Abstract: 21

Leuna Works, February 28, 1940.

Report No.

Propositions for changes and improvements in construction of the Lutzendorff - works.-

Summary:

Going over the gas production facilities, Fischer-Plant, Pomerz Plant and general plant working conditions it became apparent that certain changes should be made in the plant.

Following are some technical propositions, which we have discussed during the last three months with the men in charge at Lutzendorff.

The propositions relate to greater safety of the individual plant sections and also to the planned enlargement of the Fischer Synthesis plant to produce 75,000 tons per year.

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Alkazid-Plant (Plant 5 for the Fischer plant)

The alkazid plant was to be charged with steam from the synthesis building, since the exhaust steam and also the steam from the boiler house contains too much salt. If steam scrubbing is used, a condensate pump must be supplied.

A change in piping is suggested for safety reasons.

Each condenser must have 2 receivers, suited for carrying off 15m³ of water. All the receivers have an overflow into a condensed water tank, which must be absolutely gas-tight. The tank is equipped with a syphon in case the pumps are out of order, the container is to be swept out with N_2 when empty. 2 catchpots are inserted in the H_2S piping, (before H_2S enters condenser). The catchpots are intended to catch any possible lye entrainment.

Converting:

In the converter set-up by-passes are suggested so that the various units may be operated independently from one another, that is the present set-up of 3 contact ovens, saturator, cooler, CO_2 scrubber is to be piped up differently.

Safety of operation, etc...

In our opinion it is absolutely necessary to provide a recording oxygen flow water with alarm system at the entrance of the circulating blowers. This is necessary because this part of the synthesis gas cycle between the entrance of the raw coal into the drier and the circulating blower is under a high vacuum, which is liable to become even higher with the installation of the new circulating gas blower.

It is also recommended to equip the entire S.G. cycle, generator-dryer etc...with recording pressure gages, in order to observe variations in pressure caused by switching the flow, etc....

TNK Provision:

A larger reserve dust container is needed. An alternative exists between using a concrete tank or 10-15 Dust Kettle cars.

For the Lamont-Kessel plant, the dust supply is sufficient.

Gasification: (Plant 2 and 3)

Defects were not only found in the Cowper cupola, but also in the drying operation following the generator. It was recommended to have a spare part for every part used in the coal drying apparatus, and possibly to avoid moving parts as much as possible. The suggested "Sichter" built into Generator #4 by Wintershall, is proposed for all generators, as well as the Hammermill suggested by Wintershall. The dust containers must contain an inert gas atmosphere.

Calculations pertaining to the Cowpers and generators (Plant #4) disclose that a greater efficiency results when larger blowers are used. It is proposed to have another additional blower for every generator.

It is suggested to house all the blowers in a central building, and also do the same for all the compressors. In order to use the waste heat from the cowpers, heat exchangers are suggested for the charge entering the Cowpers. Wintershall made the proposition to equip the Schmalfeldt generators with additional oxygen nozzles, perhaps nozzles of the same kind as are found in the Winkler generators. Should those endeavors prove successful, the Schmalfeldt generator gas should contain less N_2 and CH_4. If, however, it was desired to get along with the present N_2 and CH_4 contents in the Schmalfeldt gas, we would suggest for the High Pressure hydrogenation to practise separate oxygen gasification for 10-11,000 m^3 of Watergas. Thus it would be possible to have 95% pure H_2 available for the hydrogenation. The gas from this oxygen gasification would have to be cleaned in the Alkazid-plant, or, considering the low sulfur content only, an iron oxide box would be sufficient.

Enlargement of the gasification plant to 75,000 tons per year.

a: With Schmalfeldt generators:

The summary report of plant #5 shows that with the present state of gasification, the quantity of gas produced is insufficient for the production of 75,000 tons per year of Fischer Primary product. Including hydrogenation about 113,000 standard m^3/hour of synthesis gas have to be supplied. The corresponding quantity of fuel gas has to be about 140,000 std. m^3/hour. For the production of the S.G. 4-5 Schmalfeldt have to be in operation, taking into consideration the new installation of larger

blowers. Hence 2 new Schmalfeldts have to be added to the existing 4 Generators.

For the fuel gas requirements, the present fuel gas generators would be sufficient. But it is advisable to add another 30,000 m^3 fuel gas generator, and keep same in reserve.

b) With Oxygen gasification:

If the Oxygen gasification is carried out in rotating grate generators, the capacity of 75,000 tons/year (100,000 std. m^3/hr S.G.) may be attained with 4 modified Schmalfeldts and one in reserve. Hence here only the addition of one S. G. generator would be required.

For the production of the required 122,500 m^3/hr of fuel gas the presently installed Heating gas generators will suffice.

For the rotating grate generators 1400 std. m^3/hr of oxygen would be sufficient. 2 additional small Linde units are called for.

c) With Cracking Cowpers:

For this procedure about 79,500 std m^3/hr S.G. and 39,000 std m^3/hr of cracked gas are required. Either 2 cowpers with 4 m I.D. or one cowper with 5.7 m I.D. are needed. Another S. G. generator is needed for reserve. The present fuel gas generators seem to suffice.

We are of the opinion that the most suitable and cheapest enlargement to 75,000 tons per year may be accomplished by installing another Schmalfeldt-generator for reserve, and to gasify Hartgrude* with Oxygen in rotating grate generators.

Generator gas-plant:

In order to prevent sconfication of the entrance of the Waste heat Kettles, we have suggested to bring the entrance gas temperature down to 850-900°C. The water injection system, used on S.G. generators proved successful after proper injection nozzles were used. The suggestion by Wintershall to use cold circulating gas, instead of Water is still more suitable, since thus such heat losses are avoided, which normally are connected with the evaporation of water.

The flying dust thus far precipitated in the scrubbers of the gas generating plant is proposed to be collected in multicyclones, and used as fuel in the Boiler house.

We are of the opinion that it is more advantageous to supply the air preheaters for the gas generators exclusively with gas instead of dust. The dust should go to the synthesis plant or Boiler house.

* Trade name of a certain German bituminous coal.

VII.

Leuna Werke, February 17, 1940

Calculations on the increase of efficiency of the Schmalfeldt-Generators, by increasing the blower capacity:

With respect to the gas requirements of the low pressure and high pressure synthesis, a greater efficiency of the Schmalfeldt generator is desirable. This increase in efficiency may be obtained by higher gas circulation. However, a better efficiency only will result if the circulating gas is heated sufficiently high in the cowpers.

A. Precaution on the Cowpers:

The cowpers are constructed such that the heating area may be increased by about 8.3%. This provision also permits to generate approximately 8% more S.G. provided the circulating gas quantity is increased in proportion. The temperature conditions will not change in the cowper.

The second possibility to use the cowpers to better advantage is to reduce the heating and gasing times, and at the same time increase the circulating gas quantity. By this measure the average temperature of the circulating gas leaving the cowper is not changed either, merely the temperature drop is smaller over certain time periods. The following calculation will show how the temperature conditions, heat transfer-coefficients and heat quantities adjust themselves in the cowper under the mentioned conditions: