Functional Analysis V3

Derek 2019/08/23

Overall

Inputs to the system:

- User command
- Energy (electricity)
- Raw material (insects)
- Start signal

Outputs to the system:

- Meal
- Oil
- Waste

Functions

F1 Receive and deliver energy

- Input: High voltage AC
- Output: Low voltage DC

F2 Receive a start signal and provide a ready signal

- Input: Start signal
- Output: Ready signal

F3 Process insects into meals and oils

- Input: Ready signal, energy, raw material
- Output: Meals, oils, waste

F4 Collect the final products

- Input: Meals, oils
- Output: Meal in bag, oil in can

F5 Control the system automatically

- Input: User command
- Output: Information channels

Subfunctions

F3.1 Shred the raw material into small pieces

- Input: Energy, ready signal, raw material
- Output: Shredded material

F3.2 Remove water in the shredded material

- Input: Energy, shredded material
- Output: shredded material with low water content

F3.3 Maintain the temperature of shredded material

- Input: Energy, shredded material with low water content
- Output: shredded material with melted fat

F3.4 Separate fat

- Input: Energy, shredded material with melted fat
- Output: crude oil (fat), meal, waste

Functional Analysis V2

Derek 2019/08/19

A function is an implementation free description of an action or activity that must occur as part of the operation of the system.

Inputs to the system:

- Monitoring (either remotely or manually)
- Energy (electricity)
- Raw material (insects)

Outputs to the system:

- Meal
- Oil
- Waste

F1 Receive and deliver energy
F2 Receive a start signal
F3 Provide a ready signal: The rendering plant must indicate it is ready to take raw material
F4 Receive raw material
F5 Process insects into meals and oils
F6 Release and collect the final products
F7 Receive a stop signal

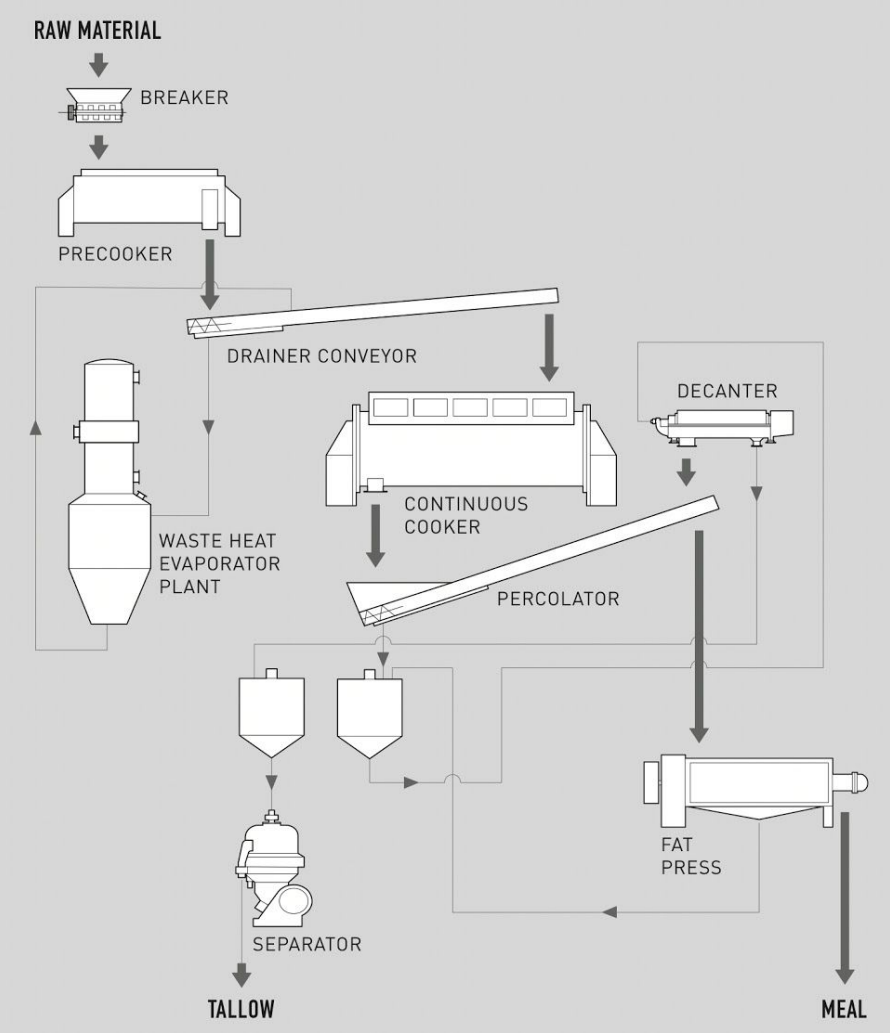
Break the raw material into small grain size
Heat the material
The designs are very different in realisation, and yet the underlying functional blocks are the same

Functional Analysis V1

Derek 2019/08/17

The goal of functional analysis is to decompose the system into actions or activities, that are termed functions. Functions characterise **what** the system does rather than **how** the system achieves this. That is:

A function is an implementation free description of an action or activity that must occur as part of the operation of the system.



Breaker

Break down raw materials to grain size smaller than xxx

Precooker

Heat up the raw material to 90-100 °C rapidly to break down the fat cells and coagulate the proteins (RenderTech, 2019).
Control the steam supply pressure automatically to keep the temperature within the desired range.

Drainer Conveyor

Separate the free liquid from the preheated raw material
Pump the free liquid to the waste heat evaporator
Transfer the materials from one end to the other end

Waste Heat Evaporator

Concentrate the process liquor using waste ener gy (vapour-rich mixture from a contact drier)
(optional) Condense the vapour produced from the evaporation process

Continuous Cooker

Heat up the product indirectly with no harsh agitation to ensure efficient separation of the fat from the cake in the following processes
Control the odour

Percolator

Separate the liquid fat from the protein solids

Decanter

Separates any solids from the drained liquid

Fat Press

Further separate fat from the protein solid by pressing

Separator

Remove any remaining protein and water from fat