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4-X PROGRAM - UO₂ PLANT EXPANSION

JUL 6 1956

INTRODUCTION

This letter is a preliminary report of the status of the 224-U Building Capacity and some of the possible alterations necessary to meet a production rate of 800 tons U/month at this plant. A production rate of 800 tons U/month would consist of the following individual plant rates: TBP Plant, 300 tons U/month (T-Plant, 150 tons U/month; B-Plant, 150 tons U/month); Redox, 200 tons U/month; Purex, 300 tons U/month. The present UO_3 Plant without any changes and using just the electric pots probably could not handle more than about 500 tons U/month and this rate could be accomplished only with close pot cycle scheduling. With minor changes including a new parallel unloading system and a little more calcination capacity (perhaps from the Luckey pots if they can be made to operate at their design rate of about 120 tons U/month), the UO_3 Plant could process 600 tons U/month. A production rate of 800 tons U/month would require considerable additional calcination capacity and some reserve feed concentration capacity. A quick look (based on our capacity studies and information from L. E. Bruns of Separations Technology) at the present UO_3 Plant equipment follows.

FEED CONCENTRATION EQUIPMENT

The E-B1 and D1 primary feed concentrators have adequate capacity to concentrate to 60% UNH the dilute feed corresponding to 300 tons U/month that would come from T and B plants via the TBP Plant. T-B4, the feed stripper, would also be able to process the required 300 tons U/month.

In order to get sufficient 60 to 100% UNH concentration capacity, it will be necessary to run E-D2 and E-D6 in parallel. Each unit is capable of handling about 450 tons U/month, so both units in parallel could concentrate about 900 tons U/month. Since these units are highly susceptible to scaling, a spare unit would be needed to insure production at 800 tons U/month.

The T-D4 Fractionator, that receives the overheads from E-D1, E-D2 and E-D6 and is in notably bad condition, would probably have to be replaced unless the Nitric Oxide Absorption System described in HW-32471 is employed.

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FUME VENT SYSTEM (NO₂ ABSORPTION) EQUIPMENT

The Fume Vent System would have to be "tightened up" to reduce the excessive air inleakage. If this were done, the E-A2 Gas Cooler and the T-A1 Absorber should each be able to recover the NO₂ corresponding to 400 tons U/month or a total of 800 tons U/month. The present instantaneous capacity is 900 tons U/month and this is with 250 scfm air inleakage.

An essential requirement of meeting an 800 tons of U/month rate is uniform composition of the gas from the calciners with a water vapor to NO₂ ratio favorable for NO₂ absorption in E-A2, volume wise about 3 to 1. If continuous calcination equipment sufficient to process 800 tons U/month be installed, perhaps in the place of the Luckey pots, the absorption equipment would not limit the production below 800 tons U/month. If the continuous calciners are not available, the capacity of E-A2 and T-A1 will be limited to about 600 tons U/month because of the tight scheduling that will be necessary.

Large surges of NO₂ evolution instantaneously overload the absorption system resulting in harmfully high concentrations of nitrogen oxides in the off gas from T-A1. If it is necessary to operate at rates in excess of 600 tons U/month using all or part batch calcination equipment, it will be necessary to install a second gas cooler (E-A2), a second acid absorber (TA-1), a second knock out pot, and a second exhausting jet.

CALCINATION EQUIPMENT

The present calcination equipment consists of 18 electric decomposition pots capable of handling about 450-500 tons U/month and two gas-fired Luckey pots designed to handle a total of 120 tons U/month, but which have not been operating satisfactorily to date. The total potential calcination capacity with existing equipment is about 570-620 tons U/month. If 800 tons U/month are to be processed, additional calcination capacity will be needed.

A battery of continuous calciners, of the type presently being tested by the Mechanical Development Group of Separations Technology, installed to carry the complete load of 800 tons U/month is being considered. If all or part batch calcination equipment is utilized, it will be necessary to augment the fume vent system as described previously.

UO₃ POWDER UNLOADING SYSTEM EQUIPMENT

The existing unloading system is presently overloaded at 450 tons U/month. A parallel unloading system for the two Luckey pots is being recommended in a separate study. If this parallel system is installed, the entire unloading system should be able to handle 800 tons U/month. This will be true especially if continuous calciners are installed, since they will be continuously feeding powder to the system at a low rate, thereby reducing surge loads. Minor rearrangement of the parallel system recommended in the separate study will be necessary if continuous calcination is used.

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C-11 VENTILATION SYSTEM EQUIPMENT

It is felt that no extensive changes will be required in the X-11 Ventilation System to meet the desired 900 tons U/month rate. The use of orlon bags might be necessary and perhaps some changes will have to be made in the blowing mechanisms.

TANKAGE, PUMPS AND PIPING

No extensive pumping or piping changes are anticipated. Most of the tanks will still provide adequate hold-up times. The 3000 gallon tank (TK-C-1) that would receive the 60% UNH from Redox and Purex might be too small, but TK-X-2 (100,000 gals) is available for storage and could receive 60% UNH.

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