SAP ERP Solution Learning for Process Engineers

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INTRODUCTION

- SAP is a well integrated enterprise resource planning application while we can also use Excel and/or Full Stack applications which are custom made for our requirements.
- Learning SAP from Production or Process Engineering point of is a very logical sequence and also interesting despite being a lengthy learning process.
- In the following slides I will summarize SAP capabilities and also the work process that process engineers can follow to utilize SAP capabilities. In the 2nd Section the utilization of HYSYS Simulation to generate date for SAP input will be presented.

EXCEL as a Simulation Tool

- Excel is a great tool for data analysis and once you keep updating it, it starts behaving like a simulation program.
- Now you plug in few numbers and the rest gets calculated.
- However, most of these excel simulations are for personal use and are not transportable as others will find highly difficult to trace the predecessors and successors of a formula and it is also time consuming.
- Also, Excel provides excellent database management capability which help in developing robust simulations.

Full Stack Applications

- The other option is to use a programming language and develop a full stack application which has predefined menu options and the user does not have to know programming logic.
- The full stack application has a front end and a back end which is a database.
- These full stack applications end up having lot of options which the end users want to see but is limited in their capability to be used as common tools across the variety of users involved in similar operations.

Enterprise Resource Planning (ERP)

In this scenario, SAP which is a well-developed **Enterprise Resource Planning (ERP)** software helps the organizations to implement the standard work process in

- Purchasing
- Sales
- Production
- Human Resources
- Quality Control
- Plant Maintenance
- Financial Accounting
- Controlling Or Management Accounting
- Project & Program Management

Why Learn SAP?

- It is worthwhile for the process engineers to know about this well integrated application which automatically updates the impact of production activities across various modules as mentioned on the second part of this presentation.
- A proposed logical sequence to learn SAP modules can be adopted.
- Normally, SAP consultants get certified in selected modules so process engineers can coordinate with them as needed to provide input or get information.
- Therefore, the whole activity starting from engineering, procurement, assembling/fabrication, sales, costing, accounting, etc., can be completed using a single tool.

Project Management using SAP

- The process engineers are interested in the process to convert raw materials to finished products and can select and size equipment to achieve that production level.
- They generate a series of design documents as part of a project and can use SAP **Project System (PS)** module during project development and control.
- Production activity can be carried out as part of a project against a particular Work Breakdown Structure (WBS).
- The project management has been enhanced with the provision of Project Management and Program Management capability in the latest versions.

Materials Procurement

- Materials can be procured through **Materials Management (MM)** for Raw, Intermediate and Finished goods, packing materials, etc., and **Asset Management (AM)** for Plant Equipment & Buildings.
- Depreciation and scrap value have to be recorded against the assets as per accounting standards.

Production Planning (PP)

- The **Production Planning (PP)** module helps in defining the production processes (routing or master recipe) and assign resources to various operations involved.
- The materials required per unit of production are also defined here using the Bills of Materials (BOM) feature.
- Thereafter, an MRP run is carried out to generate material, services, third party contract, etc.

Human Capital Management (HCM)

- Labor can be assigned to these production operations according to their assignments in **Human Capital Management (HCM)** module.
- SuccessFactors application is also available and is widely used with the Cloud SAP solution

QM & PM Modules

- Like the routing in PP Module, test plans can be maintained in **Quality Management (QM)** module and maintenance task list can defined in **Plant Maintenance (PM)** module.

Sales & Distribution (SD)

- Once the materials are produced, they are sold through **Sales & Distribution (SD)** module.
- Customer demands are updated in SD module to generate production schedules which trigger activities in **PP** and **MM** modules.
- The **Warehouse Management (EWM)** module helps in managing inventory in the plant with storage type, etc.

Financial Accounting (FI) & Controlling (CO)

- All the invoices, expenses, vouchers, recurring transactions, etc. are updated in **Financial Accounting (FI)** module which facilitates generation of financial statements for external world.
- The **Controlling (CO)** module picks numbers from G/L expense accounts to identify costs incurred by various cost centers where production is carried out, etc.
- The cost centers are the departments (HR, Sales, Production, etc.,)
- Profit Centers are the products, product lines, etc. We can generate Profit & Loss statement at the Profit Center level as well.
- We utilize this configuration controlling information for Management internal control by planned vs actual analysis, product costing, etc.

SAP Setup & Configuration

- The SAP consultants setup client company structure using the SAP configuration steps.
- The configuration also involves setting up data groups e.g., material group, document numbering and the input screen sequences for various transactions.
- Thereafter, the master data setup across modules can be done and then business transactions involving sales, purchase, accounting, controlling, etc. can be done.
- There are transaction codes i.e., Tcodes, which are run for various configuration, master and transaction data related transactions. Therefore, remembering Tcodes is necessary for consultants and the end users.

SAP Improvements Roadmap

- The SAP solution has moved through various phases with SAP R/3, ECC6 and now the S/4HANA have been in use by various clients.
- There are various 3rd party solutions that integrate with SAP and are available on cloud with much more flexibility.

Implementation Options

As far as implementation is concerned, there are the following options for staged implementation:

- **FI and MM module**
- **FI, MM and SD module**
- **FI, MM, SD, PP module**
- **FI, CO, MM, SD, PP module**
- **FI, CO, MM, SD, PP, QM module**
- **FI, CO, MM, SD, PP, QM, PM module**
- **FI, CO, MM, SD, PP, QM, PM, HCM module (HCM can be implemented with any of the above options.)**

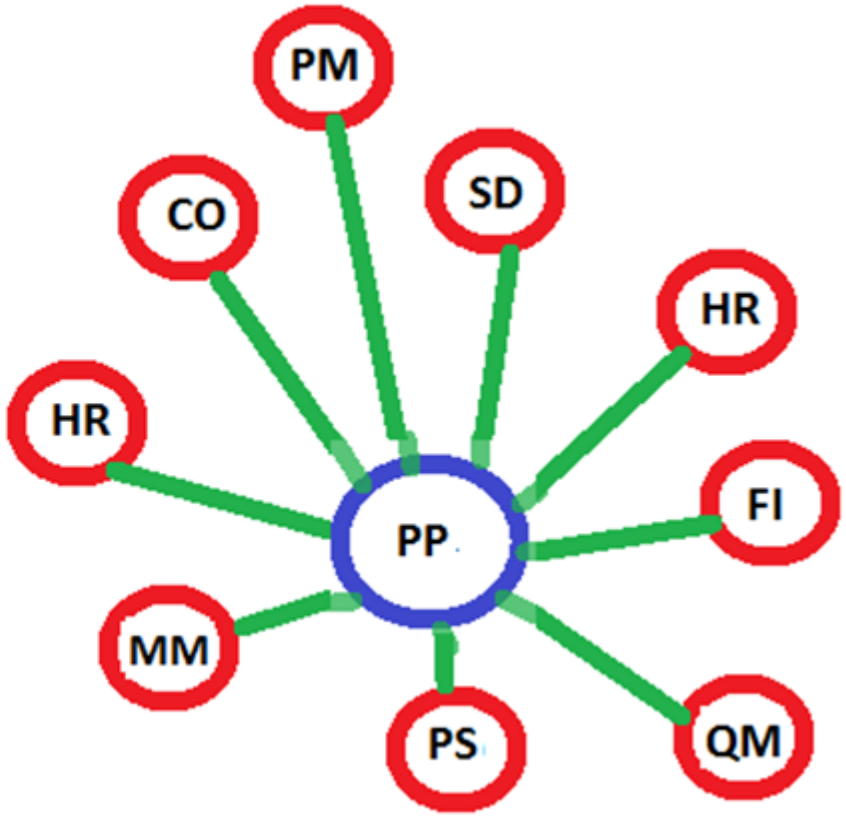
INTRODUCTION to Part 2

- HYSYS is a process simulation tool to evaluate process flows and estimate material requirements while SAP is an Enterprise Resource Planning (ERP) tool comprising of several modules which represent almost every business function.

- The data has to be transferred manually between these two great software programs and this presentation is aimed at clearing concepts for Chemical Process Engineers who may be interested.

SAP S/4HANA PP INTEGRATON

- Production Planning (PP)
- Materials Management (MM)
- Financial Accounting (FI)
- Sales and Distribution (SD)
- Quality Management (QM)
- Controlling (CO)
- Plant Maintenance (PM)
- Project System (PS)
- Human Resources (HR)

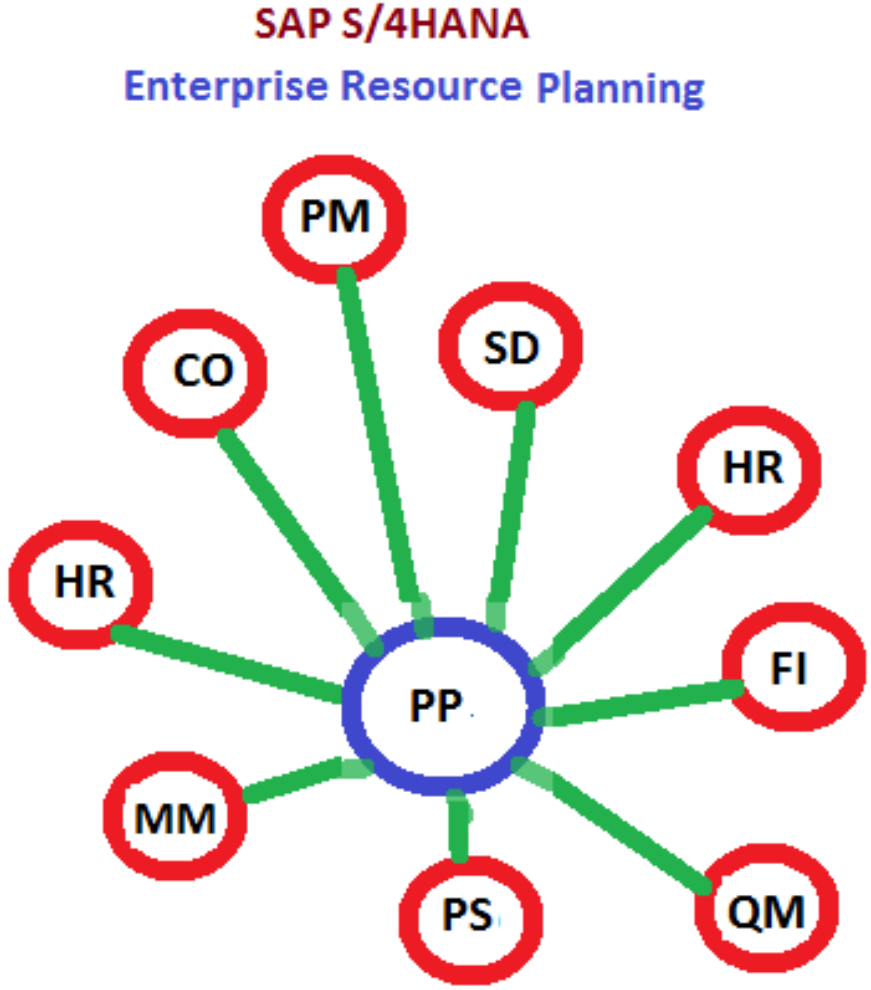


SAP S/4HANA PP/MM INTEGRATON to HYSYS

SAP S/4HANA	
Feature	Module
Material Master	MM
Bill of Materials (BOM)	PP
Master Recipes	PP

Manual input from HYSYS to SAP

AspenTech HYSYS	SAP S/4HANA
Material Balance	Material Master
Material Balance	Bill of Materials (BOM)
Process Flow	Master Recipes
Equipment Sizing	Material Master



HYSYS INPUTS TO SAP

- ***HYSYS Stream Balance*** to develop Material Master Records for Raw Materials, Intermediate and Finished Goods in **SAP MM Module**. Different Material Master Records can be developed for respective grades of Raw Materials, Intermediates, Finished products and process equipment, etc. Batch management is also supported. Unit of Measure can be changed easily to find the quantities for SAP input(Kg/Lit, etc.).
- ***HYSYS Process Flow Diagram*** to identify process equipment, develop Bill of Materials (BOM), Resources, Master Recipe and Operations/Sub-Operations in **SAP PP-PI Module**. PP-PI is an SAP module for Process Industries. A BOM can be maintained for each grade of Finished Products. A production version includes BOM and Master Recipe (operations sequence e.g., Mixing, Heating and Cooling, etc.). Materials can be applied to any selected operation as needed.

SAP DATA CONFIGURATION (PP-PI)

SAP MATERIAL MASTER DATA

Material master contains different following views:

- **Basic Data** – Client Level
- **Purchasing, MRP, Costing Data** – Plant Level
- **Sales Data** – Sales Organization Level (Tax indicator is at country level)
- **Storage Data** – Storage Location Level
- **Accounting Data** – Valuation Area Level
- **Warehouse Data** – Warehouse Number Level
- **Storage Type Data** – Warehouse Number and Storage Type level

SAP BILL OF MATERIAL (BOM)

- A production BOM is required for all **Materials Requirements Planning (MRP)** runs and standard process orders. The production BOM lists parent items (i.e., finished products) and child items (i.e., components or raw materials that complement the parent items).
- During the production process, we can convert components into finished products of various grades.

SAP MASTER RECIPES

Master recipe comprises of process steps to produce a material. For example a chemical product.

- 0010
- 0011 Mixing
- 0020
- 0021 Heating
- 0030
- 0031 Cooling

SAP MASTER RECIPES

- Master recipe have Operations and Phases, op are 0010, 0020, 0030 and phases related to operations are 0011, 0022, 0033 respectively.
- Each operation can have one or more phases attached to it.
- Phases are like sub operations.
- Process instructions (PI sheets) can be attached to these phases in master recipe.
- When you create a Process order, control recipe is created. In PI Sheet, you can give values to Process instructions attached.
- This is special feature PP-PI which normal discrete manufacturing does not have.

PRODUCTION PROCESSES

- The production process typically starts with raw materials and the creation of a production order that contains the materials and steps to produce an item in a predefined time frame. The materials can be found in the BOM. The BOM contains a hierarchical arrangement of components that lists the raw materials and sub-items— aka “child” items or “children”—for the finished product.
- Managing inventory across multiple warehouses
- Tracking and recording inventory movements
- Ensuring enough raw materials and parts are created and ordered at the time of production
- Calculating shortages or surplus inventory
- Access to real-time information

HYSYS & ASPEN PLUS

The most common industries for SAP PP-PI modelled in HYSYS are:

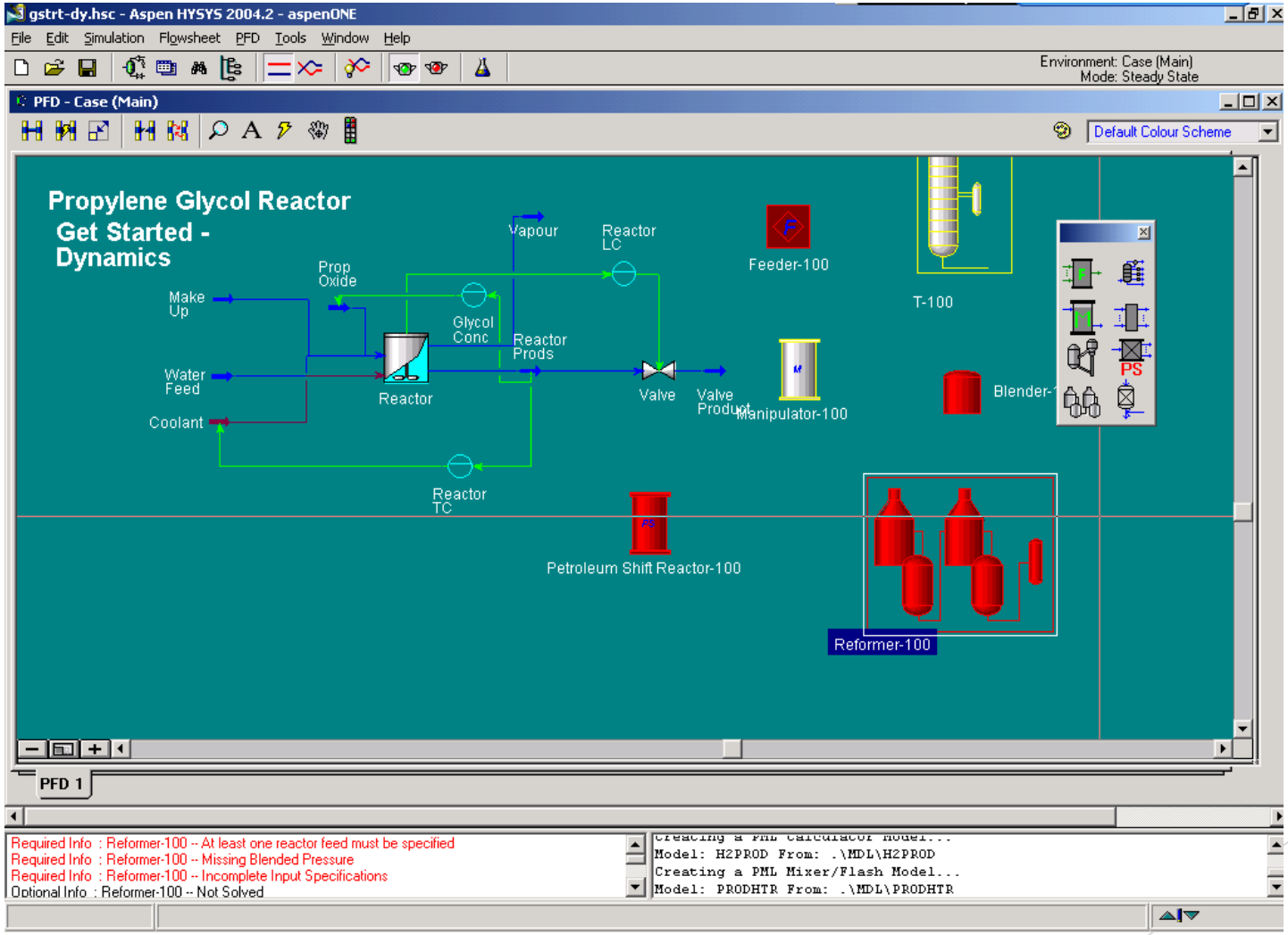
- Oil & Gas (upstream and downstream)
- Petroleum Refining
- Natural Gas

Aspen Plus is used in the following industries and then data used can be used in SAP PP-PI:

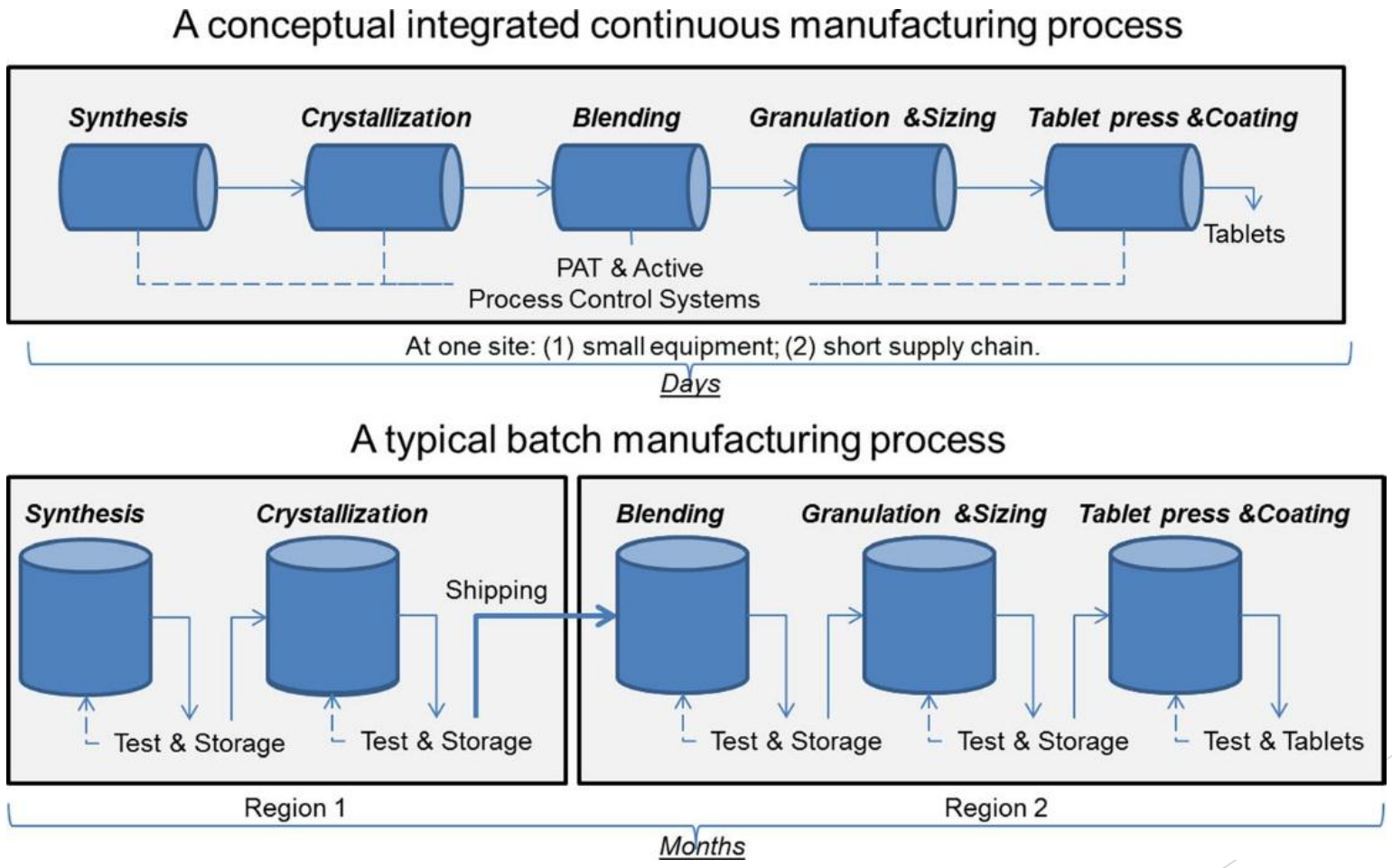
- Petrochemicals
- Chemical Industry
- Polymers
- Pharmaceuticals
- Painting & Coatings
- Food & Beverages

Examples on the next page

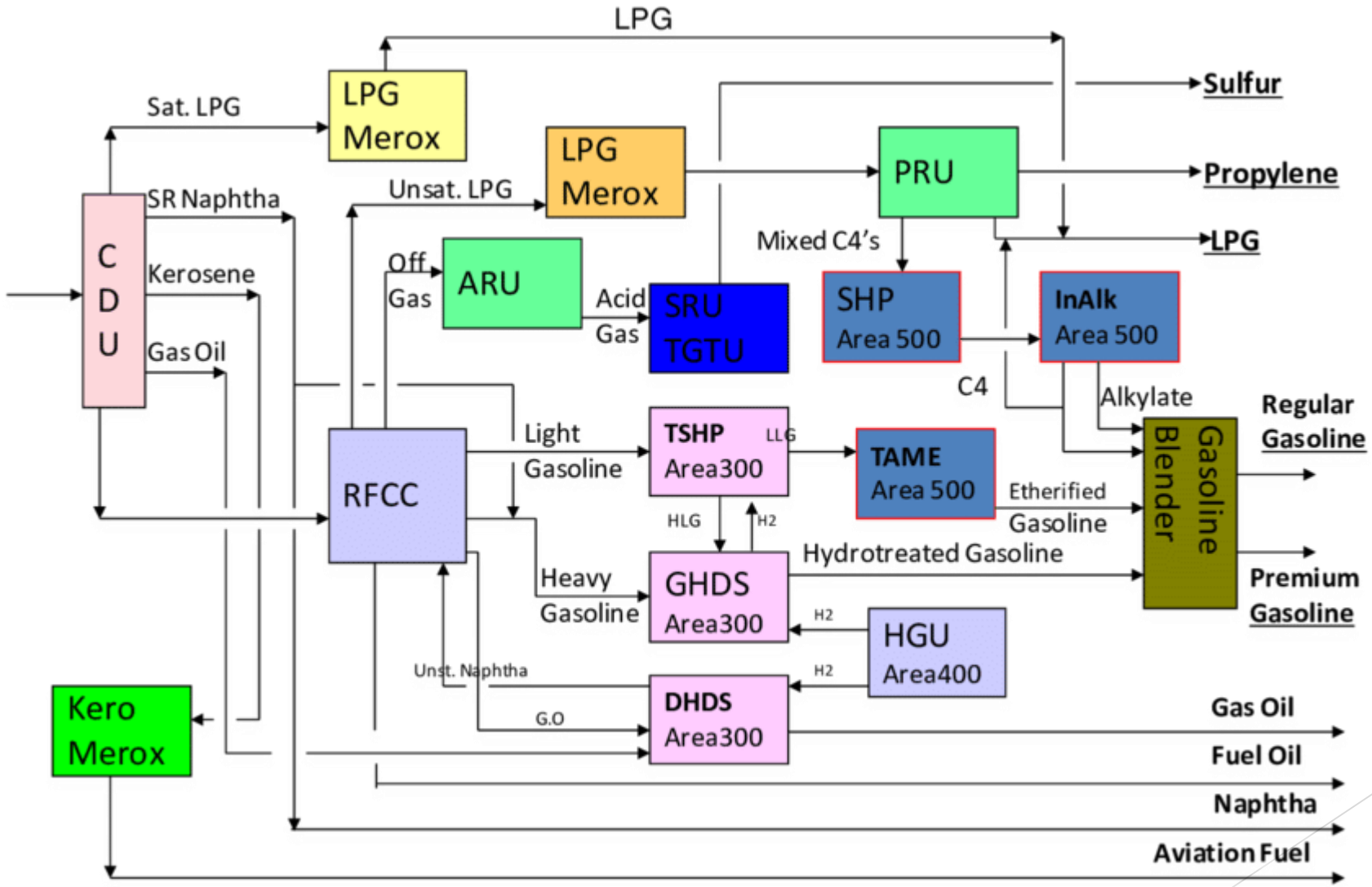
Propylene Glycol Process



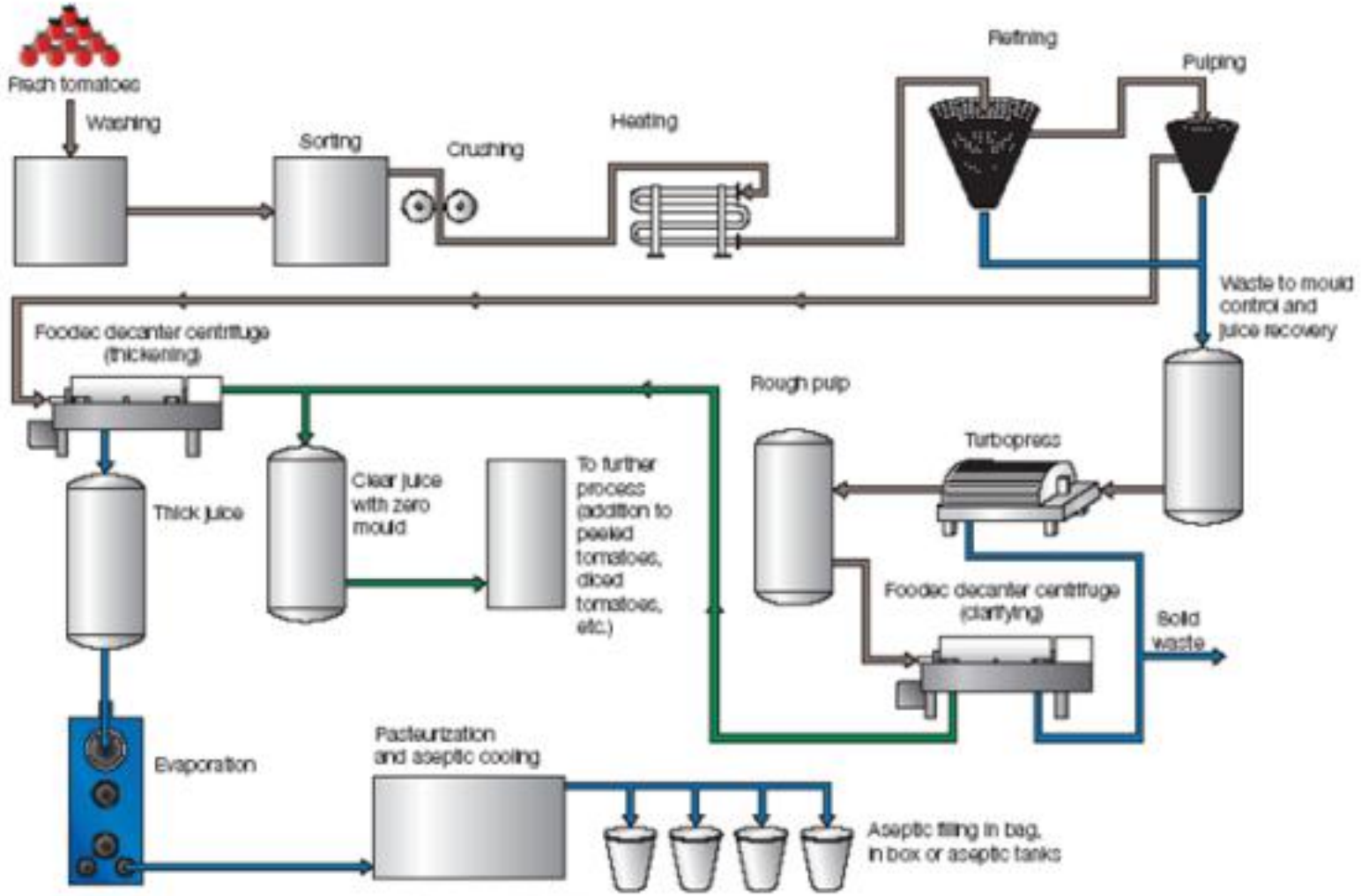
Pharma Manufacturing Process



Petroleum Refinery Process

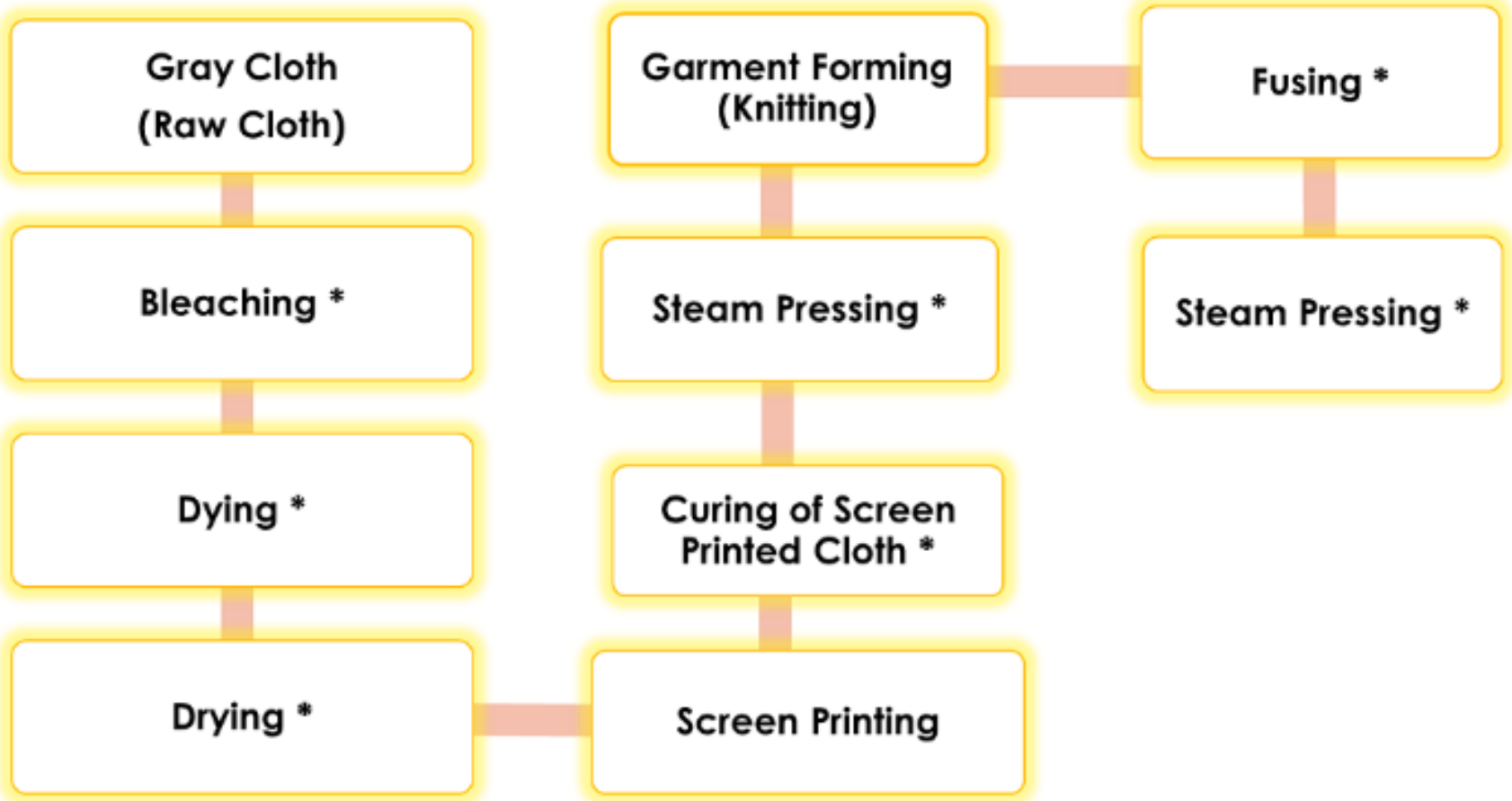


Food Industry Process



Textile Industry Process

This cannot be handled in HYSYS OR ASPEN PLUS but can be managed in SAP



CASE STUDY

- A smaller food industry merged with a larger neighbor nearby who acquired one another smaller food industry.
- The new units do chemical processing and also simple mixing, heating, etc., operations. So HYSYS was used to generate the stream balances (data) for material master records, bill of materials and Master recipes.
- This helped the acquiring company generate consolidated financial statements in quick time and improved inventory management.

CASE STUDY

- A refinery took over a industrial gases supplier right next door.
- Chemical processing included reactors, mass transfer equipment, etc., So HYSYS was used to generate the stream balances (data) for material master records, bill of materials and Master recipes.
- This helped the acquiring company generate consolidated financial statements in quick time and improved production planning as external procurement

SAP PP-PI TRAINING VIDEO

- You may refer to the below link on Youtube to learn various steps involved in Production Planning using SAP PP-PI.
- You can download this presentation and then click on the below link to go to Youtube video or fell free to email me for a copy.

- https://www.youtube.com/watch?v=5u1eWL5z2Jw

- There is another tons of stuff on internet to learn HYSYS and SAP S/4HANA.

THANK YOU