



# Overview of Biorefinery Pilot Plant @EECi

10 Oct 2023

The Bio-Process consists of 4 different modules that will allow the users to start from raw biomass and sugars and convert them into valuable substances via a wide portfolio of processes available at the Biorefinery.

## Module BMP – Biomass Pretreatment

In this module raw biomass can be process, in order to manufacture intermediate or finish product. *Production of several chemical molecules from biomass*

## Module USP – Upstream Fermentation Process

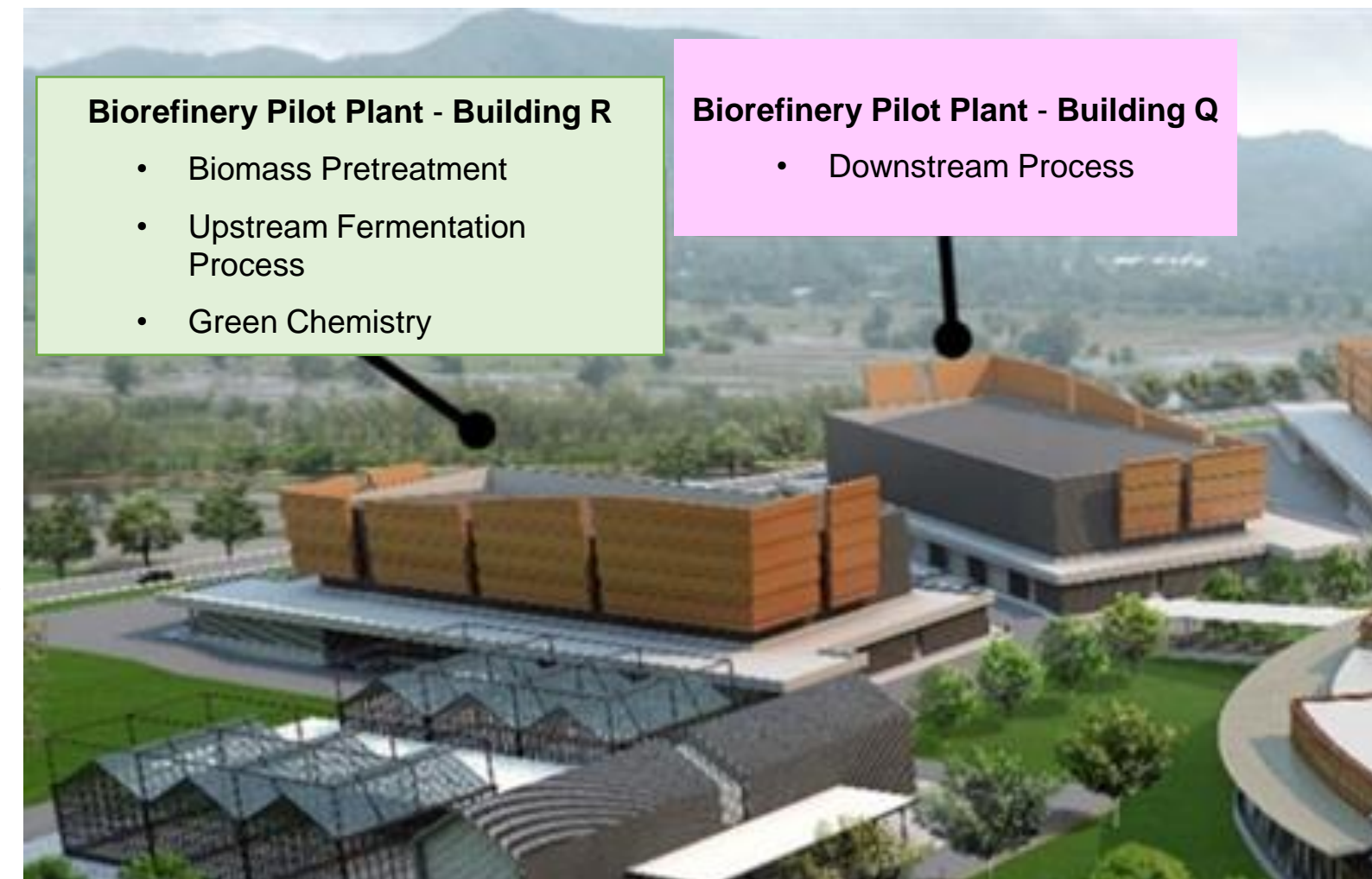
In this module various sugars or intermediate product can be used to grow micro-organisms in anaerobic or aerobic conditions for further treatment. *Upstream process for protein, enzyme, intracellular recombinant enzyme, etc*

## Module DSP – Downstream Process

In this module intermediate product mainly from fermentation or others intermediate can be further refined into intermediate or finish product in dry or liquid format. *Production of protein, enzyme, intracellular recombinant enzyme, etc*

## Module ATEX – Green Chemistry

In this module Biomass, or intermediate product can be reacted to manufacture new intermediate or finish product. *Synthesis of the different chemicals*

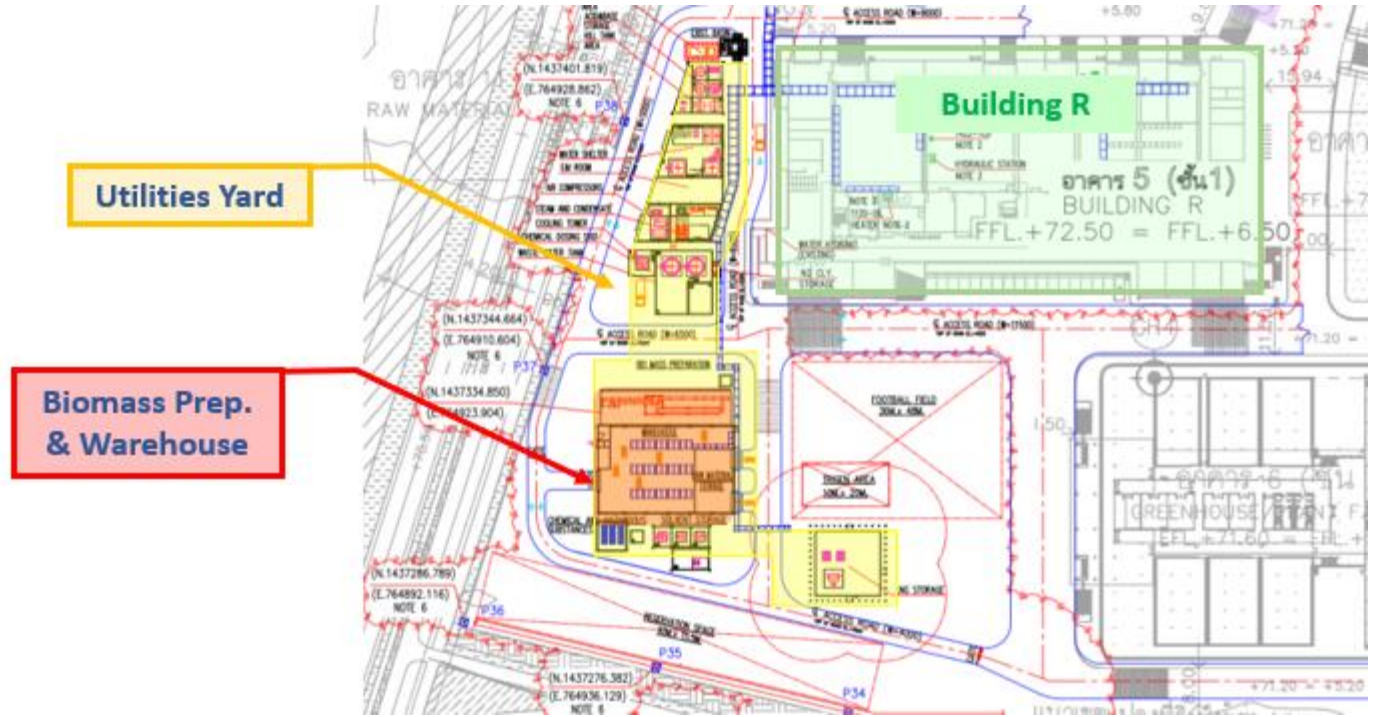
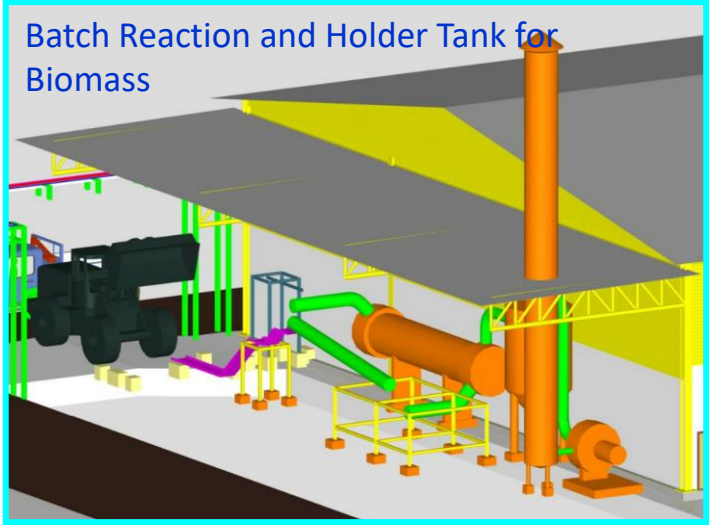
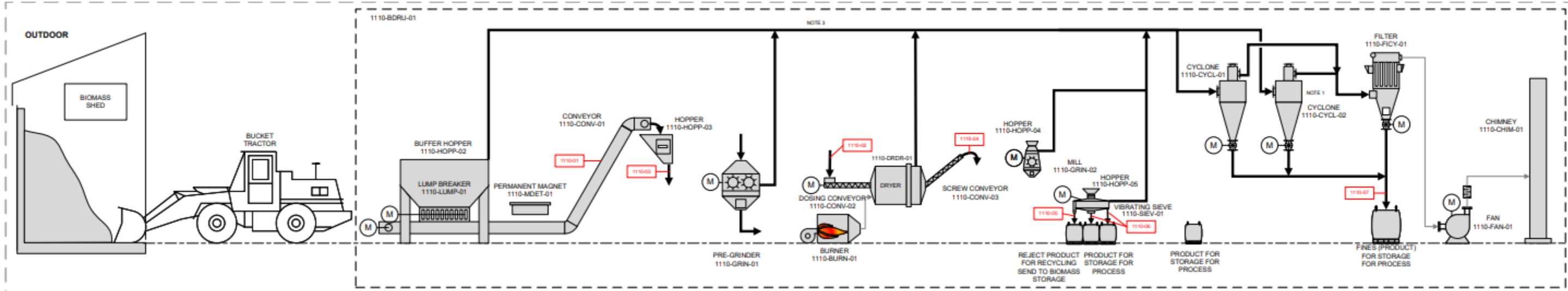


# Module BMP

Biomass Pretreatment

## PFD : MODULE BMP

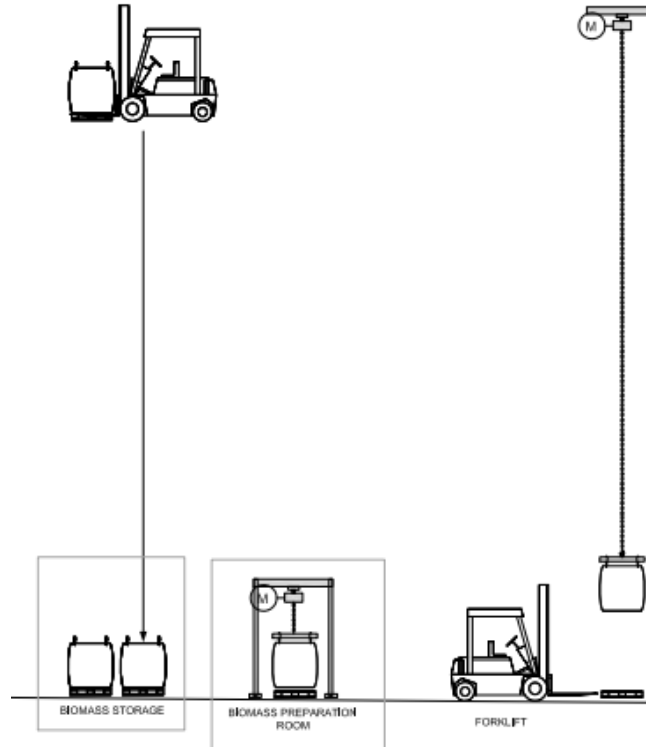
### Biomass Dryer and Grinder



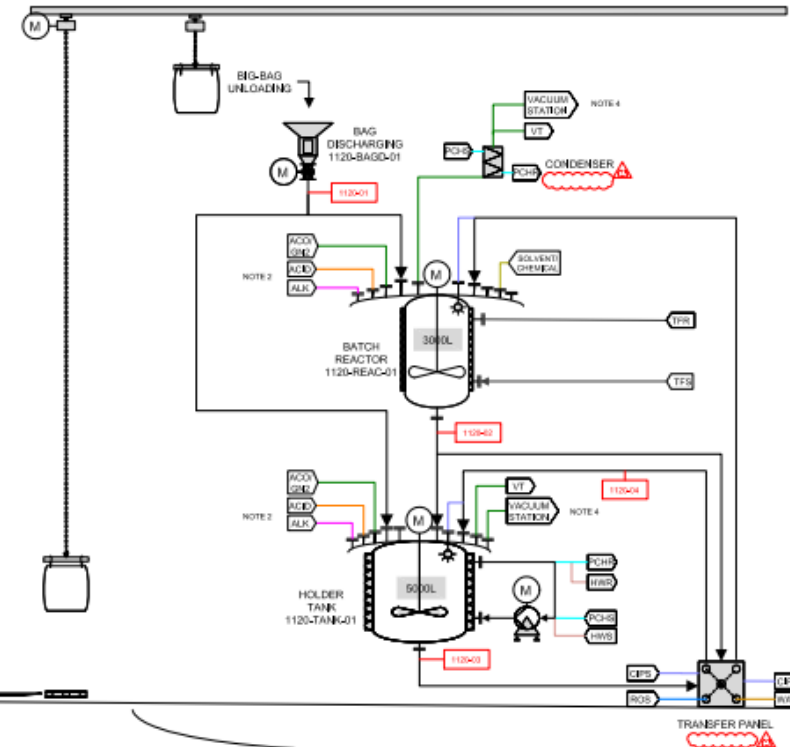
# Bio-Process Engineering

## PFD : MODULE BMP

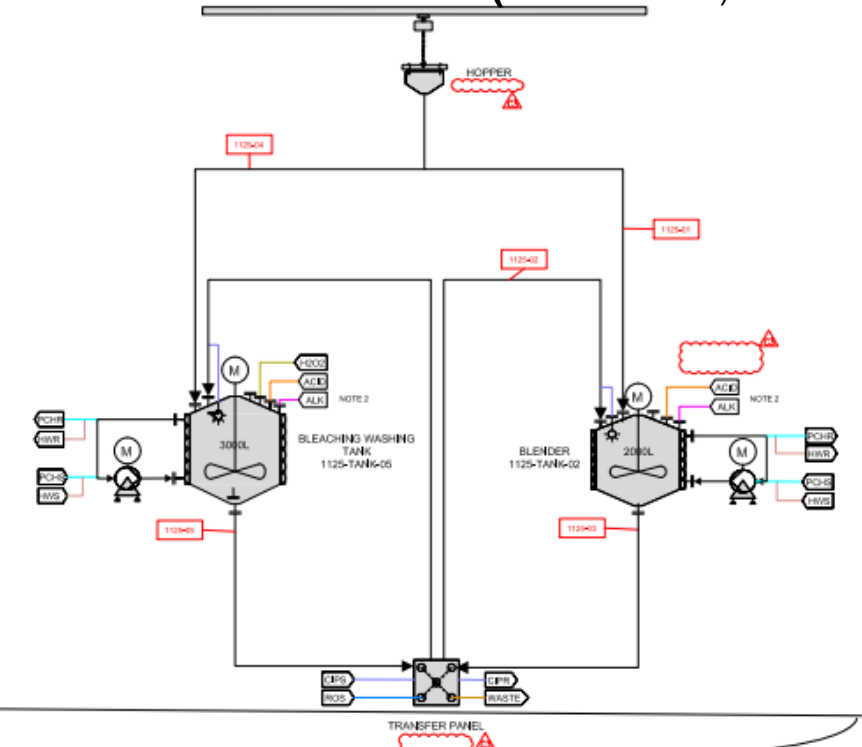
### Biomass preparation



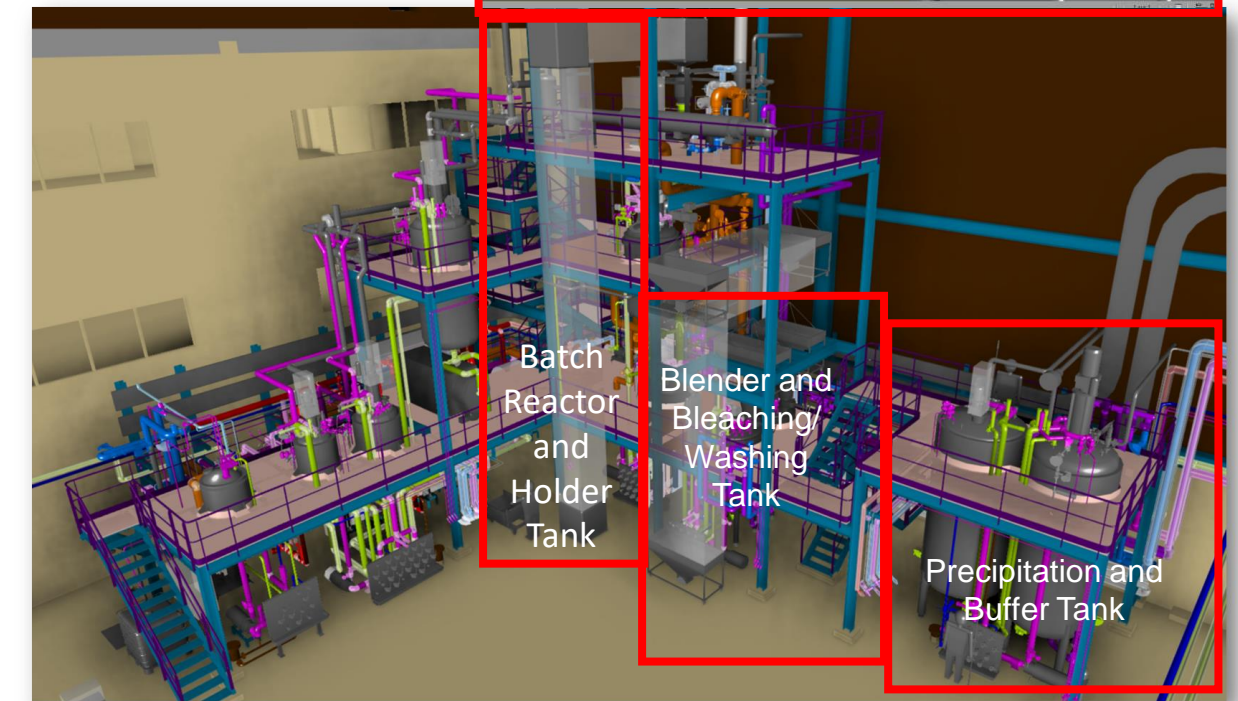
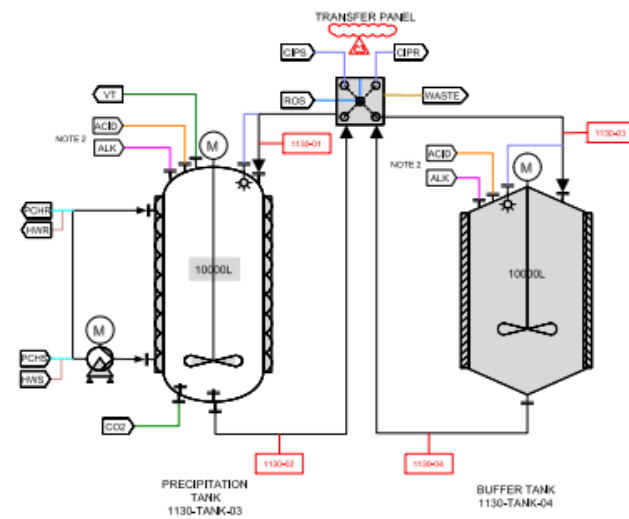
### Batch Reactor and Holder Tank (3000L & 5000L)



### Blender and Bleaching /Washing Tank (3000L & 2000L)



### Precipitation and Buffer Tank (10000L & 10000L)

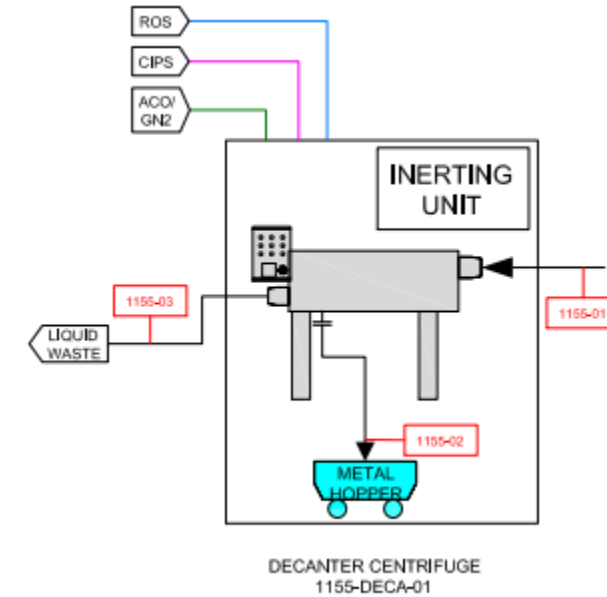
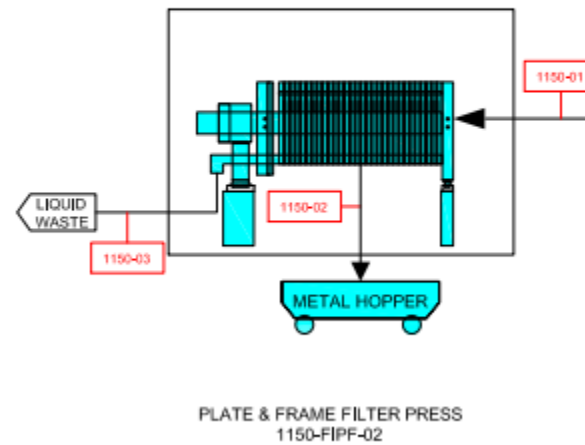
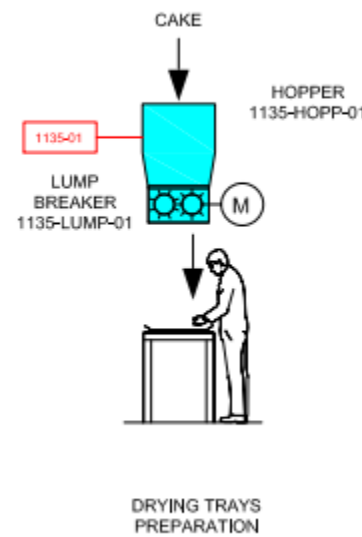


### Mobile Equipment Associates to Module BMP

Lump breaker to break cake before further processings

Decanter centrifuge ATEX

Plate and frame filter press 400x400 ATEX

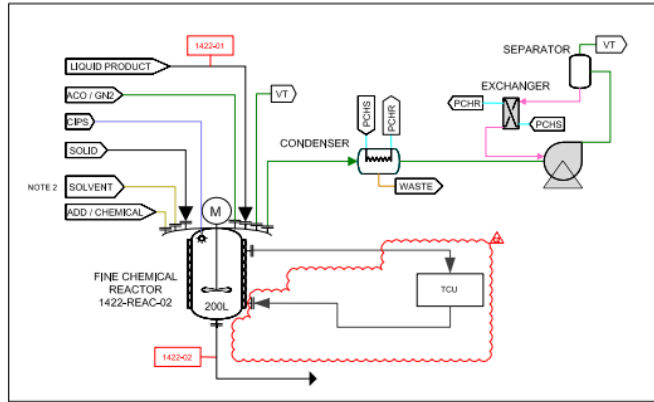


# Module ATEX

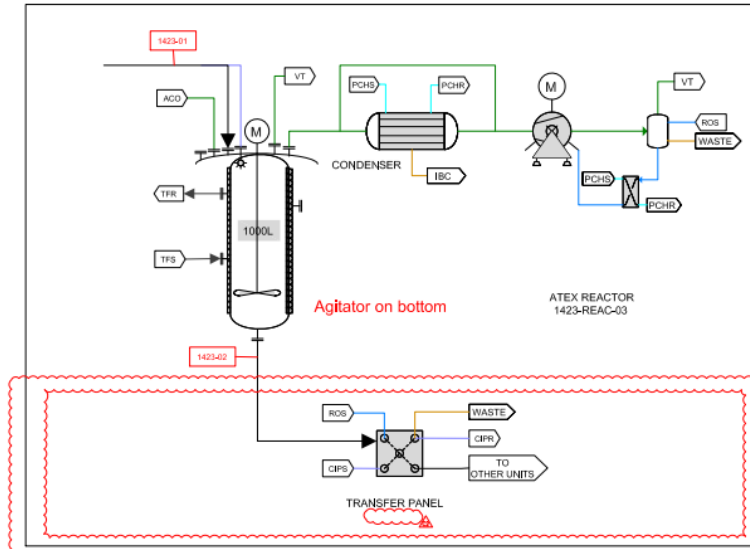
Green Chemistry

## PFD : MODULE ATEX

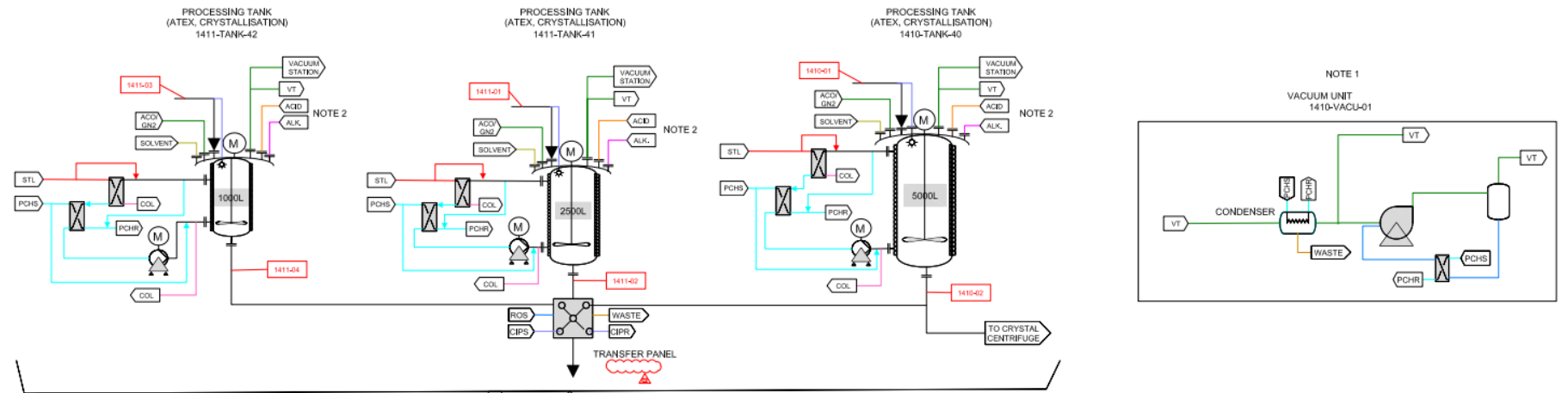
**FINE CHEMICAL REACTOR (200L)**



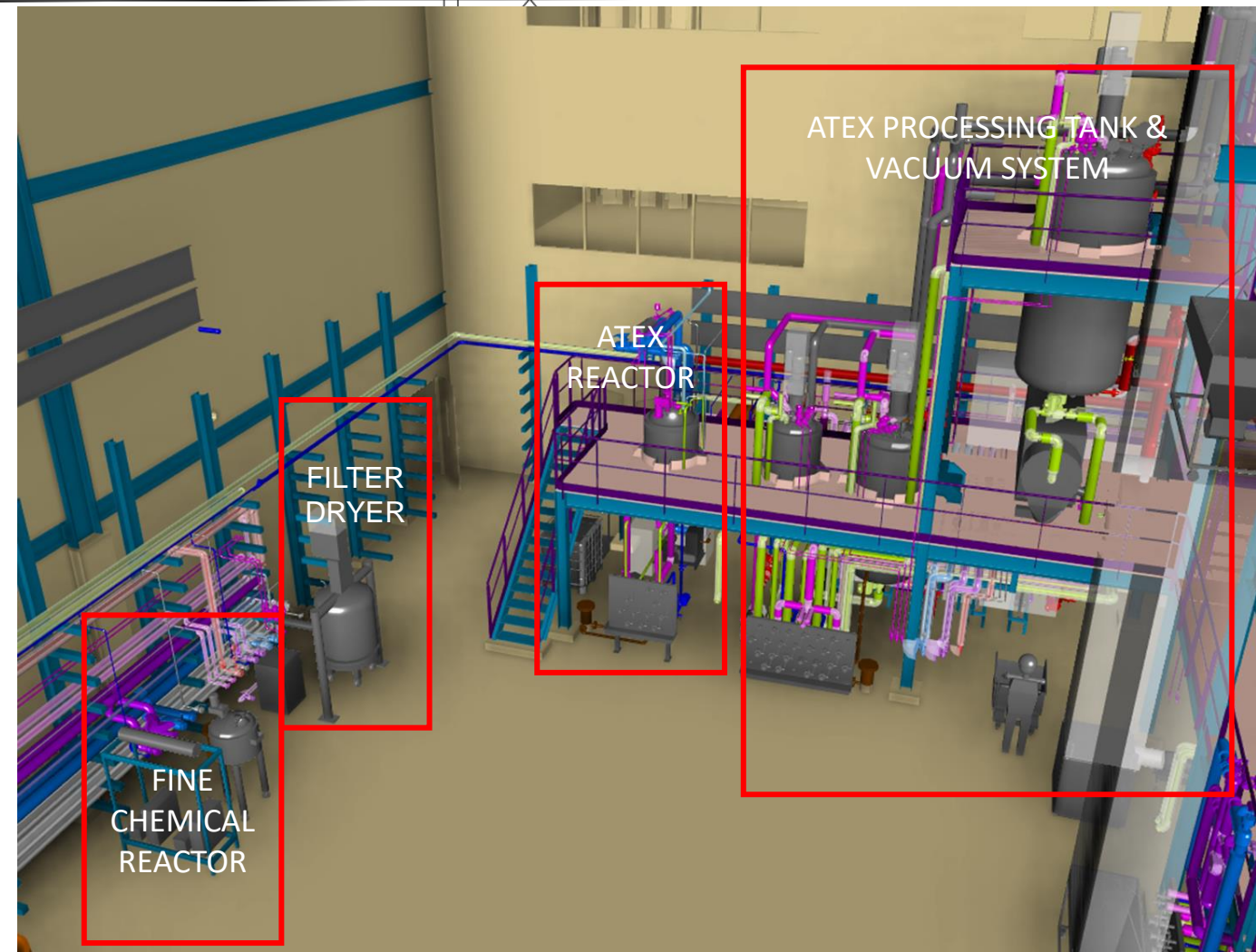
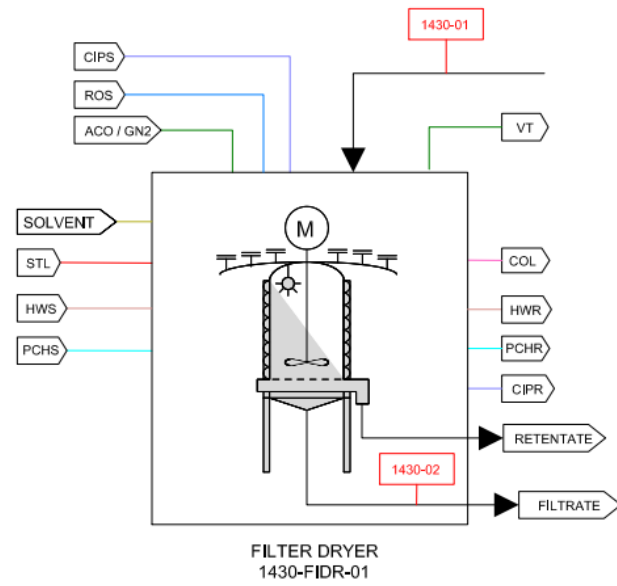
**ATEX REACTOR (1000L)**



**ATEX PROCESSING TANK & VACUUM SYSTEM (1000L/2500L/5000L)**



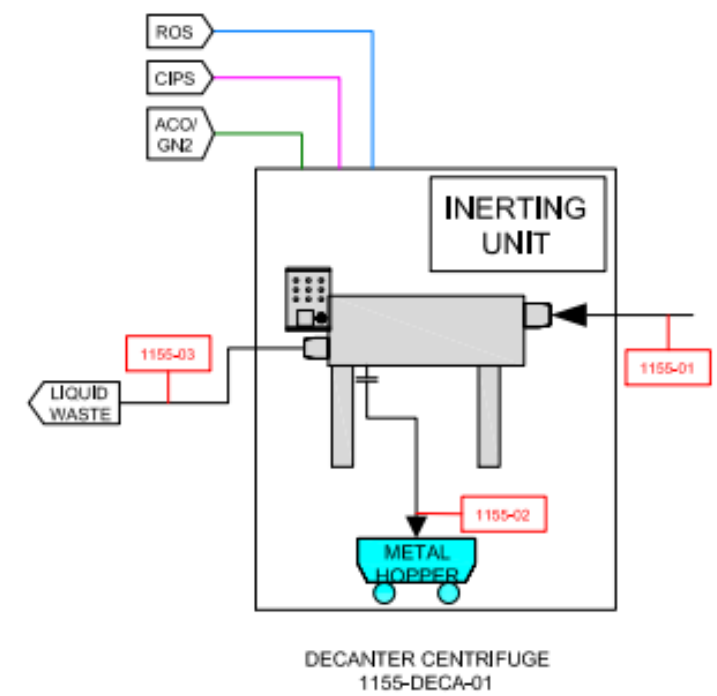
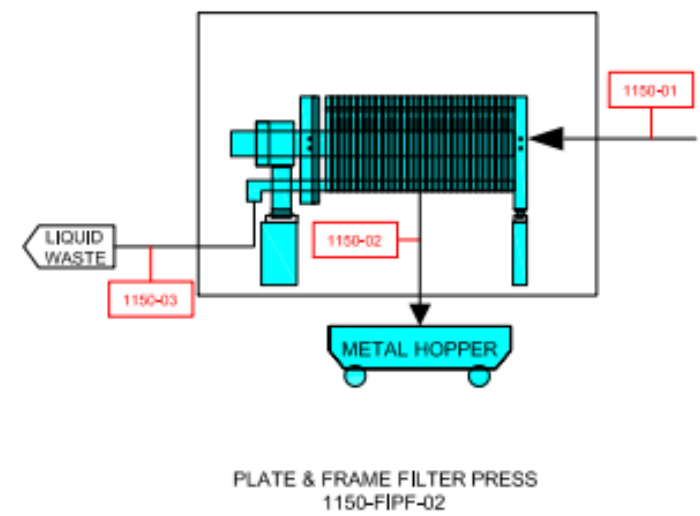
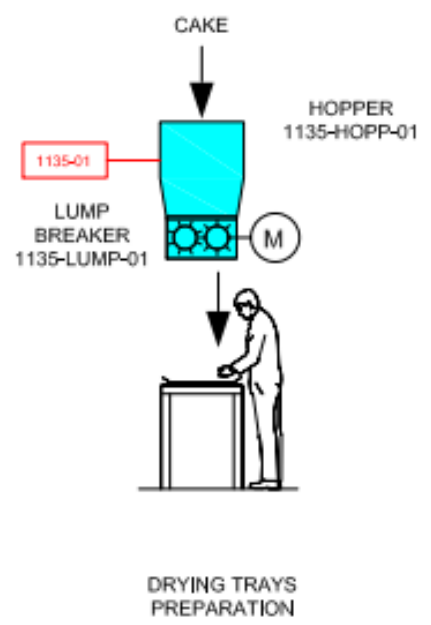
**FILTER DRYER**





## Mobile Equipment associated to Module ATEX

- Chamber filter press 600x600 ATEX.
- Solid liquid liquid centrifuge ATEX.

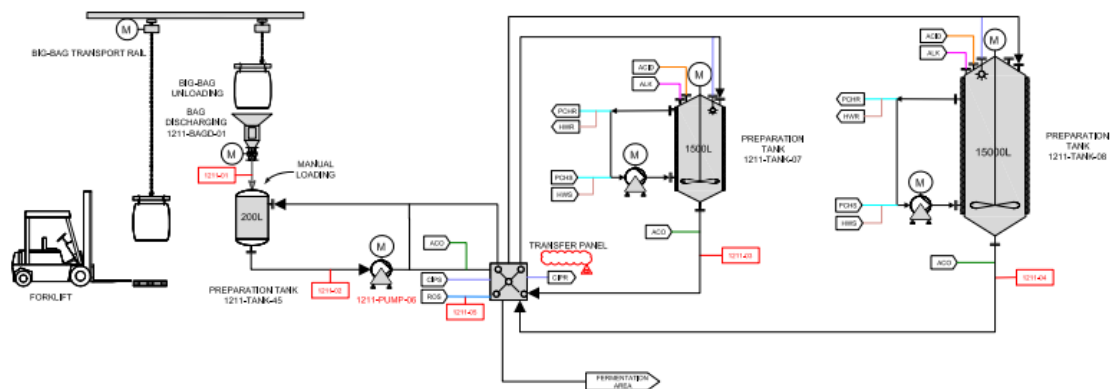


# Module USP

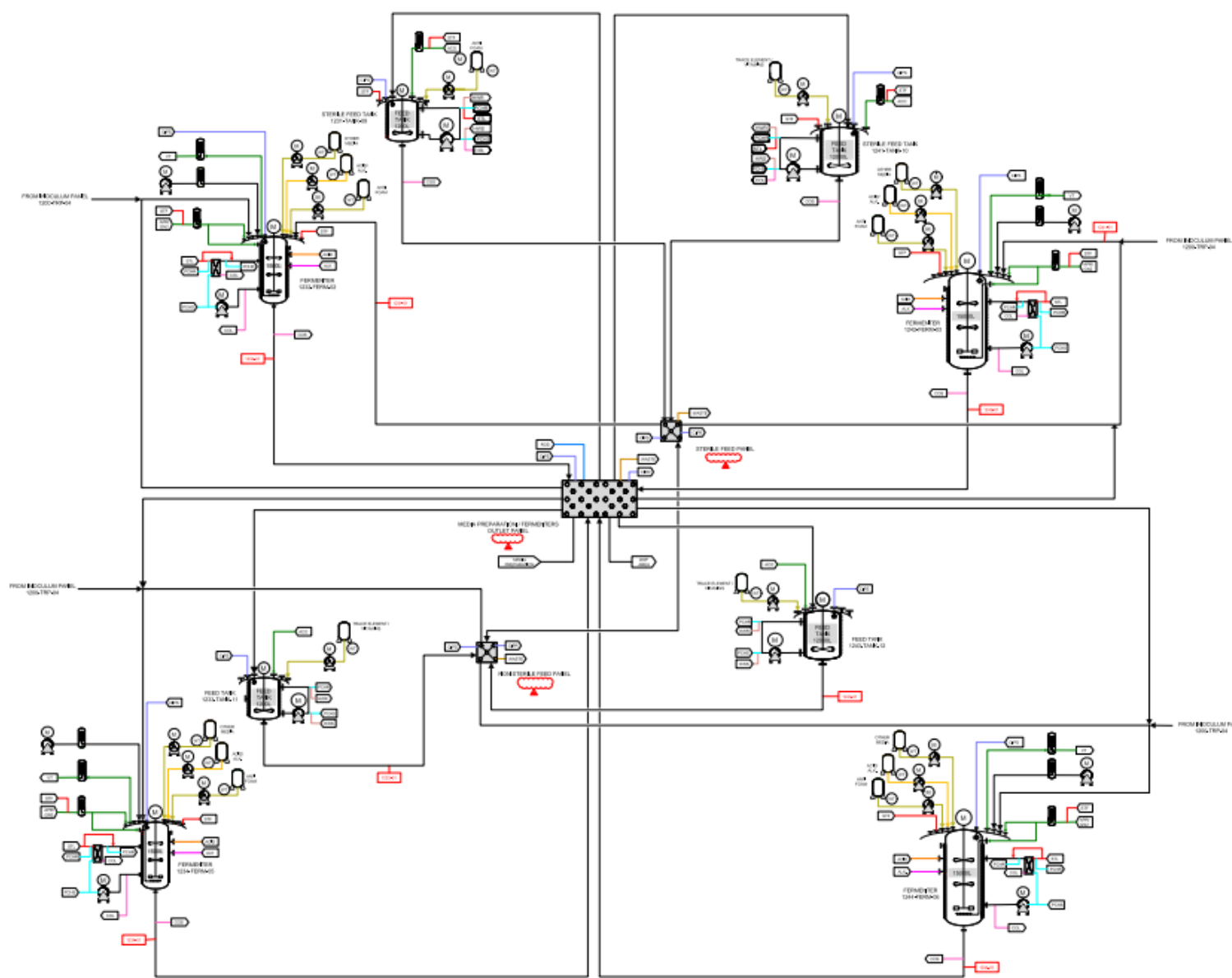
Upstream Fermentation Process

## PFD : MODULE USP

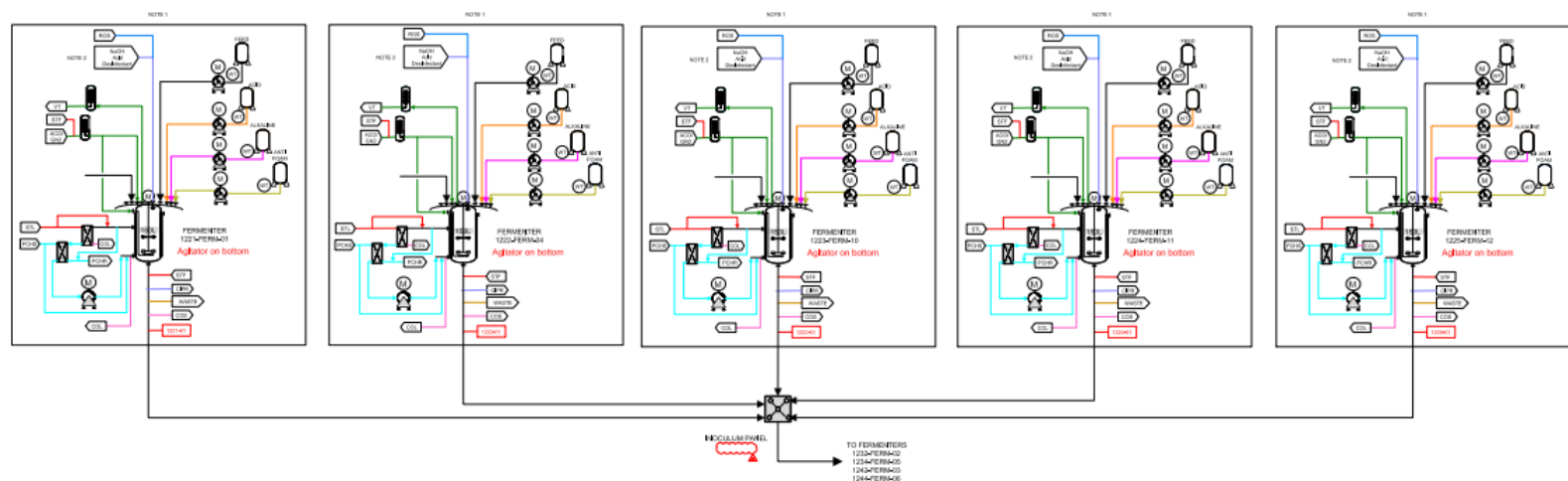
### PREPARATION TANK



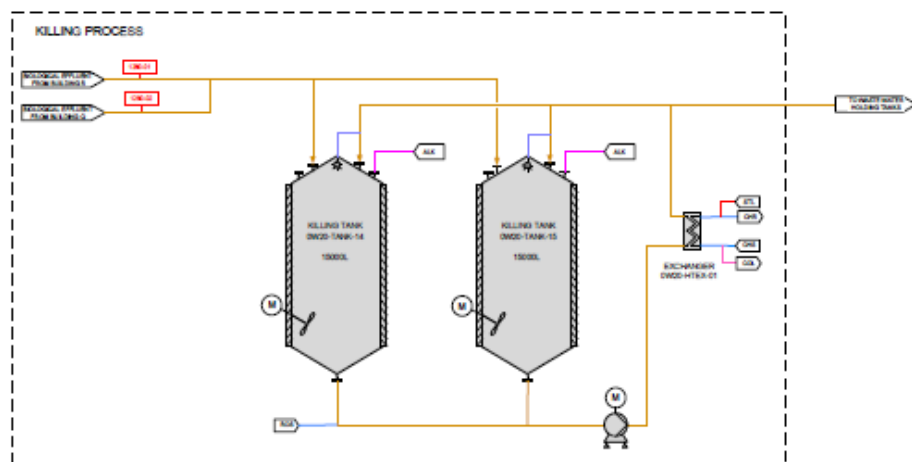
### FERMENTER (1500L/15000L) & FEED TANKs



### FERMENTER 150L



### KILLING TANK





# Bio-Process Engineering



## Mobile Equipment associated to All Building R

- 10 Mobile tanks from 200L to 1000L
- 1 mobile plate heat exchanger
- 7 mobile dosing stations for chemical addition or pH regulation
- 2 Mobile Ion Exchange 100L

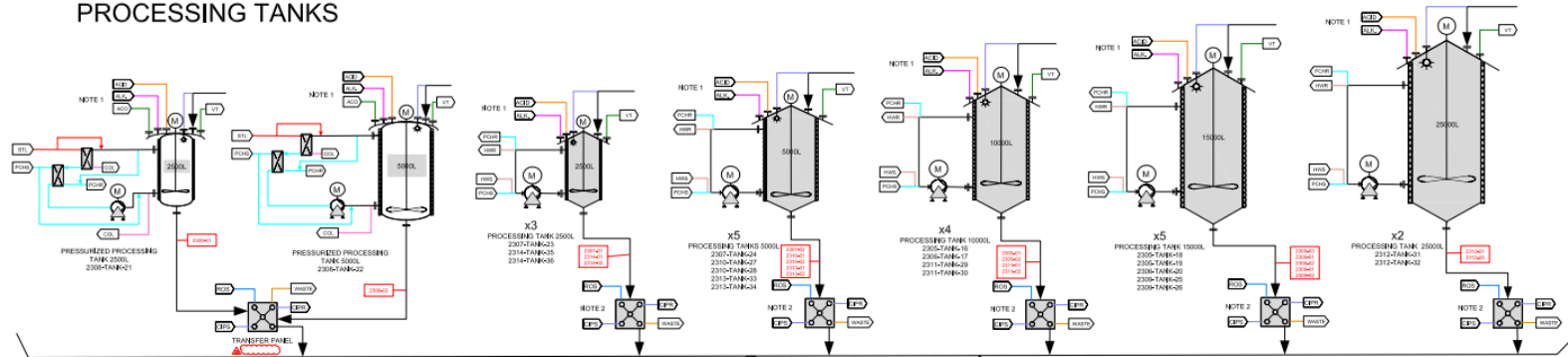
# Module DSP

## Downstream Process

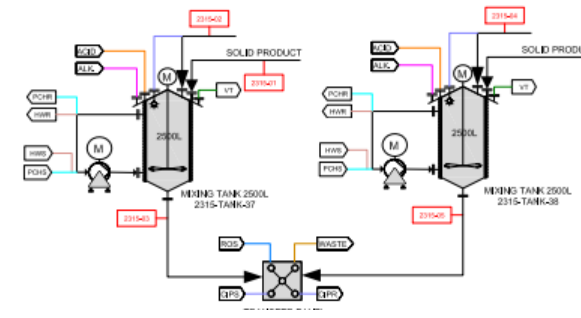
## PFD : MODULE DSP

### PROCESSING TANK & MIXING TANK

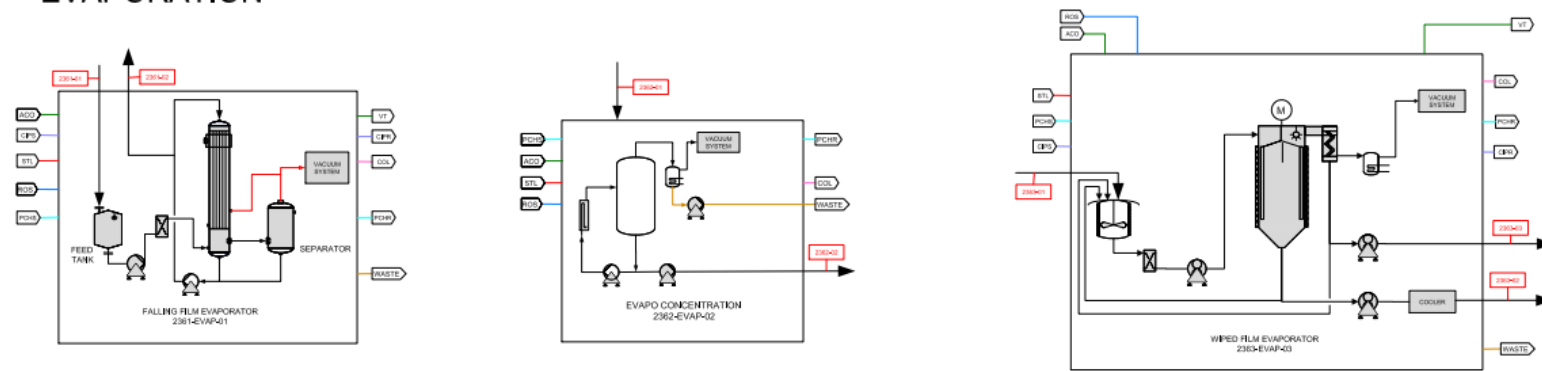
#### PROCESSING TANKS



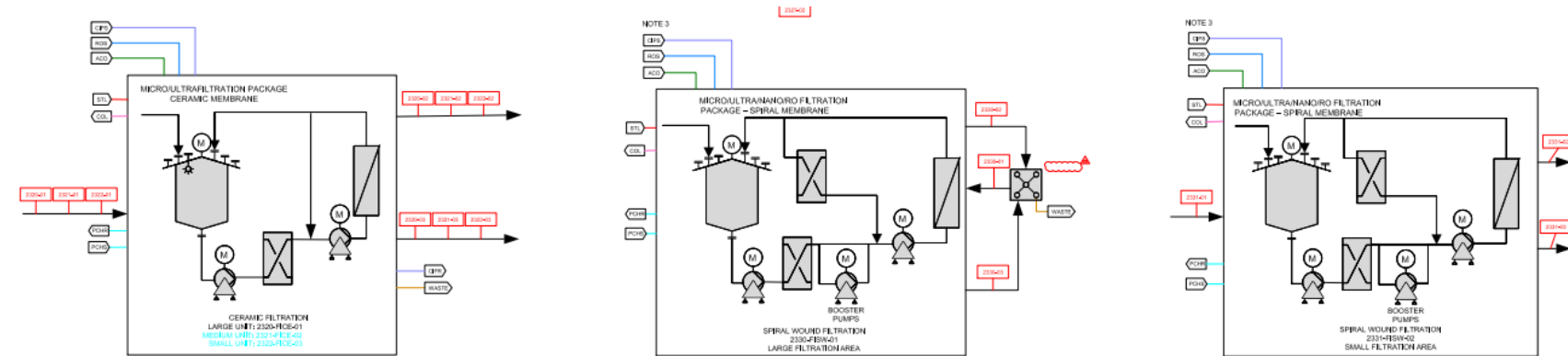
#### MIXING TANK



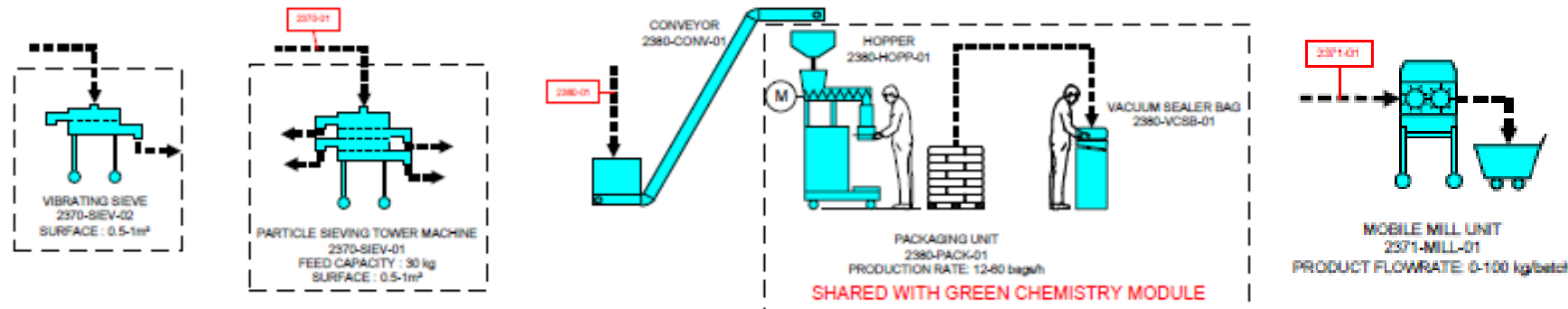
### EVAPORATION



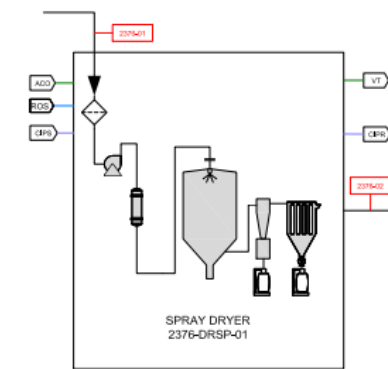
### FILTRATION & CHROMATOGRAPHY



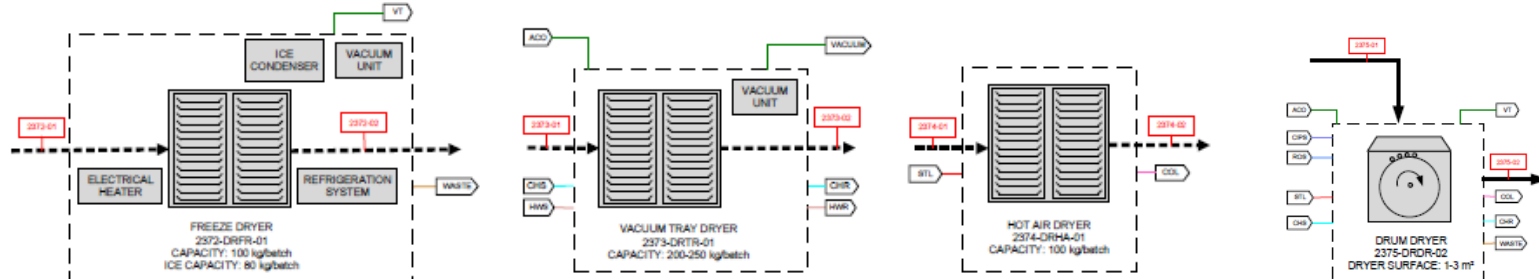
### PACKAGING



### SPRAY DRYER



### DRYING



# Bio-Process Engineering

Mobile Equipment associated to All Building Q

- 2 Chamber Filter Press of different sizes & 1 Plate and Frame Filter Press
- 1 mobile shell and tube heat exchanger
- 1 Horizontal Mixing Vessel
- 1 Small Filtration Test unit
- 6 Mobile tank from 200L to 1000L
- 9 mobile dosing stations for chemical addition or pH regulation