PS8000: Process Simulator Suite

The PS-8000 is a simulation software package with rigorous and detailed simulation models of Paper & Pulp, Metal Processing plants and other special chemical process units. The benefits of this package are:

For Academic

- Industrial Exposure for Students.
- In-depth Process Understanding.
- Carry out In-house projects.
- Sound Fundamental Concepts of Process Control and safety with DCS Operations.
- Understanding the Intricacy & Complexity of process dynamics.
- Employability

For Industries

- Improved Plant Safety.
- Smooth Startup & Shutdown.
- Evaluation of Operator Proficiency.
- Faster Recovery from External/Internal Process Disturbances.
- Increased familiarity of Controls & Interlock Systems.

The package consists of simulation models for paper & Pulp, metal processing plants including Copper and Iron & Steel. The Models simulate a Metal processing plant with basic controls, Instrumentation systems and field devices. The Instructor can invoke malfunctions, disturbances and instrument failures and evaluate the trainee performance. Trainee can perform normal operations, emergency operations as well as startup / shutdown operations on these models.

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PS-8001: Copper Smelting Unit:

The model simulates a Copper Smelting Unit which converts concentrated Copper ore to 99.9% pure copper. Major sections in model are:

- Flash Smelter: Copper Concentrate blend mixed with flux (SiO2) is fed to the smelting furnace, where enriched air added with oxygen is fed to furnace. The smelting reaction takes place at Furnace temperature around 1200°C. Furnace produces Copper Matte (~60% Cu); Copper Slag (~1% Cu) and Sulphur Di-Oxide Gas (SO2). Both Copper Matte (~60% Cu) and Copper Slag (~1% Cu) is tapped to Settling furnace and Sulphur Di-Oxide Gas (SO_2) is transferred to Sulphuric acid plant through a closed pipeline.
- Copper converter: Converters will be used to Convert Copper matte to Blister Copper (~98% Cu). Converting is oxidation of molten matte to form molten 'blister' copper (~ 98 % Cu). It entails oxidizing Fe and S from the matte with oxygen-enriched air.
- Anode Furnace: Anode furnaces will be used to make anode copper (~99.5% Cu) from blister received from Copper Converter. Residual Sulphur is removed by oxidation followed by oxygen removal by reduction. This results in 99.5% pure copper that is finally sent to Electrolysis section for enhancing purity to 99.9%

PS-8002: Iron & Steel Processing Unit:

The model simulates a direct reduction Process that converts iron oxides containing roughly 67% Fe, which is fed to the furnace in the form of lump and pellet, to high purity directly reduced iron (DRI).

The major equipment of a Direct Reduction Plant includes

- Shaft furnace: The Iron Oxide fed from the top, is carried down to Bottom by the shaft furnace, having hydraulically operated shafts and is discharged from the bottom in the form of DRI (Direct reduced Iron).
- Gas handling system: Spent Gas after reduction cooled in Scrubber and circulated to Reformer through Process Gas compressors.
- Reformer and Heat recovery system: Compressed gas is pre-heated in recuperator where it is heated by Reformer Flue gas and finds way to Reformer to get converted to CO and H2 rich gases to reduce the ore in Furnace.

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PS8101: Chlor Alkali Plant

The chlor alkali unit has been designed to produce caustic soda, chlorine, hydrogen and hydrochloric acid. This unit has the following main sections:

- Salt Handling and Brine saturation
- Brine Treatment and Filtration
- Deionization and Storage
- Membrane Electrolyzer
- Anolyte Circulation and Catholyte Circulation
- 32% Caustic Storage
- Caustic Soda Concentration
- Chlorine Cooling, Demisting and Compression
- Hydrogen Cooling, Demisting and HCl synthesis Unit
- Brine Dechlorination

The saturated brine solution is treated, filtered and De-ionized and sent to membrane electrolyzer. The electrolysis reactions are as listed below:

Anode: $2NaCl \rightarrow 2Na^+ + Cl_2 (g)$

Cathode: $2H_2O \rightarrow 2OH^- + H_2 (g)$

Overall: $2NaCl + 2H_2O \rightarrow 2NaOH + Cl_2 (g) + H_2 (g)$

The remaining brine solution and formed chlorine leaves the anode chamber for the top of the cell and enters the anolyte exit header. The chlorine gas is separated from depleted brine by a separator and further cooled, demisted and dried. The hydrogen gas is separated from caustic soda solution by means of a separator, further cooled, demisted and sent for hydrochloric acid synthesis unit. The caustic soda solution flows to the caustic tank by gravity and sent for further processing and storage.

PS8102: Calcium Chloride plant

The Calcium Chloride unit consists of following sections:

- Pretreatment
- Pre concentration
- Crude Crystallization
- Pure Crystallization
- Purge Crystallization
- Granulation, Sieving & Air treatment.

The feedstock, a calcium chloride containing outlet stream from an epichlorohydrine production will be worked up into a valuable calcium chloride product by means of crystallization, granulation and destruction of the impurities by incineration. In an alternative mode of operation the impurities can be separated as a concentrated solidified waste stream. The plant consists of a feedstock pre-treatment section, which serves as conditioning step for adjustment of stable feedstock conditions for the crystallization stages. After this pre-treatment the feedstock is evaporated in a pre-concentration section followed by a crude crystallization section where the first calcium chloride crystals are formed. The product is further concentrated and granulated. A constant calcium chloride quality will be achieved by recycling streams.