

KCBraun
5-21-47

Liquid Phase Operating Difficulties
at Rheinbraun, 1942
By Becker, Ludwigshafen, 5 June 1942

The difficulties due to caviar formation and coking of converters has apparently been largely eliminated by injecting cooling oil instead of cold gas. At present, however, trouble with heat exchangers, which limits their operating life to 60-80 days, represents the operating bottle neck.

The K-values of the heat exchangers deteriorate from 250 to below 100 within a month. Fine, hardened coal paste is deposited, which does not consist primarily of lignitic fibers or coarse coal particles. The screen analysis of the deposits from the heat exchangers indicates only relatively few particles coarser than the coal paste:

H.E. deposits: Oversize on 10000 mesh screen = 30%
Coal paste: " " " " " = 12-13%

No direct plugs of individual tubes has yet occurred. Therefore, no tubes have broken up to this time, with one exception, nor has any wear-through been observed.

The pressure difference of an entire stall has risen from an initial 18 atm to 35 atm, divided as follows:

H.E. (charging pass)	16 atm
Preheater	12 " , (8 atm to start)
Converter	6 "
H.E. (return pass)	2.5"

Since the K-values of the preheater are still good, the encrustation is possibly at the preheater outlet. The main pressure difference is in the cold heat exchanger. To eliminate these difficulties we must do the following:

- 1) Increase the temperature in the cold heat exchanger, since it is too low.
- 2) The velocity in the heat exchanger is too low at 0.5 m/sec. and must be increased, first to an extreme of 1.2 m/sec. For this purpose the shop at Huls is reducing the cross-section of the heat exchanger and removing the two outer rows of tubes.

The temperature at the inlet to the heat exchanger is increased by preheating the gas in a gas heat exchanger and subsequently in 2 gas coils; only the second heat exchanger is then used as paste heat exchanger, see Fig. 1. This arrangement also has this advantage, that the gas heat exchanger can still be used after a stall overhaul.

Since we still lack measurements of the viscosity of coal paste, which are very important for judging the preparation, such measurements are to be made shortly in Leuna and Ludwigshafen.

Desanding converter I has presumably done nothing to prevent caviar. The ash analysis of the desanded material (Entsandung) shows no enriching of specifically heavier constituents and resembles the analysis of the letdown (Entschlammung). The solids content of the desanded material equals about 30% and the coal is converted over 80%.

The cooling oil pumps have been connected to a recycle loop (Ringleitung). Cold catch pot heavy oil is used as cooling oil. Twice as much cooling oil is run as the stalls consume. The line has a large surge tank with gas cushion above it. The line is 45 mm in diameter, but both line and surge tank have been found too small and should be enlarged. When a stall is changed over from cold gas to cooling oil, it is found that the adjacent stall is affected by it. It is necessary that a piston differential manometer be used in the expansion of the cooling oil. Naturally, the stall temperature is more difficult to control with cooling oil than with cold gas, but the operators have apparently got used to this more difficult operating method.

The third coal stall will be started in July. At the same time the hygas splitting plant will be ready to start. Desanding has been eliminated in the third coal stall, the paste heat exchanger with reduced cross-section will be installed and heat exchanger and preheater arrangement shown in Fig. 1 will be used.

Table I shows the most important data and results of the present operating method.

TABLE I		
	Stall 3	Stall 4
Days operating	60	36
Catalyst	6% Bayermass +2% Sulfur, colloidal, based on dry br. coal/6% H ₂ O.	
Thruput	29-32 tons, including cold letdown.	
Cold letdown recycle,	15%, based on coal paste.	
Solids in paste	41-42%	
Pure coal in paste	30-31%	
" " thruput	9-10 t = 0.3 kg/Ltr.	
Inlet gas	3300 m ³ = 1.1 m ³ /kg paste.	
Cold "	0	
Cooling oil	7 m ³	
Pressure	570 atm	
Temperature	24.5 mV	
Pasting oil, % solids	2-3.5	
" " % asphalt	6-7	
Letdown, % solids	12-18	
" " % asphalt	10-12	

T-365

FIG. 1

948

