A new challenge every day.™

Case Study - Assignment

Engineering challenge:

Product making

- *Propose a robust solution*
- *Scalable unit*
- *Minimized cost and complexity*

Product Making – an engineering challenge!

Daily.
Globally.
Personally.
Professionally.

Research and development department has brought an enhanced formulation for our HDL product.

Because this is something rare on the market company wants to produce this product in all its plants where suitable.

Your team was asked to lead a project and bring a technical solution for manufacturing scale of production.

Background information

The product you are going to produce is a liquid of higher viscosity being filled to bottles via a packing line with high level of automation.

Therefore, you might focus only on the product making. As soon as the product is produced, it's being stored in a storage tank of a sufficient capacity to supply the line.

Your goal is to design a making unit which mixes different raw materials while keeping the right process conditions. (Pressure, temperature, dosing accuracy, etc.) One operator should be enough to operate the machine.

You are expected to bring a solution which will be scalable, cost effective and will be easy to maintain.

The new formulation contains:

Caustic Water	32 %
STA dissolvent	14 %
EP-Poly surfactant	18 %
Active substance	12 %
Water Softening subst.	8 %
Preservative	3 %
Dye	3 %
Perfume	2 %
pH regulator	2 %
Viscosity regulator	2 %
Enzymes	1 %

Process conditions:

Pressure	min. 1 bar
Process temp.	56 °C
Stable product temp.	20 - 22 °C
Line filling rate	16 t/hr.
Bottle sizes:	0.5/0.75/1 l

Product transformations:

1. Caustic Water & pH regulator to be dosed together
2. STA and EP-Poly create gel, if concentrated solutions mixed together
3. While dosing Active substance, pre-mix temperature has to be btw. 54 - 58 °C
4. Active substance and Caustic water creates emulsion, when properly mixed.
5. Dye & Perfume to be dosed into the stable product

Full assignment

- Your task is to create and present a fundamental design of a making unit which will transform input materials (RM) into a finish product.
- Your design has to reflect process conditions and 5 main transformations.
- Consider mechanical complexity and cost of your solution.
- Keep the system modular and easily scalable to add a new RM, if needed.
- Consider all RM requirements in terms of Safety and Material handling during design

Expectations

- Prepare a basic design concept (P&ID, 3D or 2D drawings of proposed equipment)
- Define your PCS to reach RM dosing accuracy better than 1%
- Presentation of the proposed solution: be prepared to defend your design!
- Define and present your key assumptions for your solution
- Cost estimate of the system – break down per Attachment A
- Use a creative and innovative approach

Resources

- Computer with internet access
- Case study price list
- Your brain – don't copy, be creative, use your own invention…

What counts?

- *Innovative ideas*
- *Minimized complexity*
- *Scalability*
- *Cost of the solution*
- *Fundamental principles*
- *Low / no impact on the bottles quality*

And…

… ORIGINALITY!

Note: This assignment is not based on a real product innovation. Used materials, transformations and process conditions are a fiction.

Appendix A – Price sheet

Item	Unit	Price [€/unit]	Units	Total price [€]
Pipe DN25	m	30		
Pipe DN50	m	50		
Pipe DN100	m	60		
Pump small size	pc	1.000		
Pump mid-size	pc	1.500		
Pump size	pc	3.500		
Tank	per m^3	10.000		
Agitator (incl. motor)	pc	6.500		
PIT	pc	800		
TIT	pc	800		
Flow meter	pc	1.200		
Load cell	pc	1.700		
Automatic Valve	pc	900		
Pressure/Flow regulation valve	pc	1.700		
Non-return Valve	pc	200		
Heat exchanger	pc	22.000		
Cooling system	pc	45.000		
Heating system	pc	14.000		
Static mixer (strainer)	pc	1.500		
Dynamic mixer (mill)	pc	8.400		
Tank heating	pc	2.000		
Other equipment	pc	Price per Req.		
Total price for project				

Appendix B – Glossary

RM – Raw Materials

TIT – Temperature Indicator – Transmitter

PFD – Process Flow Diagram

PIT – Pressure Indicator – Transmitter

P&ID – Process & Instrumentation diagram

PCS – Process Control Strategy

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