

FILM STUDY GROUP
REPORT ON MICROFILM REEL NO. 24
Prepared by
BUREAU OF MINES

T. O. M. Reel No. 24Item
No.

1. A flowsheet showing the usual items. It shows the flow for the DHD process, AK process, KK process, alkazid-wash, and gas reworking.
2. Simply a plot plan with equipment layout.
3. Same as Item 2.
4. Flowsheet of a hydro plant.
5. Flowsheet of DHD plant.
6. Flowsheet of catalyst cracking plant.
7. Flowsheet of gas recovery system.
8. Low-pressure gas - H₂ purification.
9. Flowsheet of caustic and water washing of gasoline and wet-gas.
10. Detail flowsheet of C₄ dehydrogenation and alkylation.
11. Flowsheet - wet-gas piping manifold.
12. Flowsheet - fuel gas system.
13. Plant material balance. Flowsheet for gas and gasoline.
14. Plot plan of air inlet piping to Linde plant.
15. Flowsheet - sulfur balance.
16. Flowsheet of catalytic cracking plant.
17. Layout of emergency drop-out lines.
18. Same as Item 17.
19. Flow sketch of Ku-plant.
20. A piping layout, showing steam and condensate lines.
21. Plan and elevation of hydro-distillation equipment.
22. A piping flowsheet interconnecting various distillation units with each other.
23. Piping elevations of gas plant.
24. Bill of materials for Item 23.
25. Catalytic cracking reactor drawing.
26. Drawings of valves pertaining to Item 25.
27. Detail drawing of Item 25 - brickwork.
28. Piping diagram for distillation set-up.
29. Reactor cooling coils.
30. Gas yields.

31. Reaction chamber setting.
 32. Piping details.
 33. Piping details.
 34. Arrangement of reactor and apparatus.
 35. Flowsheet.
 36. Dumping apparatus for reaction chamber.
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37. General flowsheet.
 38. Hydrogen purification and solution flowsheet.
 39. Piping details.
 40. Piping details.
 41. Piping details.
 42. Low-pressure gas recovery. Drawing pertaining to catalytic cracking pilot plant.
 43. Flowsheet alkyl-chloride pilot plant.
 44. The solubility of OH_4 and H_2 in heavy benzine. A graph showing solubility of the gases at various temperatures at a partial pressure of 1 atmosphere.
 45. Heat of dilution of H_2SO_4 . (graph)
 46. Heat of dilution of HCl "
- 47-48. Hottel charts (radiation)
 49. Alignment chart for obtaining vapor pressure and fatty alcohols.
- 50-52. Cox charts (vapor press. vs. temp.) for amines, acids, alcohols, aldehydes, ketones.
 - 53-58. Contain a few sketches on slugging producer, proposed change of cooling system, piping scheme, and some maps of secret plants.

Bag No. 1928, Target No. 30/4.03

1. Thirty-three pages. Some fundamental data is reported such as:
 - a. Increase of vapor pressure of hydrocarbons due to superimposed pressure.
 - b. Solubility data of H_2 , N_2 , and CH_4 at 700 atm. in the "Abstreifer", in the sludge, and in wash oil. This information seems to be reliable.
 - c. Some speculations in the formation of gas-hydrates.
 - d. Some operating data.
 - e. K-values (apparently Henry's law constants) for CH_4 , C_2H_6 , C_3H_8 , n - and i - C_4H_{10} , and C_5H_{12} .

- f. Three curve sheets giving equilibrium data on the formation of gas hydrates of hydrocarbon mixtures at 35°C.; (hard to read) and a few melting point curves of CH_4 - C_2H_6 - C_3H_8 - and C_4H_{10} -hydrates.
 - g. Two pages dealing with further processing of Böhlen tar.
 - h. Considerations on the stability of hydrocarbons being made up of 4 benzene rings.
 - i. Physical properties of German crude oil.
 - j. Some operating data on the refining of crude oil.
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2. Liquid phase hydrogenation. This is a total of 170 pages, containing the following major items.
 - a. Chiefly operating data on equipment operating on commercial scales (Politz, Nordstern, Ludwigshafen). Telephone conversations and memoranda between people interested in the performance. This is not strictly work carried out for commercial purposes, but includes considerable suggestions intended to improve the processes. However, it could not be classified as research and development work.
Data is given pertaining to tar hydrogenation, hydrogenation of bituminous coal under various pressures.
 - b. A short report on hydrogenation of coal and the liquid phase development since 1933; it discusses hydrogenation as a function of properties of the coal, influence of pressure upon hydrogenation, and development of sump phase since 1933.
 - c. Contribution to the knowledge of chemical constitution of asphalts, obtained from coal hydrogenation and the sump phase. Differentiation between Bitumen and Asphalt Chemistry of asphalts. A literature survey. Development of sump phase catalysts.
 3. Vapor-phase hydrogenation. A total of 39 pages containing chiefly information on:
 - a. Experiments with iron-containing catalysts and reactions using WS_2 .
 - b. Development of poison-resistant catalysts. This is not actually a report of development work, but rather a report having to do with what had been accomplished in earlier years and what is to be suggested.
 - c. Cost data on the operation of three hydrogenation stalls. (Some of this is rather difficult to read). A heat balance for each stall is included.
 - d. Silicon sulfide. Investigation of the cause of deposits (of silicon sulfide it seems) during gasification and combustion of hard coal. An inorganic chemical study of the formation of sulfides, oxides of various metals. Reduction of As_2O_3 . Thermodynamics data on As_2O_3 , AsH_3 , As_2S_2 , As_2S_3 etc.
 4. Engine testing. Use of iso-octane.
 5. The influence of the addition of aromatics, naphthenes, ether, alcohol to benzene. Knocking properties. Various "knock-limit" curves shown for the above mixtures.
 6. Knocking properties of Fischer-Tropsch polymerbenzene. Influence of various quantities of Pb upon the octane number. (Includes 9 graphs relating to percent Pb in gasoline with octane number.)

7. Ethylene production from coke-oven gas. Various sketches showing the flow of material for the removal of ethylene from gases. Activated charcoal isotherms of ethylene are reported. One proposed technique for removal of the ethylene is compression and cooling; another technique is to adsorb C_2H_4 on activated charcoal.
8. Electrode material for aluminum manufacture. Report on the treatment of coke for improvement to be used as electrodes.
9. Synthetic alcohols. Development of CH_3OH synthesis and catalytic high-pressure hydrogenation. Reaction between CH_4 , H_2O , and CO_2 for the formation of synthesis gas $2H_2 + 1CO$. This work was carried out in connection with the CH_3OH synthesis, and has no new information to disclose. (Rather complete data is given on the $CH_4 - H_2O - CO_2$ reaction.)
10. Reports on paraffin oxidation (synthetic fats). The work has to do with the disposition of sludgy material obtained as by-products from oxidation of paraffins. Some work is described on hydrogenation of oxidation products of paraffins and soaps. Studies on oil soluble soaps included. Washing performance of such soaps is studied. Some of the work is also carried out with the aim of finding synthetic food stuffs.
11. DHD process. Technical data of process are reported. Flowsheets, and a list of the more important pieces of machinery and apparatus required for the DHD process are given. Typical stall arrangements are shown.
12. On the formation of butadiene and acetylene through the action of high-frequency currents upon ethylene. This is a short report.

Production of acetylene in the electric arc. Three conditions had to be met in order to make the process possible:

1. Electric energy had to be cheap.
2. Sufficient quantities of gaseous hydrocarbons had to be available
(4 kg. C_3H_8 /kg. C_2H_2)
3. The possibility had to exist to re-use the unspent gases in the electric arc after the C_2H_2 was removed.

Flowsheets. Graphs are included relating to electrical energy required and C_2H_2 formed from C_3H_8 . There are other graphs also showing the effect of the addition of higher molecular weight hydrocarbons to hydrocarbons in illuminating gas in the production of C_2H_2 in the electric arc.

Some work is reported on acetaldehyde formation from unpurified electric arc gases.

Thermodynamic data are reported for the C_2H_2 production process.

Considerable details are revealed on electrical set-up for acetylene production.

Arc processes are described for production of butadiene from Vinyl acetylene.