

SECTION 2

SUMMARY

Thirty-two processes were investigated. At the start of this survey a list of over 60 contending processes was compiled. Of these, 32 were judged worthy of detailed investigation within the limits of time and resources available. Processes were deleted for various reasons: some appeared too similar to warrant separate study; some had insufficient data sources for evaluation, or had been deactivated by the developers. The remaining 32 processes are considered to be representative of emerging coal liquefaction technology.

The survey attempted to cover the current state of the coal liquefaction art. The status of development is quite broad and ranges from conceptual through bench scale, pilot scale, to commercial. Some commercial processes are reported here since they serve well as a datum to assessing a developing process and would require significant adaptation for the installations required.

PROCESS INFORMATION EXTRACTS

Section 3 contains an extract of data and descriptions of processes surveyed. The Process Information Extracts follow a format to the extent that data were available to allow a format. Block flow diagrams are included at the end of each process description for ready reference. The depth available of information varies from process to process. In some cases data was restricted due to the proprietary nature of the process. Some requests for information were honored fully and promptly. Others were responded to briefly or tardily, or not at all. We recognize that the development status may change rapidly for a number of the processes in this survey, while for many the status may stay relatively dormant for some time to come. We expect, however, that the information contained in this Data Source Book will remain useful for a reasonable period of time.

PROCESS CLASSIFICATION SYSTEM

As the survey progressed, the need for an identification system more useful than the process name alone became apparent. Categories were developed and expanded to help sort out and keep track of the processes. A number was assigned to each as well.

While the categories are somewhat arbitrary, they are logical for purposes of this study. Following are the 32 processes tabulated according to this classification system.

1. Hydroliquefaction
 - 1.1 Direct, Non Catalytic
 - 1.1.1 Solvent Refined Coal (SRC-I)
Solvent Refined Coal (SRC-II) (Pseudocatalytic)
 - 1.1.2 UOP Extraction
 - 1.2 Direct, Catalytic
 - 1.2.1 Gulf Catalytic Coal Liquids (CCL)
 - 1.2.2 SYNTHIOL
 - 1.2.3 H-Coal
 - 1.2.4 Clean Fuel from Coal (CFEC)
 - 1.2.5 CONOCO Zinc Halide Hydrocracking
 - 1.3 Indirect, Donor Solvent
 - 1.3.1 Exxon
 - 1.3.2 ADL Extractive Coking
 - 1.3.3 Consol Synthetic Fuel (CSF)
2. Pyrolysis
 - 2.1 Direct
 - 2.1.1 Char-Oil-Energy Development (COED-RMP)
 - 2.1.2 Char-Oil-Energy Development (COED-FMC)
 - 2.1.3 Occidental Coal Flash Pyrolysis
 - 2.1.4 TOSCOAL
 - 2.1.5 Lurgi-Ruhrgas
 - 2.2 Hydrocarbonization
 - 2.2.1 U.S. Steel Clean Coke
 - 2.2.2 Coalcon
 - 2.3 Rapid Hydrogenation
 - 2.3.1 BNL Rotating Fluidized Bed
 - 2.3.2 Short Residence Time (SRT) Hydrolypyrolysis
 - 2.3.3 Intermediate Coal Hydrogenation
 - 2.3.4 Schroeder's Rapid Hydrogenation
 - 2.3.5 BNL Flash Hydrolypyrolysis
 - 2.3.6 Rockwell Direct Coal Hydrogenation
3. Indirect
 - 3.1 Fischer-Tropsch
 - 3.1.1 Flame Sprayed Catalyst
 - 3.1.2 ARGE
 - 3.1.3 SYNTHIOL
 - 3.2 Methanol
 - 3.2.1 High Pressure Methanol
 - 3.2.2 ICI LP/LT Methanol
 - 3.2.3 Lurgi LP/LT Methanol
 - 3.2.4 Three Phase Methanol Synthesis

- 5.5 Other
 - 5.5.1 M-Gasoline (Mobil)
- 4. Miscellaneous
 - 4.1.1 Supercritical Gas Extraction (SCE)
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REFERENCES

Information was gathered by direct communication with developers and the literature was reviewed. A bibliography is included under Section 4 - REFERENCES. The reference numbers are cross-indexed to the process classification number as assigned above. At the end of each Process Extract the pertinent references for that process are repeated.

FORMAT

The Process Information Extracts were composed in the format outlined below to the extent that the data and process permitted.

- Process No. (Name)
- Process Type (Category)
- Main Products (General)
- Development Status (Level)
- Process Developers (Names)
- Process Sponsors (Names)
- Process Description (Narrative)
- Operating Conditions (Tabulations)
- Products (Tabulations, Analyses, Characteristics)
- Process Efficiency (Tabulations)
- Unique Features of Process (Narrative)
- Process Status
 - Development Status - Narrative
 - History - Narrative
 - Problem Areas - Narrative
- References - Numbered Listing