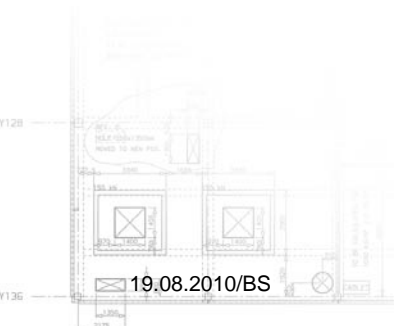
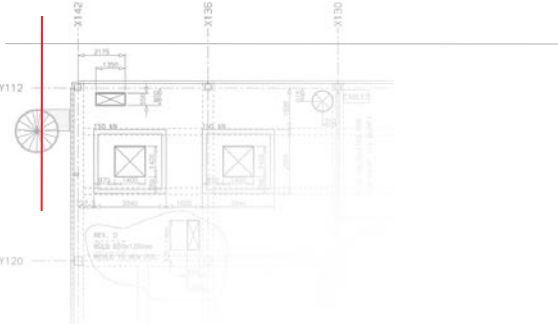




ODOUR REDUCTION & ENERGY RECOVERY

GRAINTEC A/S

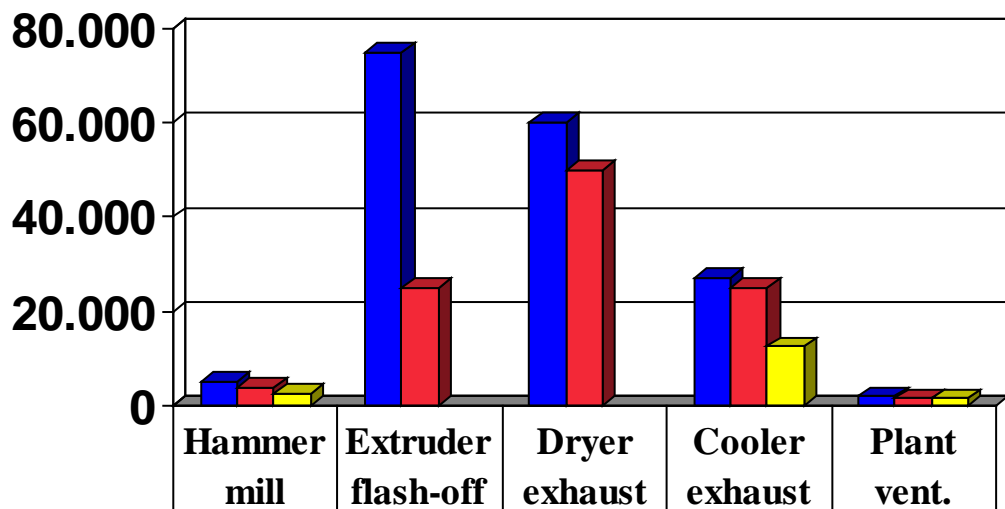




THE GRAINTEC SOLUTION

- The GRAINTEC solution includes:
 - Reduction of air emission by recirculation of process air
 - Cleaning of exhaust air by condensation and other technologies
 - Energy recovery systems for extruder flash-off and dryer exhaust

ODOUR CONCENTRATIONS OU/M³



Aqua Feed Plant	5000	75000	60000	27000	2000
Pet Food Plant	4000	25000	50000	25000	1500
Animal Feed Plant	2600			12500	1500

■ Aqua Feed Plant ■ Pet Food Plant ■ Animal Feed Plant

Odour concentration may fluctuate significantly from plant to plant!

ODOUR EMISSIONS OU/H

3,500E+09 OU/H
86% from drying

2,500E+09 OU/H
80% from drying

300E+09 OU/H
83% from cooling

3,500E+09
3,000E+09
2,500E+09
2,000E+09
1,500E+09
1,000E+09
5,000E+08
0,000E+00

■ Aqua Feed Plant ■ Pet Food Plant ■ Animal Feed Plant



ENVIRONMENTAL SOLUTIONS

Solution:	Cleaning efficiency
1. Chimney	0 % (Only dilution)
2. Ozone Reactor (Plasma)	70 – 85 %
3. Bio or Chemical Scrubber(s)	70 – 90 %
4. Bio Filter	70 – 95 %
5. RTO Oxidizing	90 – 98 %
6. Recirculation/Condensation incl. Coal Filter	98 – 99 %

1. CHIMNEY: EFFICIENCY 0%

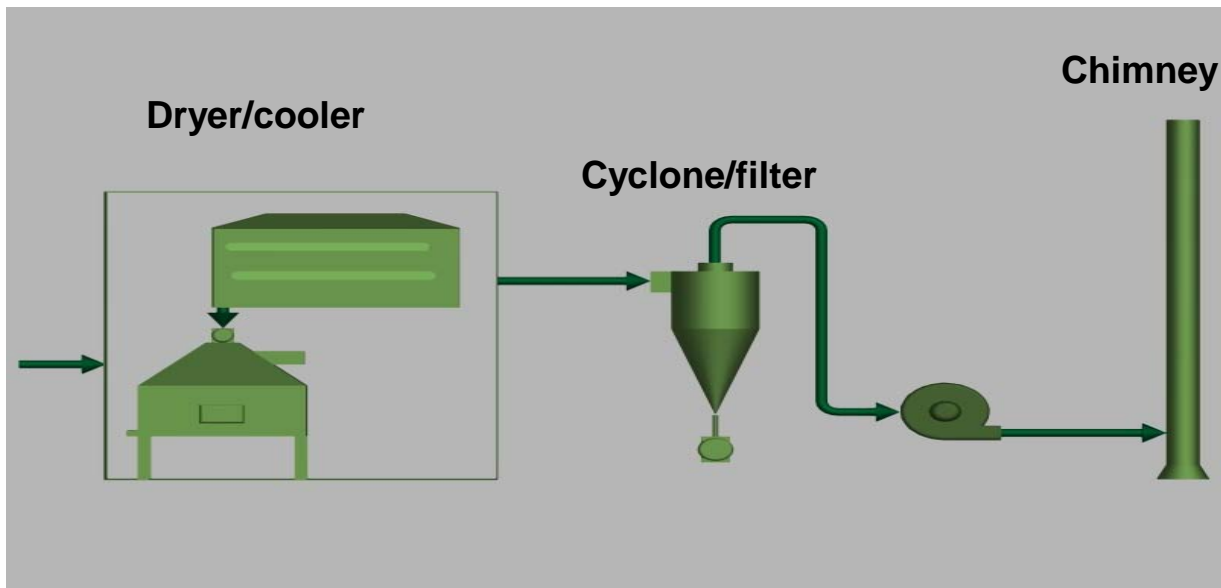


Photo left:
Plume of
smoke (winter
conditions)



Photo right:
Stack/chimney
above 100 m is
not unusual



19.08.2010/BS

2. OZONE REACTOR (PLASMA): EFFICIENCY 70 - 85%

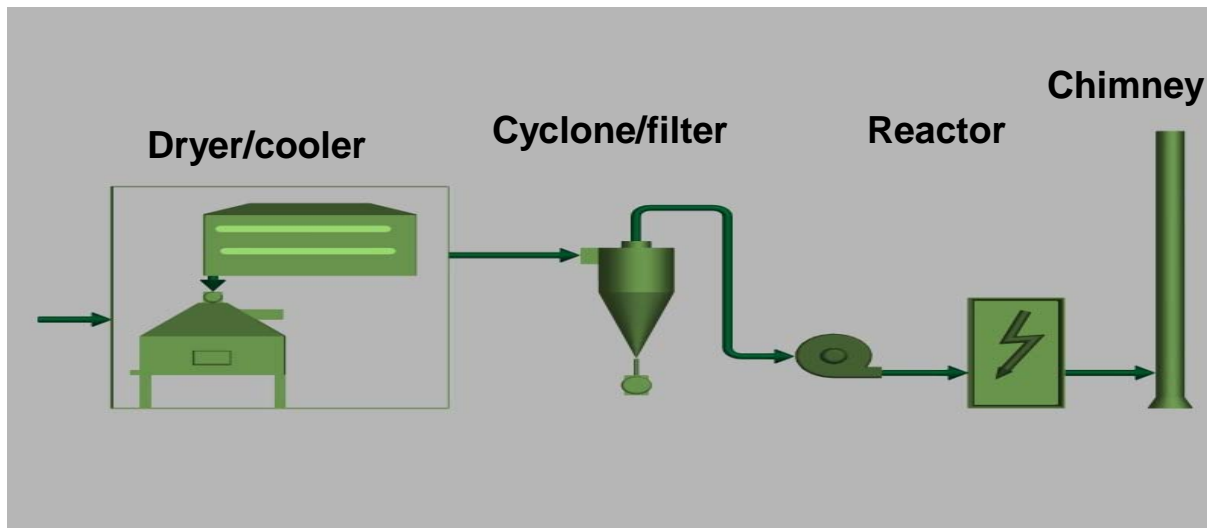


Photo left:
APP plasma
unit

3. BIO/CHEM. OR SEA WATER SCRUBBER: EFFICIENCY 70 - 90%

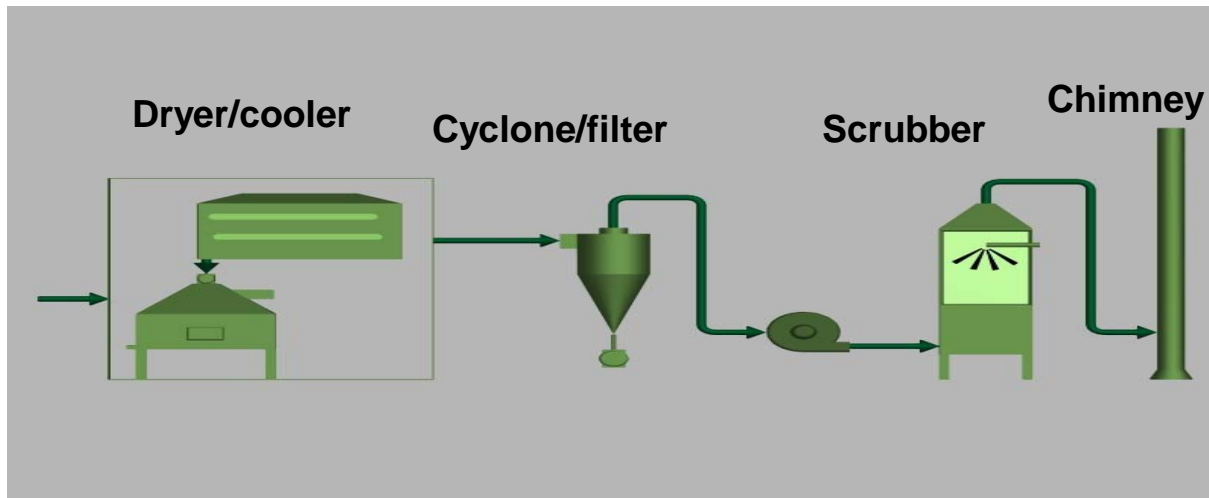


Photo left:
Sea water
scrubbers



Photo right:
Chemical
scrubber
located indoors

4. BIO FILTER: EFFICIENCY 70 - 95%

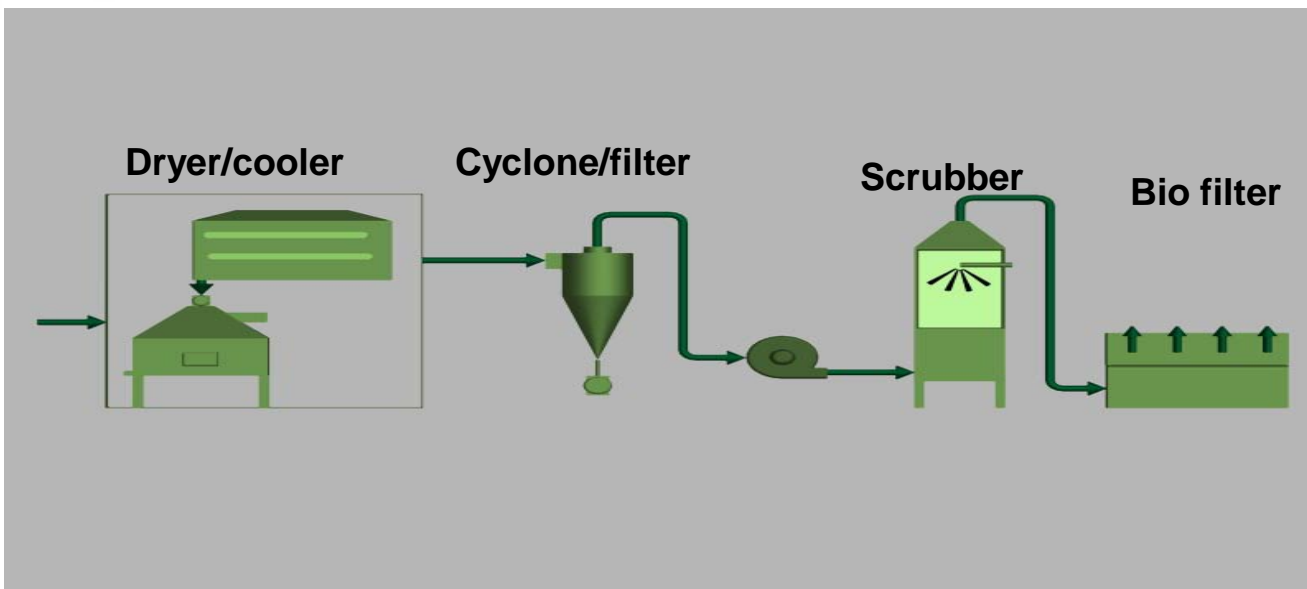


Photo left:
Bio filter with
wood chips



Photo right:
Fresh water
scrubber

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5. RTO OXIDIZING: EFFICIENCY 90 - 98%

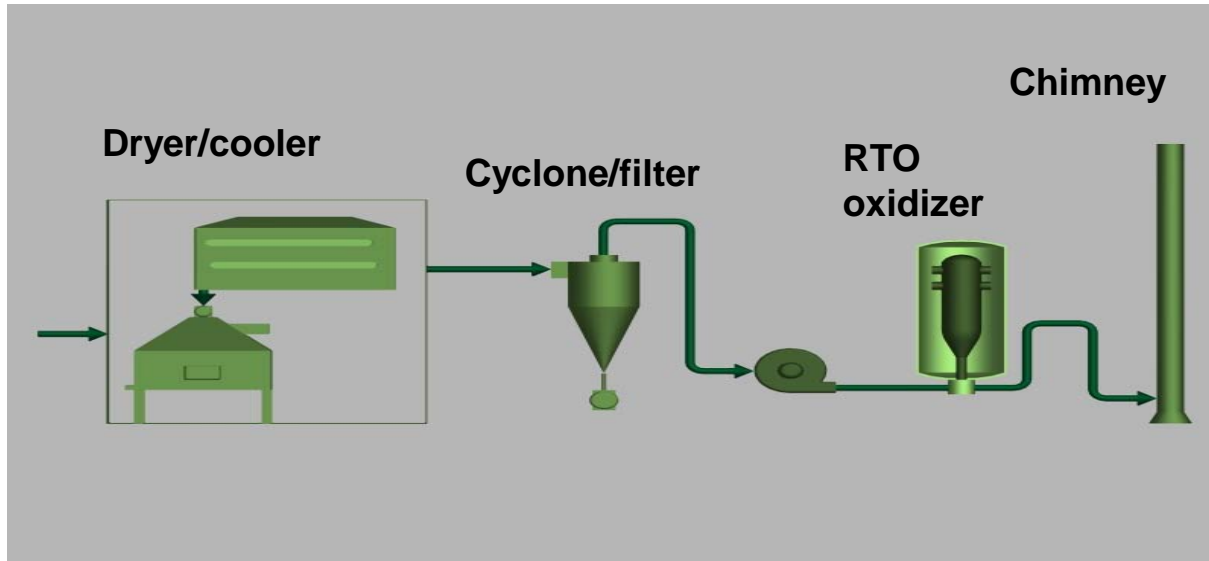


Photo left:
Regenerative
thermal
oxidizers

6A. TOTAL RECIRCULATION INCL. COAL FILTER: EFFICIENCY 98 – 99%

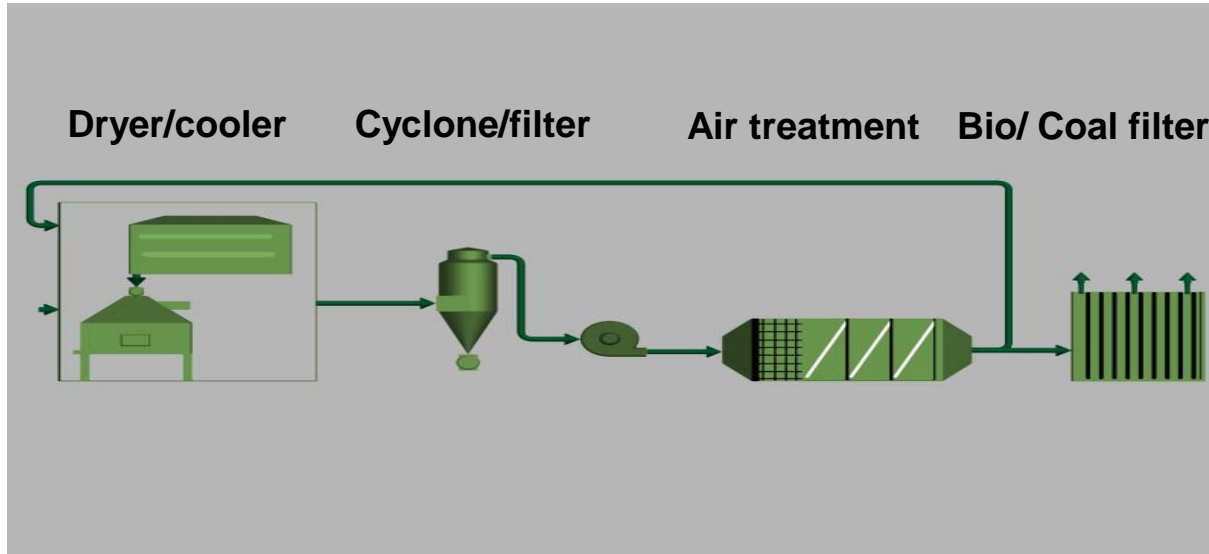
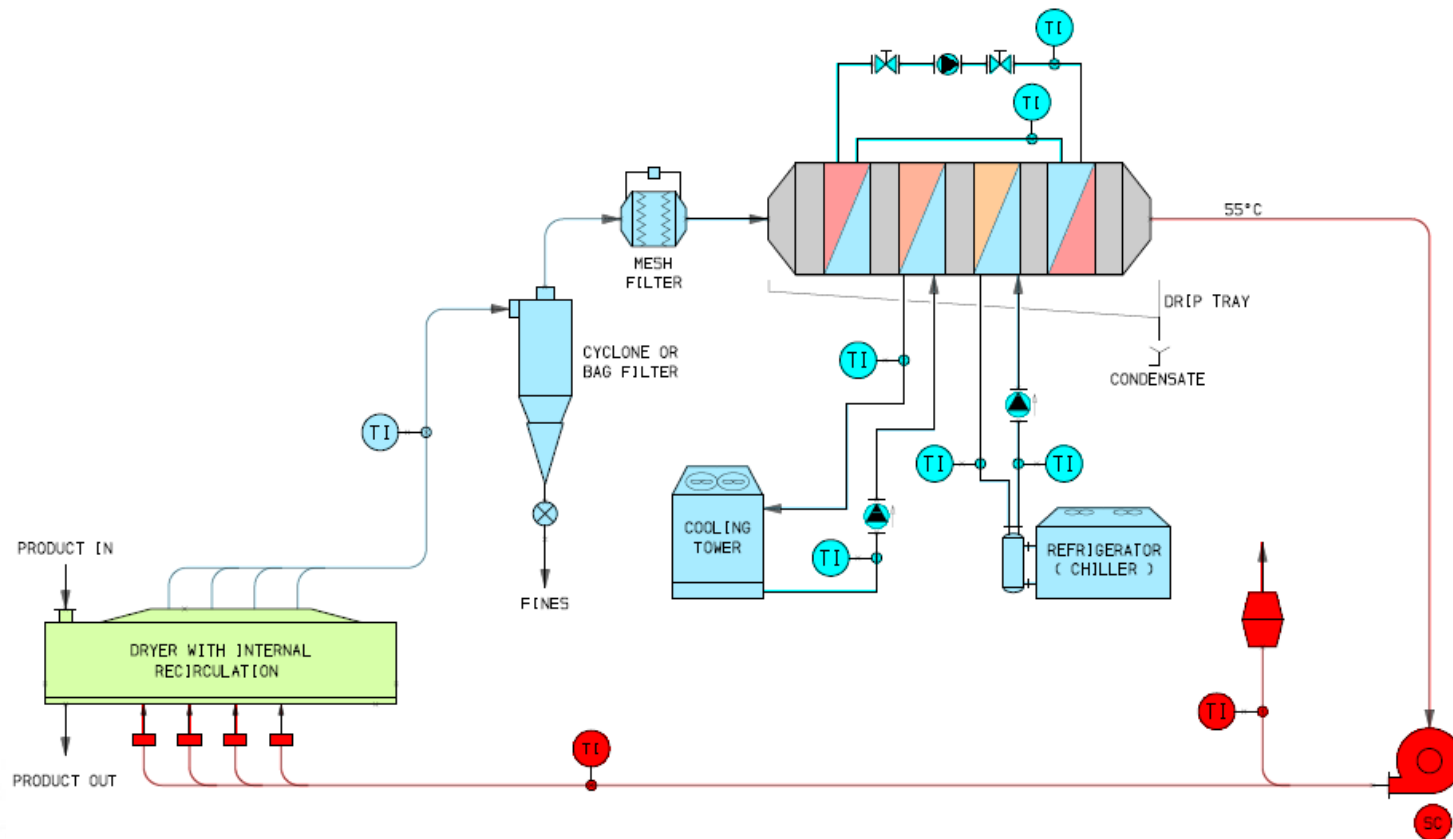


Photo left:
Air treatment unit
incl. bag filter



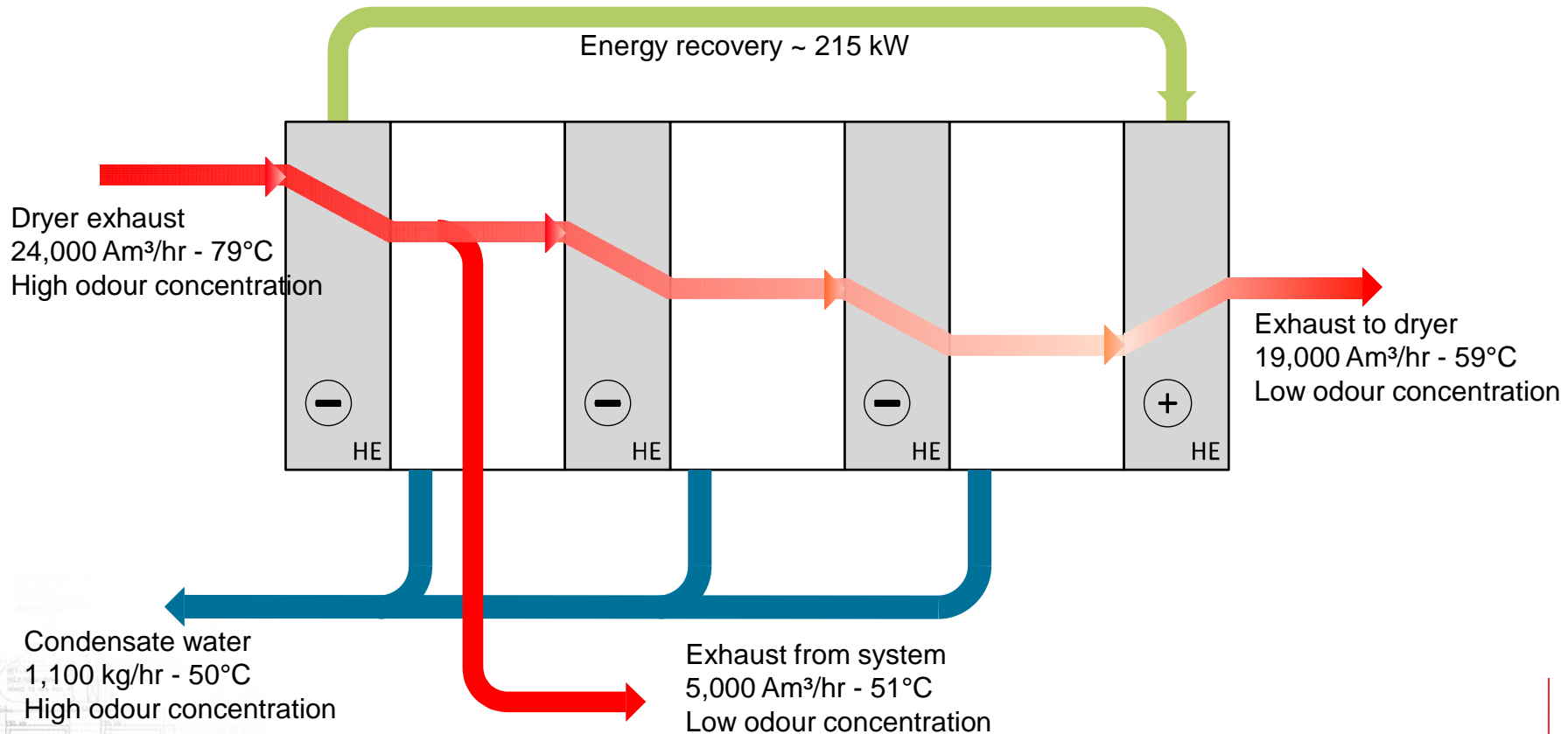
Photo right:
Cooling tower

6B. ENERGY RECOVERY AND ODOUR REDUCTION GRAINTEC SOLUTION



Reduction in odour emission: 85 - 98%
Thermal energy recovery: ~ 15 – 50 kWh/ton

6C. SYSTEM APPLICATION GRAINTEC SOLUTION



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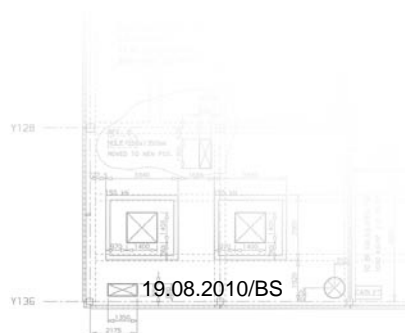
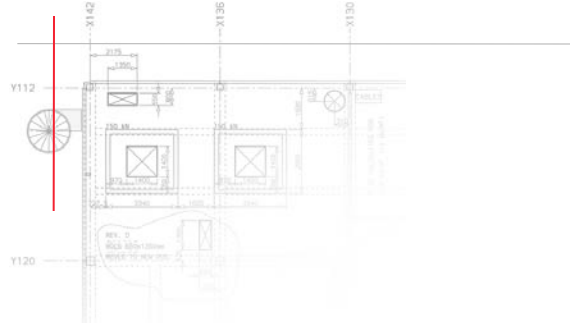
SUMMARY

Solution:	Cleaning efficiency	Capital investment costs for each cbm air/h to be cleaned	Annual operating costs for each cbm air/h to be cleaned
Chimney	0 %	Very low	Low
Ozone/plasma Reactor	70 – 85 %	Low	High
Bio/Chemical or Sea Water Scrubber(s)	70 – 90 %	Very High	Very high
Bio Filter	70 – 95 %	Low	High
RTO Oxidizing	90 – 98 %	High	High
Recirculation/Condensation incl. Coal/Bio Filter	98 – 99 %	Very high	Very low (note)

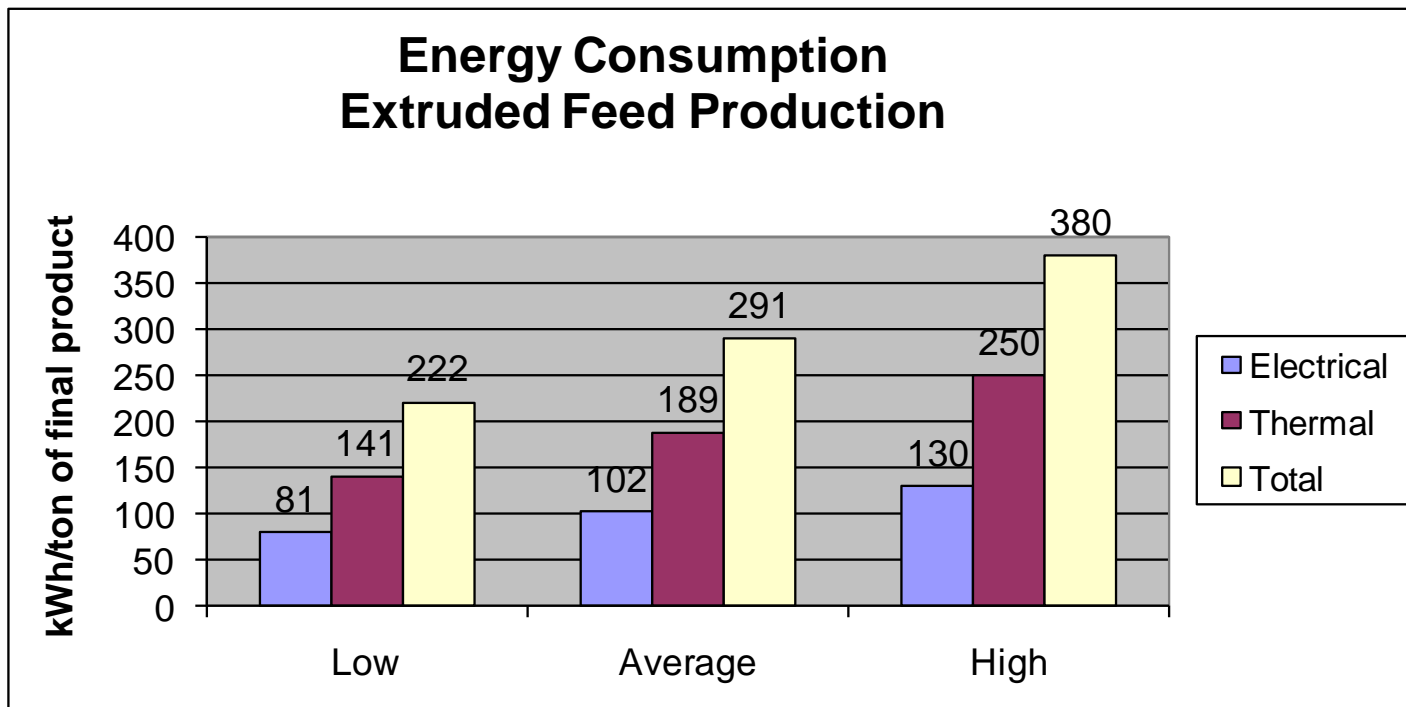
Note: The annual operating cost for this solution is very low because the solution includes energy recovery!



ENERGY RECOVERY

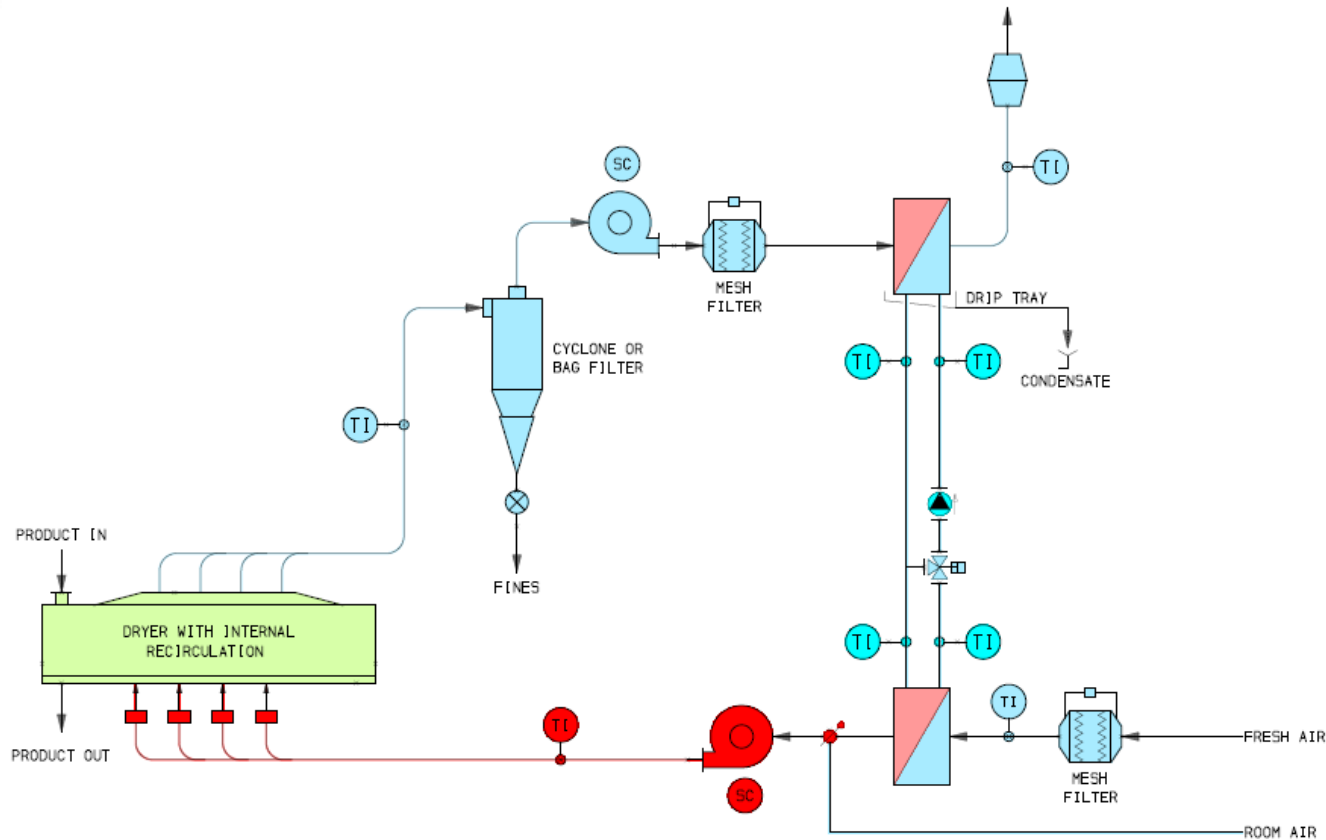


ENERGY CONSUMPTION



The total energy consumption (thermal and electrical) can normally be reduced to less than 220 kWh per ton final product in extruded feed and drying is the most energy consuming process

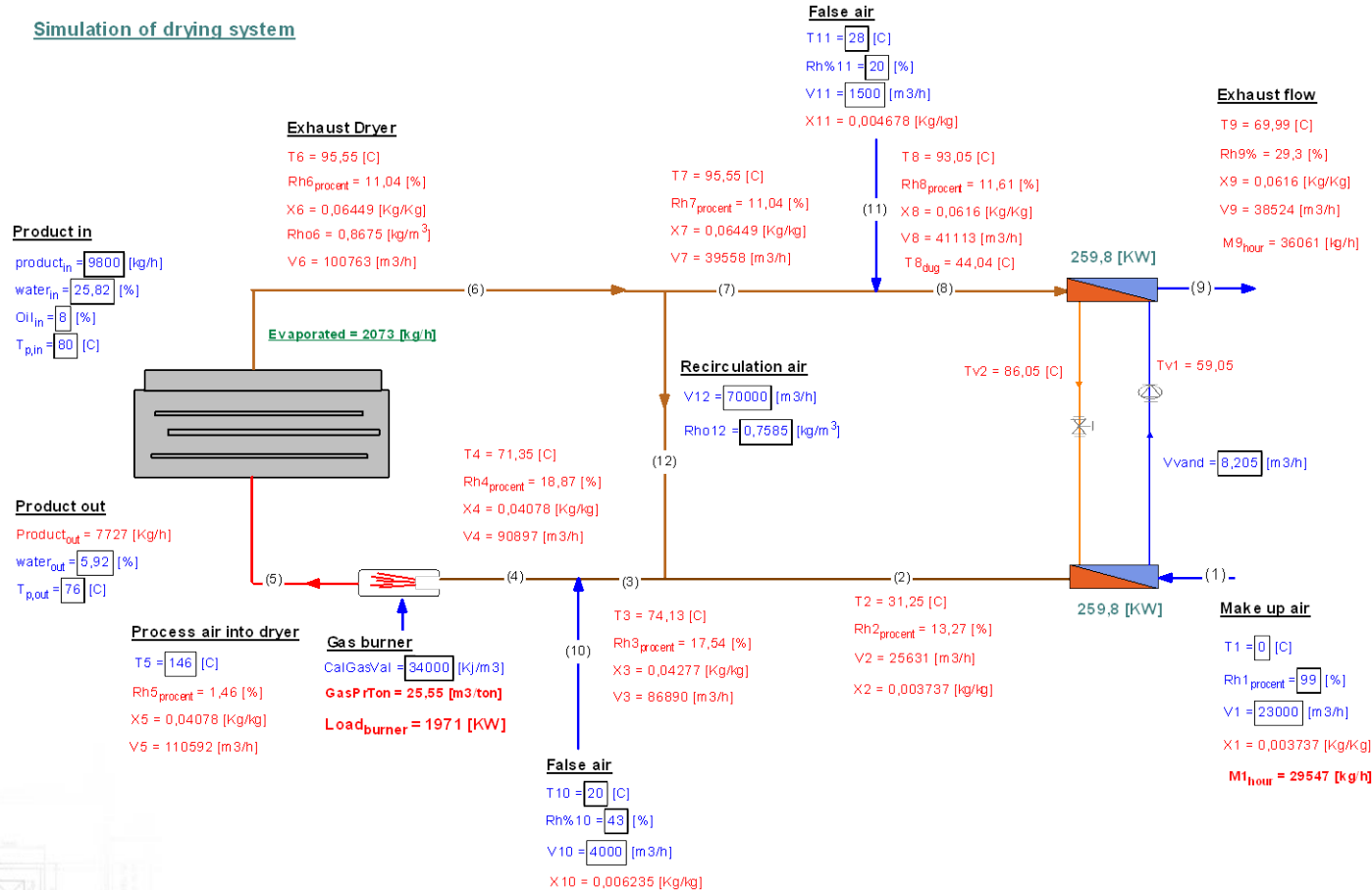
ENERGY RECOVERY - DRYING GRAINTEC SOLUTION



Reduction in odour emission: 40 - 70%
Thermal energy recovery: 15 – 50 kWh/ton

SIMULATION PROGRAM DEVELOPED BY GRAINTEC

Simulation of drying system





SUMMARY

- Odour reduction by energy recovery of dryer exhaust air in combination with condensation and re-circulation of dryer air operates with an efficiency of 85 – 98% and is very operational cost effective
- Energy recovery of dryer exhaust air can reduce odour emission by 40 – 70% and recover 15 – 50 kWh of thermal energy per ton of product