

Gelsenkirchen-Horst, October 30, 1943. Clogging of Hot Separator of Coal Chamber #2.

A sludge containing a soft mass of 0.39 to 0.78" thickness adhered to the walls. The interior of the vessel was almost completely filled with coke. The presence of the salve-like mass on the walls can be explained by the cooling effect of the walls. The solid coke had the following analysis:

Ash	-	13.7%
Volatile Matter	-	20.1%
Iron in Ash	-	21.8%
Sulphur	-	1.52%
Temperature of Formation	-	932°F.

Figure 1 shows a typical microphotograph of the coke. The coke has been formed near the walls and has grown towards the center of the vessel. The right side of the photograph shows the channel through which products could still pass. The degasification of the coke resulted in the formation of fissures which later on filled with newly-formed asphalt coke.

Figures 2 and 3 show the asphalt coke at the edges of the fissures. According to the analysis, the coke had been principally formed from oil, asphalt and sludge.

The crystallization nuclei for the coke formation are furnished by iron sulphide ores which are found partly in the coal and partly in the catalyst. These iron sulphides can react as follows when the product mass is either not in motion or flows only at a low speed and is, at the same time, cooled.  $6 \text{ FeS} + 4 \text{ O} = \text{Fe}_3\text{O}_4 + 3 \text{ FeS}_2$ .

Figure 4 shows the product of this reaction in the coke. The interior consists of high temperature coke of very fine grain surrounded by  $\text{FeS}_2$ . The outer layer consists of  $\text{Fe}_3\text{O}_4$ . The spontaneous reaction liberates enough heat to initiate coking of the contents of the separator.

The low temperature of formation of the coke, about 932°F., indicates that sufficient cooling (hydrogen and flushing oil) is of main importance in the operation of the separator. The flow of the separator product must under no circumstances be permitted to stop since otherwise the crystallization of the iron sulphide cannot be prevented.



70.1



V = 1 : 200

