any Ammonia Plant (till now) but it will be, in the near future, one of the major supliers of High Analysis Fertilizers to the world market, while it is now one of the major phosphate rock producers.

In Jordan, ere is a project to exploit Oil-Shales either to produce electricity by direct combustion or to produce shale oil & other distiliates from the shales. The preliminary studies were carried by NRA (National Resorces Authority) Stuff and several discussions betn NRA, J.E.A. (Jordan Electricity Authority), and N.P.C. (National Planing Council) were carried to decide the optimum method for exploitation the shales.

As we haven't any ammonia plant in Jordan, this report will include the following items :

1. Description of the D.A.P. Plant of J.F.I. CC at Aqaba Sea-Port in South Jordan.

2. General explanation of Oil Shales Project.

Yousuf Abu-Rish
J O R D A N.
Jan, 1982.

Jordan Fertilizer Industry Co. (J.F.I.)
D A P & M A P Plant.

J.F.I. Factory is Located at Aqaba at the Red Sea Coast. The factory consists of the following plants :

1. Sulphuric Acid Plant; two lines of production of 1800 TPD of 98% H_2SO_4 each.
2. P.A. (Phosphoric Acid) Plant, single line of 1250 TPD 100% P_2O_5.
3. Granulation Plant consisting of two units of 50 T.P.H. each of DAP or MAP.
4. One unit to produce Aluminium Flouride of 20000 MT/Year. And other auxialiary units e.g.
   Turbo generators of 2x22 MW capacity, aux boilers of 2x100 T/hr., water treatment plant, and marine Loading & discharging terminal.

The factory is expected to import Ammonia (167000 MT), 370 000 MT Sulphur, and 35000 aluminium hydroxide annually from abroad. While 1.3 million tons/year of phosphate rock will be supplied by JPMC. from Al-Hassa Mine which is 200 Km distance north to Aqaba Port.

Granulation Plant.

The plant consists of two symetrical units of 50 tons/hr. capacity each of DAP or MAP. The plant will work on the basis of 22 hrs per day and 317 working days per annum. The plant is still under commissioning. Production is expected before the end of this year after finishing start-up trials with doesn't start yet. So no technical operational problems arise yet.

Description of the flow sheet

Ammonia liquid at the rate of 11.14 T/H and ρ = 0.682 from its large single storage tank (of 30000 t. capacity, under atmosphoric pressure and -33°C), flows to the ammonia vapourizer and ammonia heater where it is vapourized, then ammonia vapour at 5°C, at a rate of 7.2 T/H flows to the 1st reactor (preneutralizer) where it is mixed and reacts with PA.

PA of 54% P_2O_5 (by weight), ρ = 1.7, 70°C flows at the rate of 23.3 T/H as 100% which is divided into two equals streams the first to meet NH_3 vapour in the preneutralizer and the other stream to the ammoniation tank to meet the underflows of the different gases & vapours scrubbers.

The slurry from 1st reactor is pumped to the cylindrical granulator where it reacts with further ammonia coming from ammonia heater at the rate of 3.92 T/H and 8°C. Then DAP granuels at the rate of 373 T/H goes to the concurrent dryer which consumes 0.8T/H of Fuel Oil (ρ=0.89). Then by a bucket elevator to the screen feed conveyor after passing a magnet at the rate of 370 T/H.

Screens are double deck, the oversize which is + 6 mesh passed to the mills & recyled with the undersize (-14 mesh) on the rate of 320 T/H to the granulator by a belt conveyor & a bucket elevator (also after passing a magnet).

The product of the screens (-6 mesh & + 14 mesh) is directed to counter current cooler, then by a bucket elevator to finishing (polishing) screen at the rate of 56.6 T/H and 54°C. The oversize of the upper deck & the uncersize of the lower deck are recycled to the process while the finished product at the rate, of 50 T/H DAP goes to the Product Bin. All the vapours & gases are sucked to the venturi scrubbing systems and dusts to cyclones.

So the plant characteristic figures are:

Production rate	50 T/H DAP.
NH_3	11.14 T/H
P_2O_5 (as 100%)	23.30 "
H_2SO_4 (as 100%)	2.92 "
NaOH (as 100%)	0.0185 "
Defoamer	0.01
Fuel Oil	0.8
Industrial water	21.0
L.P. Steam	5.08
Desuper Water	0.21
Instrument Air	65 NCM/H
Plant Air	10 NCM/H
Power	252.5 KW.

Note:- Bucket elevators, are not shown in the flowsheet.
Some Lines are joined togetner to prevent confusion.

El-Lajjun Oil-Shale deposit

Oil-shales exploration in different places in Jordan was carried by National Resorces Authority (NRA). Exploitation studies El-Lajjun (100 Km South to Amman and betn the Amman-Aqaba High & Al Karak) deposit was carried by the same authority. The major aim is to supply the country with a new local source of energy. But, I draw the attension that this can be a source to produce Ammonia either as a by-product of some retorting processes directly or by utilezation of a part of the light distillate of the shale oil produced by steam reforming or other process in a suitable low or medium scale ammonia plant.

The proved reserve of this deposit is more than billion metric tons. The weighed average oil yeiled is about 10% wt based on the Fisher assay analysis of cores from 31 boreholes (drilled in 20 square Km). The oil-shale bed of (0 to 86m) thickness lies between a chalky marl layer of (10 to 60m) thickness from surfaces and a phosphate horizon bellow it.

A Retort Plant of 64000 tons/day crude shale oil was sugested by an NRA reseacher using e.g. Tosco II (U.S.A.). process.

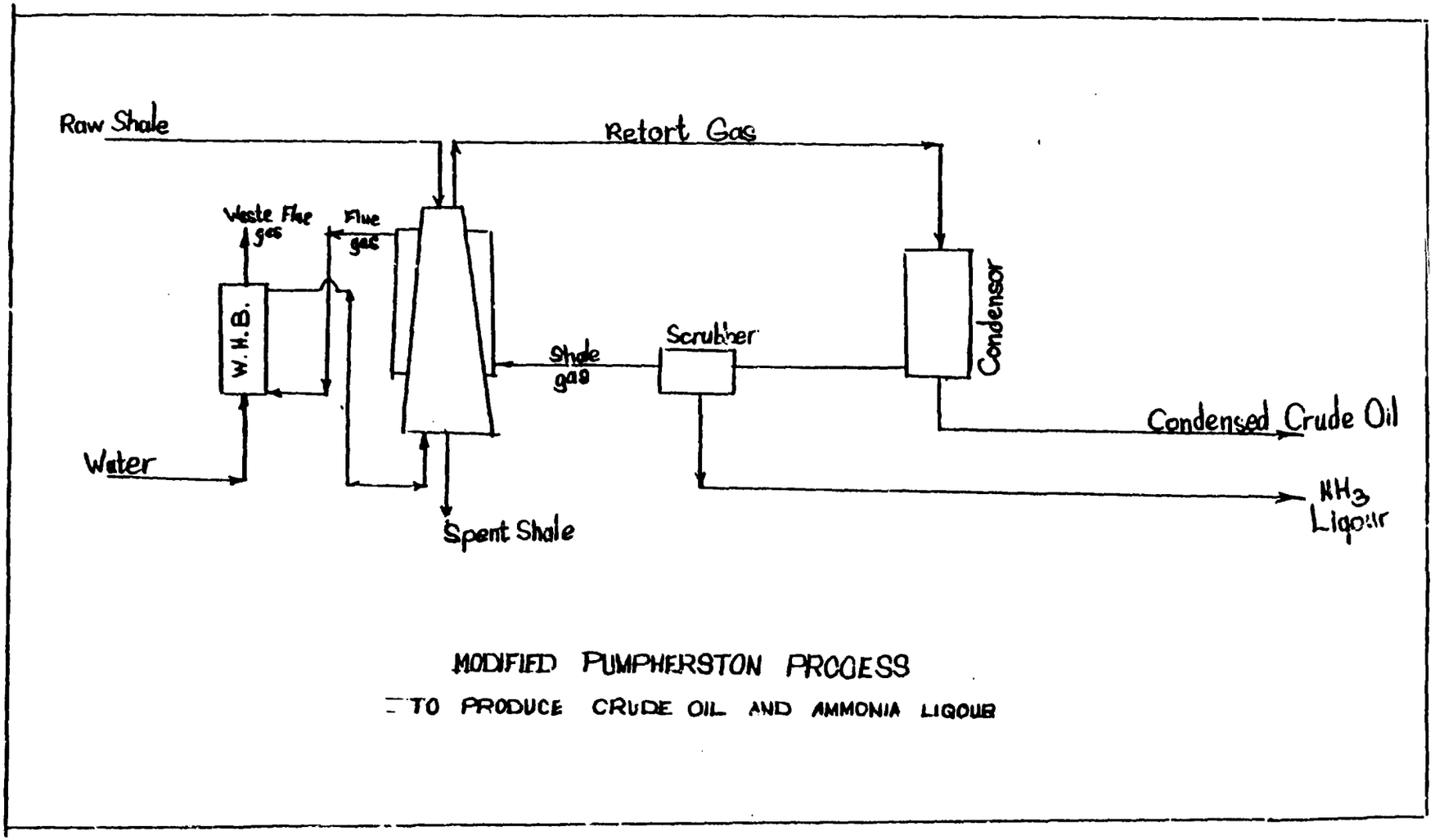
Inorganic Chemical Analysis of Shales:

	Weight %
Loss On Ignition	48.25
Insoluble Matter	0.94
SiO_2	8.64
CaO	31.22
MgO	0.88
Fe_2O_3	1.28
TiO_2	0.23
P_2O_5	0.15
MnO	0.13
Al_2O_3	3.1
Na_2O	0.47
K_2O	0.84
SO_3	3.78
V_2O_5	0.2
Pb (ppm)	45
Cu "	50
Ni "	85
Zn "	250.

Organic matter composition ranges between 22-30% wt. most of it is insoluble in organic solvents(Kerogen) and 2-6% soluble in toluene or methyl cyclo-hexane (betumen).

Analysis of organic matter (both sol. & Insol.):

Shale Oil	54.7
Gas	18.3
Water	5.3
Ash	12.2



MODIFIED PUMPHERSTON PROCESS

= TO PRODUCE CRUDE OIL AND AMMONIA LIQUOR

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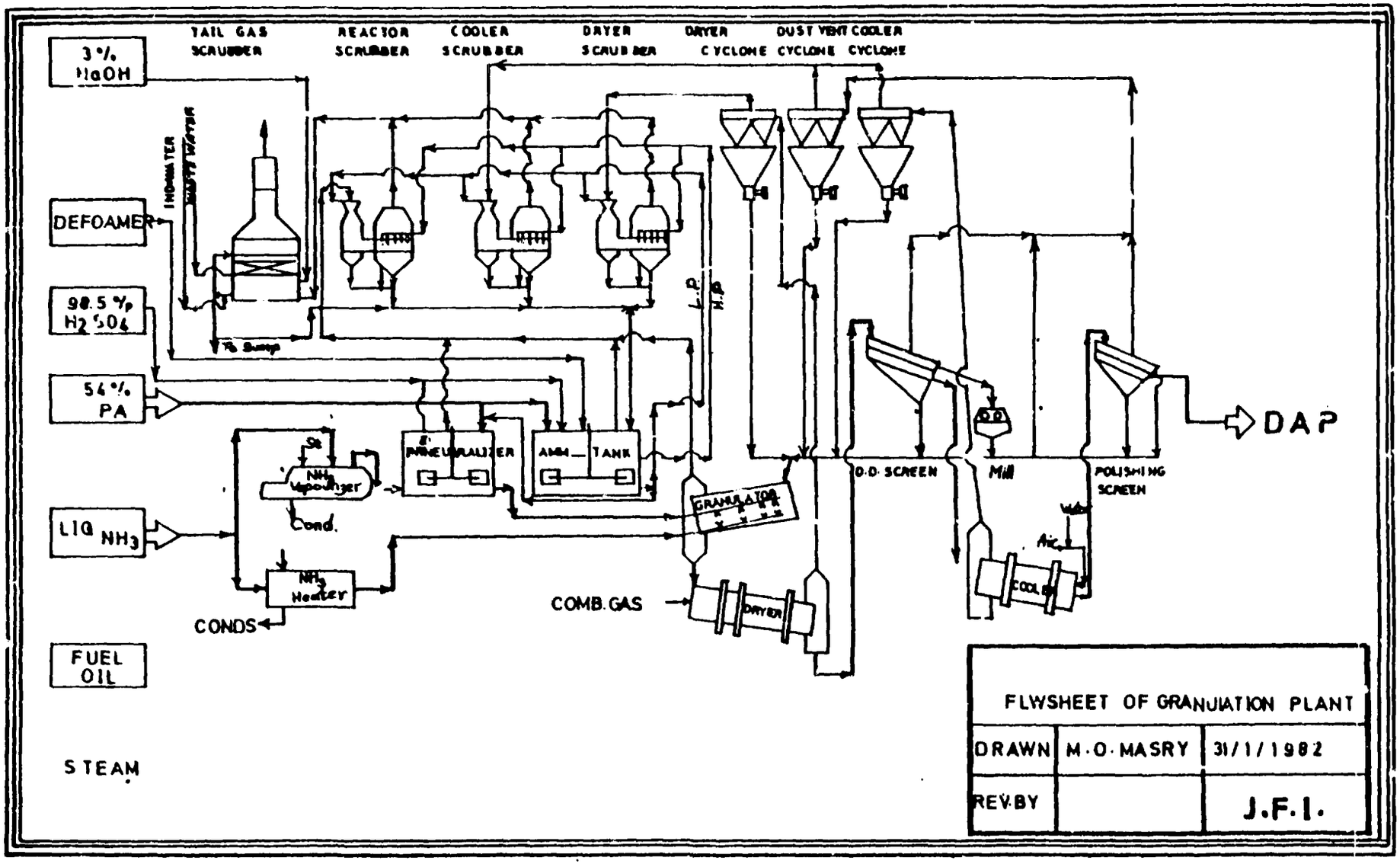
3% NaOH
DEFOAMER
98.5% H2SO4
54% PA
LIQ NH3
FUEL OIL
STEAM
TAIL GAS SCRUBBER
REACTOR SCRUBBER
COOLER SCRUBBER
DRYER SCRUBBER
DRYER CYCLONE
DUST VENT CYCLONE
COOLER CYCLONE
INDUSTRIAL WATER
To Sump
NH3 Vaporizer
Cond.
NH3 Heater
CONDS
PRE-NEUTRALIZER
AMM. TANK
GRANULATOR
COMB. GAS
DRYER
O.D. SCREEN
Mill
POLISHING SCREEN
COOLER
DAP
FLWSHEET OF GRANULATION PLANT
DRAWN
M.O. MASRY
31/1/1982
REV.BY
J.F.I.