

JUNE 1 - 3  
SKAGEN  
DENMARK

Leif Gunnar  
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Fjell Technology Group

Energy Efficiency in the Fishmeal Industry



# ENERGY EFFICIENCY IN FISH MEAL PLANTS

Composed by Dr. Asbjørn Strand

EFFOP, Skagen - June 2022



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[www.fjelltg.com](http://www.fjelltg.com)

FTG-2022-ENERGYEFFICIENCY

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## Content Overview

### About Fjell Technology Group

- History
- Our Vision
- Quality standards
- Business Areas

### Improvement of Existing Process Lines

### Fjell Turbodisc Dryer Atmospheric and Vacuum

### LT Meal Line

### 2 stage Disc Dryer Line

### Steam Disc Dryer & Vacuum Dryer Line



# PAST vs. FUTURE



New strategy with  
focus on  
innovation and  
Greentech



Core technology is thermo-dynamics and  
pressurized rotating equipment for mass  
and heat transfer



FTG owned patented solutions, as well as  
installation of market leading solutions



Sales, R&D, Engineering and Project  
Management of FTG deliveries

Moving our Head Office to Bergen City,  
Norway





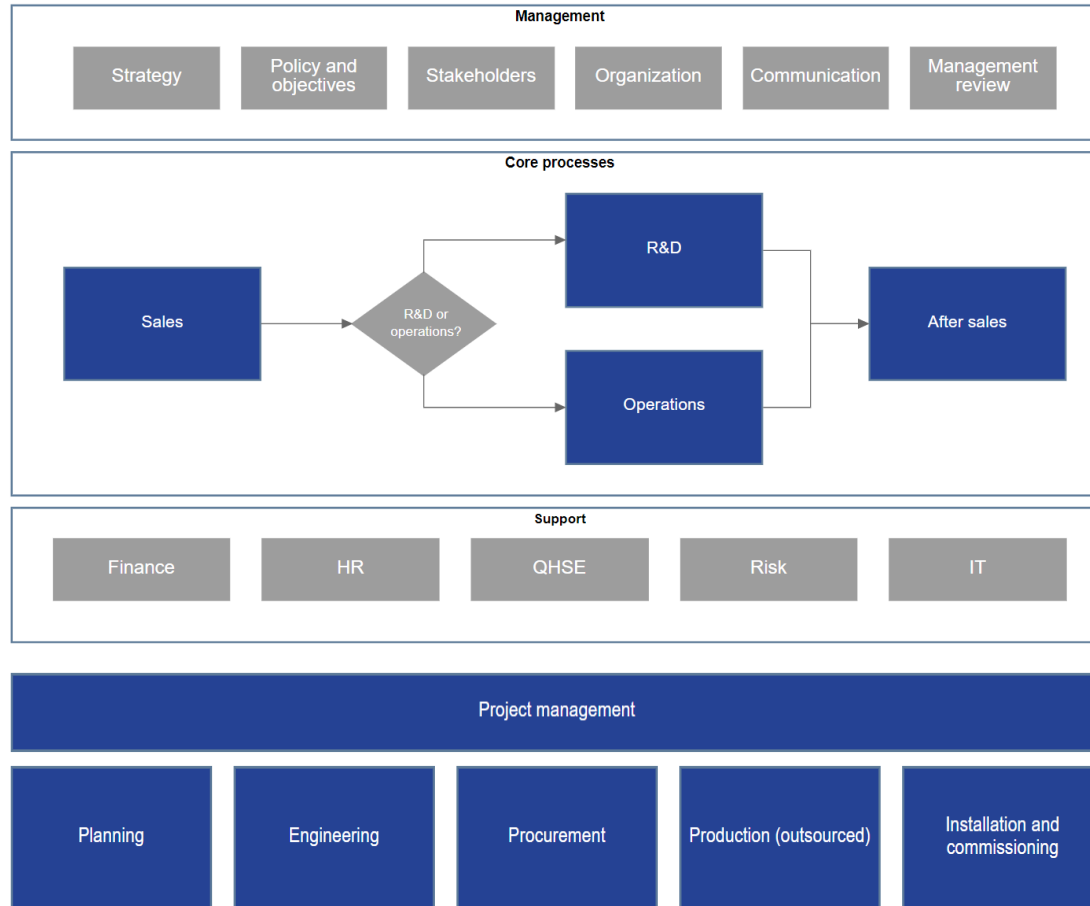


*The FTG delivers innovative process  
technology for a sustainable future*

*Reliable  
Innovative  
Responsible*



# Standardized project execution



## Management System Certificate

To certify conformity with // Godkjent overensstemmelse med  
the Management System Requirements of // Styringssystemkravene i henhold til

**NS-EN ISO 9001:2015**

awarded // tildelt



**Fjell Technology Group AS**  
Thormøhlens Gate 49A, 5006 Bergen

Manufacturing/supplying following products/services:  
for produksjon/leveranse av følgende produkter/tjenester:

**FTG is certified for research, design, manufacturing, assembly and  
commissioning of stationary and rotating process machinery  
and solutions for heat- and mass transfer.**

Certificate No // Sertifikat nr.:

**2107**



# Business Areas – Fjell Technology Group

40 years experience as supplier of process technology for sludge treatment and resource recycling.

Core technology is pressurized rotating equipment for mass and heat transfer.

We will always propose solutions that represent the optimum trade off between energy usage, environmental issues, and operational concerns.

Your partner for  
**mass & heat transfer technology**



## GreenTech Development

Biosludge & Municipal Waste Water

Waste Water Treatment



## CO2 Capture and Hydrogen

CO2 Capture using Solid Sorbents

Compact CO2 Capturing

Green Hydrogen production



## Oil & Gas

Air Coolers

Heat Exchangers

Pressure Vessels

Process Modules & Skids



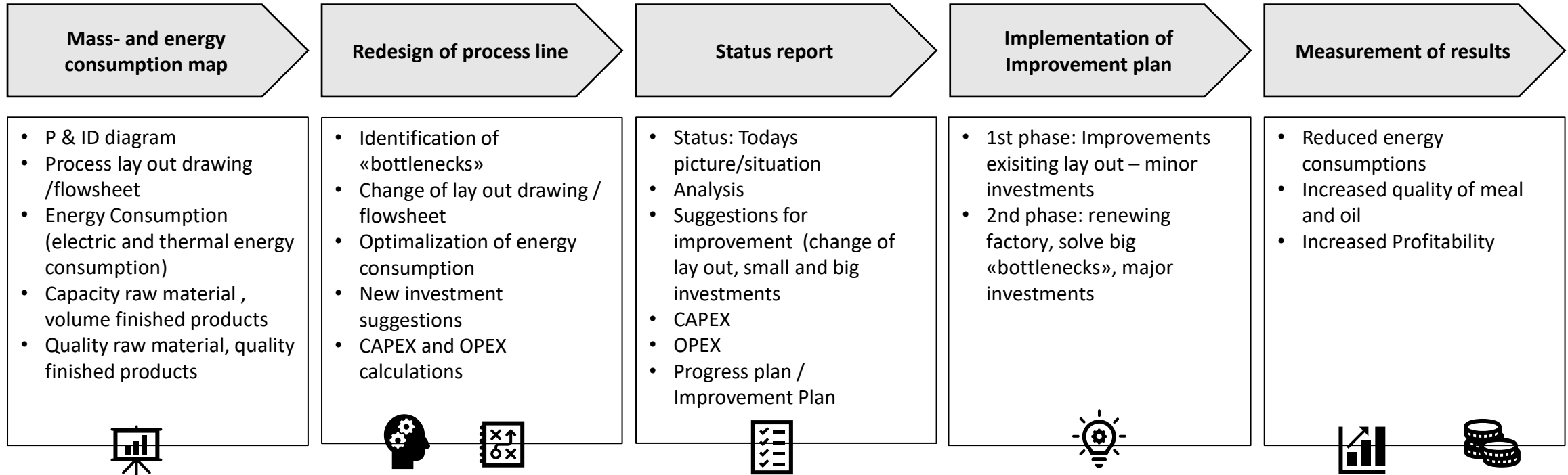
## Protein Recycling and the environment

Fish meal & Omega 3 Processing

Rendering Meat & Poultry

# Improvement of Existing Process Lines «The Fjell Way»

How FTG increase our customer's margin

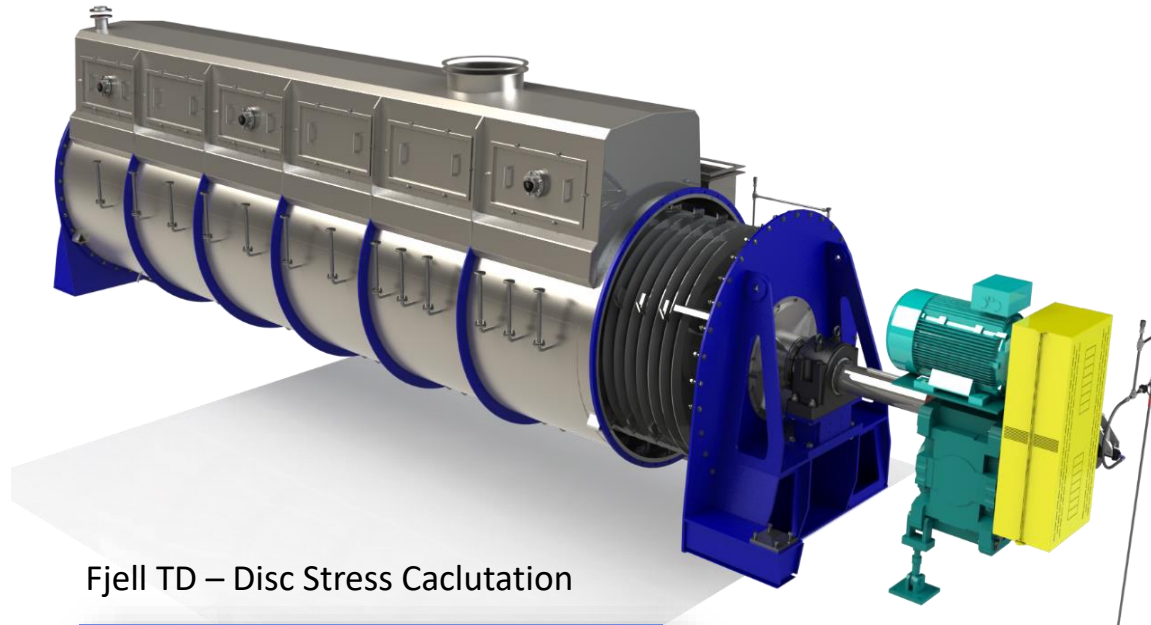


Most important is to look at the overall picture, through an energy balance - to identify the opportunities that give the most effect on margin.  
Different equipment relies on other equipment in the process to be most energy efficient.

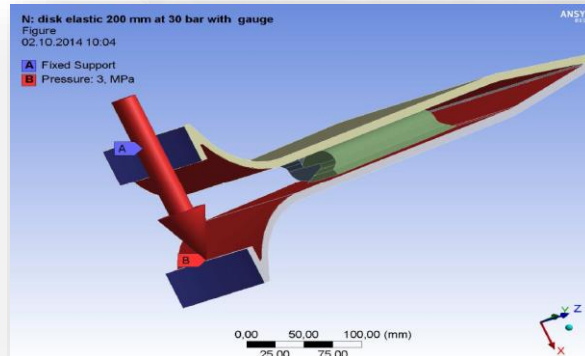


# Indirect Dryer – Fjell Turbo Disc Dryer

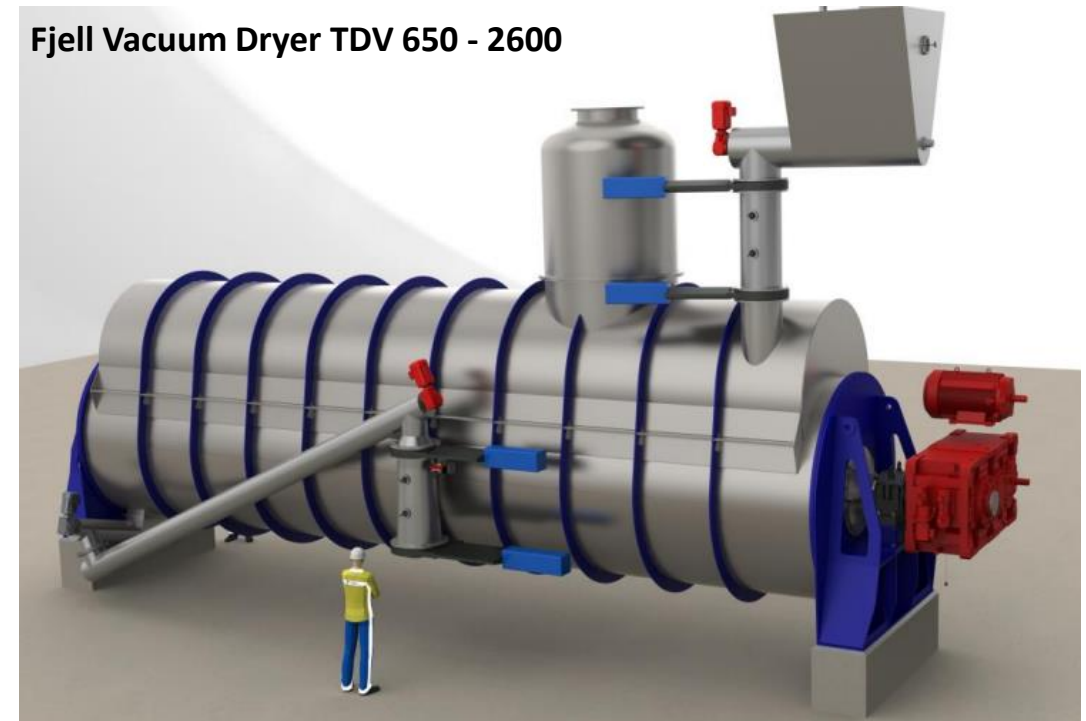
Fjell Turbodisc Dryer TD300 - 1900



Fjell TD – Disc Stress Caclutation



Fjell Vacuum Dryer TDV 650 - 2600



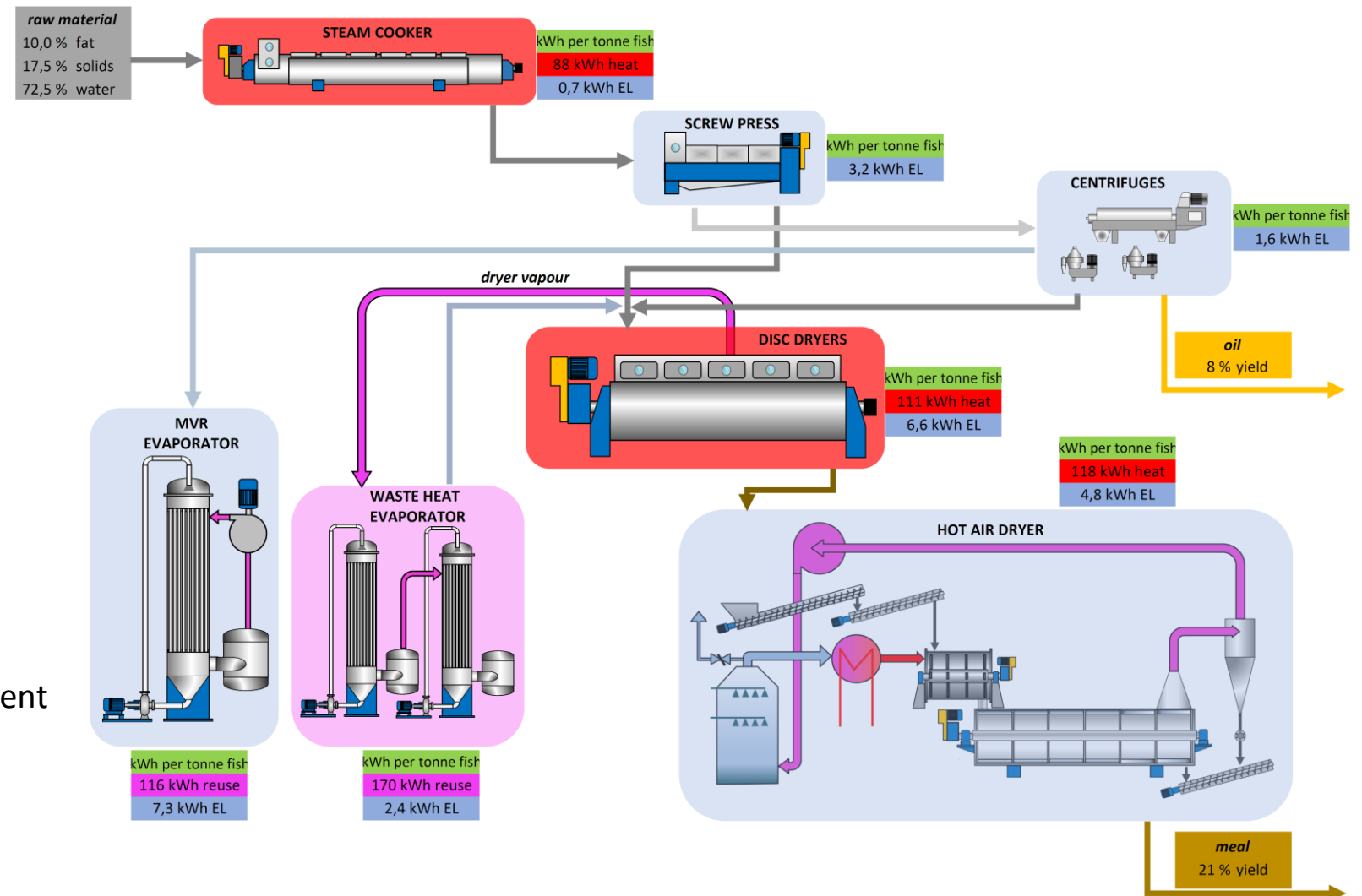
# LT-meal line



Energy usage per tonne raw material*
316 kWh heat**
286 kWh reuse
27 kWh EL
<b>343 kWh energy input**</b>

\*Only shown process line included  
 \*\*10% heat loss added in each stage

- Conversion to electric air heater will save 5-10% heat and eliminate emissions to air.
- Fjell is still offering the Dyno-Jet technology.
- Perhaps less attractive with the present energy market?



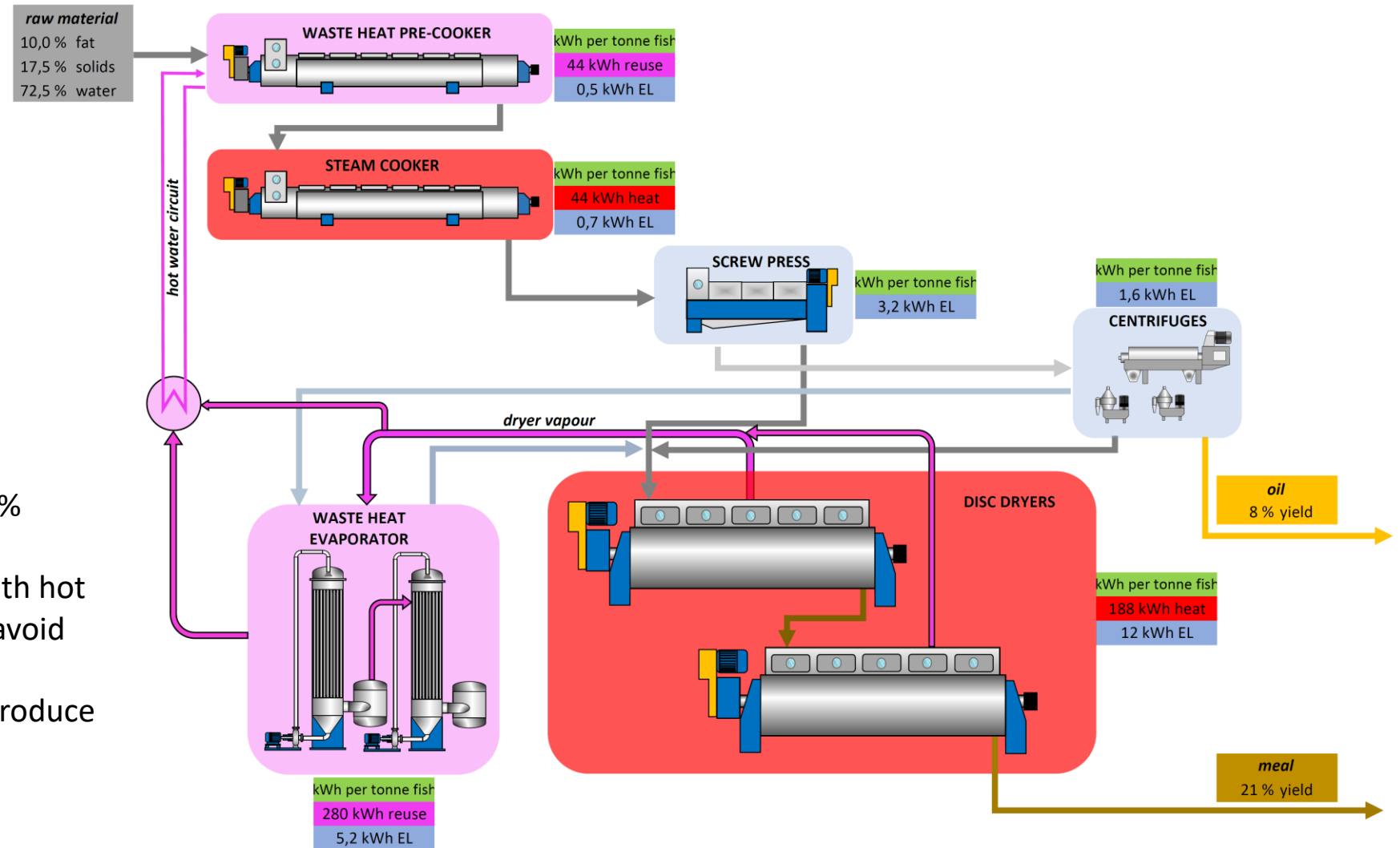
# Two stage disc dryer line



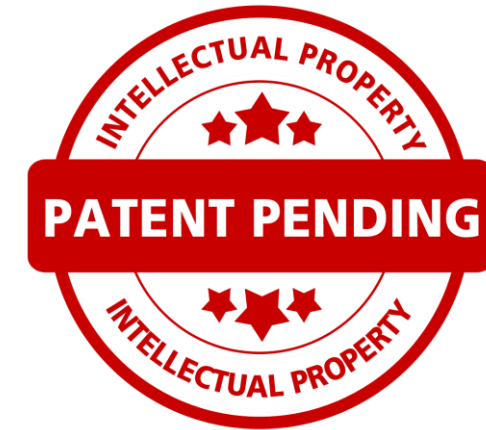
Energy usage per tonne raw material*
227 kWh heat**
329 kWh reuse
23 kWh EL
<b>250 kWh energy input</b>

\*Only shown process line included  
 \*\*10% heat loss added in each stage

- Waste heat pre-cooker saves 15% steam.
- Fjell is offering screw cookers with hot water circuit to save space and avoid autolysis.
- Modern plants with such lines produce high quality meal.



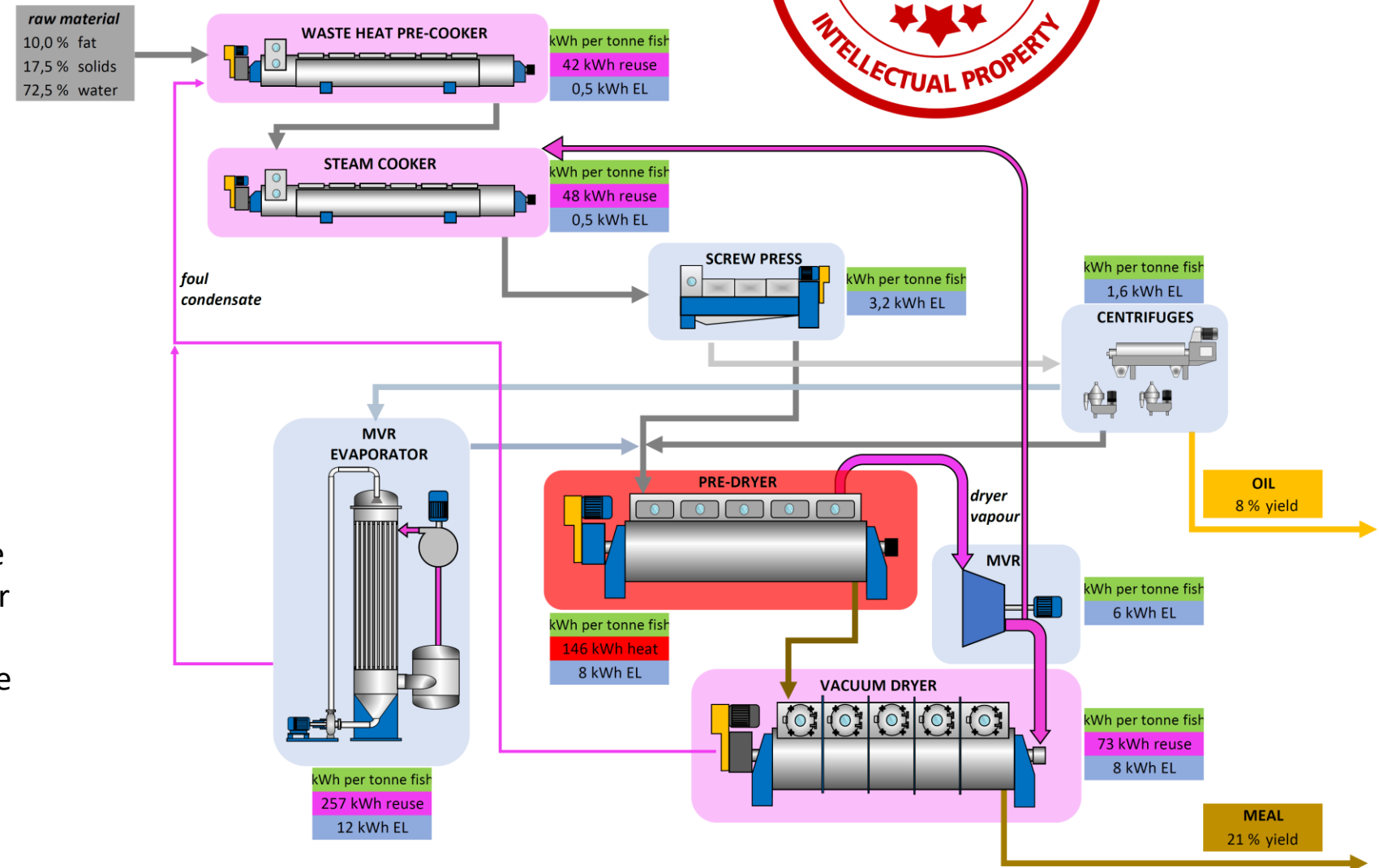
# Steam disc dryer + vacuum dryer line



Energy usage per tonne raw material*
146 kWh heat**
420 kWh reuse
40 kWh EL
<b>186 kWh energy input</b>

\*Only shown process line included  
 \*\* 10% heat loss added in each stage

- Lowest theoretical energy input of practically possible process lines?
- Pre-drying in closed dryer to secure hygienisation and high-quality dryer vapour for reuse.
- Meal quality in industrial scale to be demonstrated.







***FJELL***  
***TECHNOLOGY GROUP***

Your partner for  
**mass & heat transfer technology**

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RELIABLE – INNOVATIVE – RESPONSIBLE