



**SUNPINE**

# **SunPine Biorefinery**

## **Second generation biofuel**

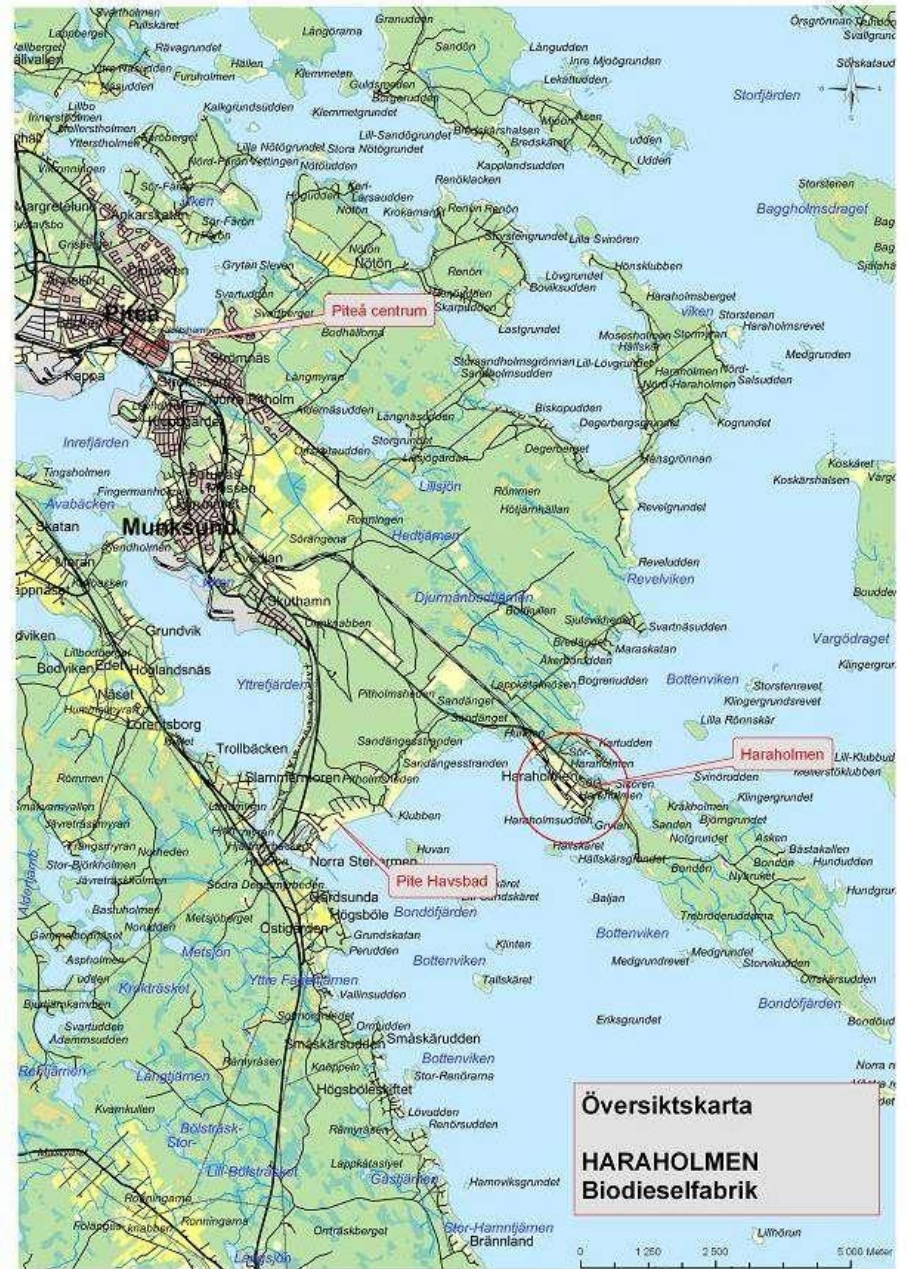


# SunPine AB

- Founded in 2006
- Environmental permission 2008-03
- Owners
  - KIRAM AB (Lars Stigsson)
  - Preem AB (from 2008-06)
  - Sveaskog (from 2008-06)
  - Södra Skogsägarna (from 2008-06)
- Investment approx. 32 million EUR
- Production start 2010-04
- 20+ employees



# Location



# Piteå Harbour



# Summer 2010



# SunPine AB

## .....about Crude Tall Oil (CTO)

- CTO is a renewable, non food raw material.
- CTO is a rest product from the kraft sulphate process. After the digester (anthraquinone can be used for increased yield), soap is separated from the black liquor and acidulated with sulphuric acid into CTO.
- 2-3 procent of the wood becomes CTO.
- Swedish CTO volume is approx. 200 kton/year.
- CTO main components are fatty acids, resin acids and neutral elements.
- Sterols are part of the neutral elements and are today recovered and used in functional foods.

# SunPine

## .....about wood components



	Pine (Pinus)		Spruce (Picea)		Birch (Betula)	
	kg/ton	%	kg/ton	%	kg/ton	%
Fatty acid	16	73	5	62	13	70
Resin acid	5	22	1,5	21	0	0
Neutral element	1,1	5	1,3	17	5	30
of which Beta-sitosterol	0,8	4	0,5	7	0,7	4



# SunPine – first phase

## Production facility for crude tall diesel

### ■ Feedstock

- Crude Tall Oil
- Methanol

### ■ Products

- Crude Tall Diesel (55%)
- Tall Oil Pitch (45%)

### ■ Capacity

- 100.000 m<sup>3</sup>/year

(that is 2,5% of the  
swedish diesel volume)



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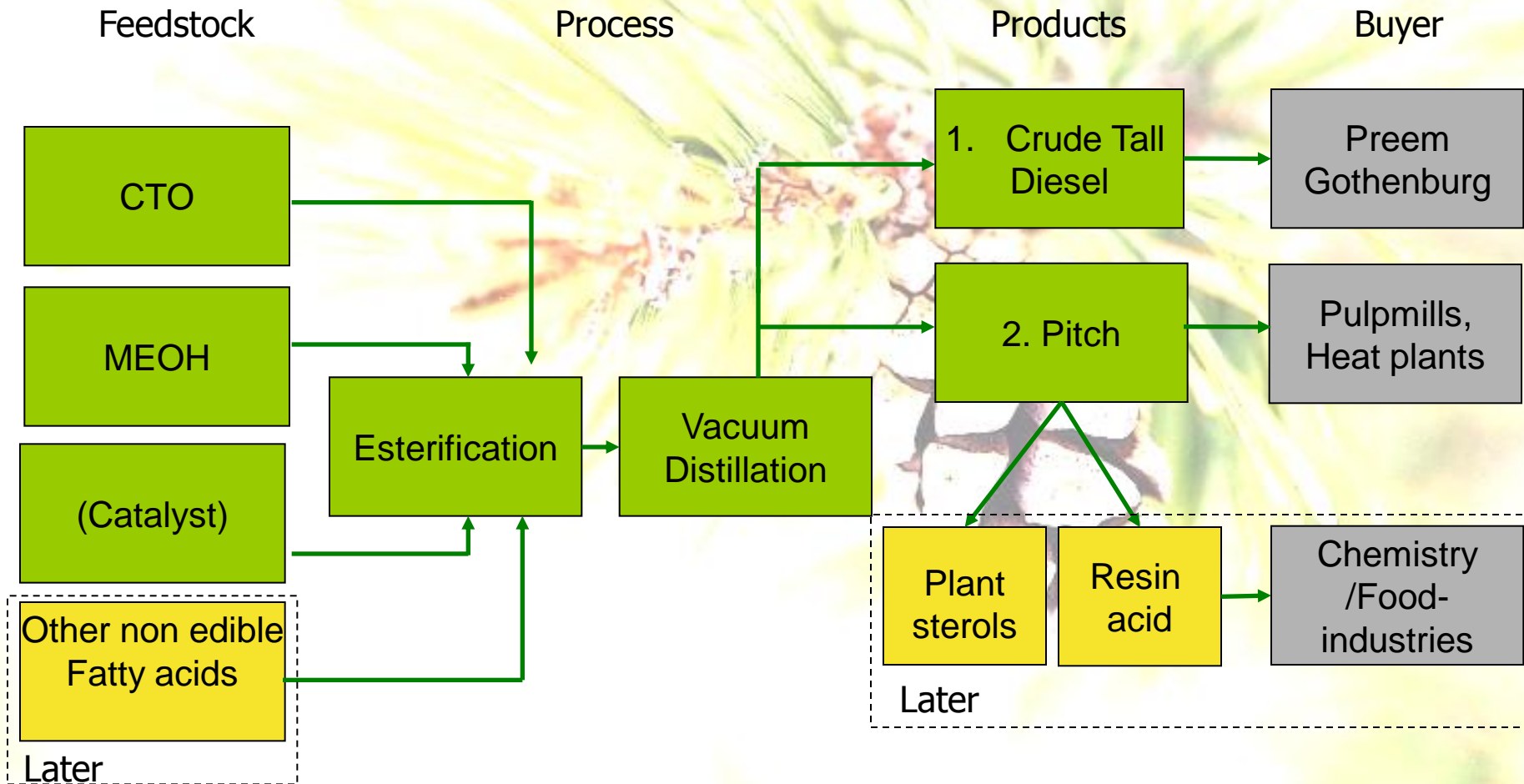




SUNPINE



# The SunPine Process



# 2006: Process development

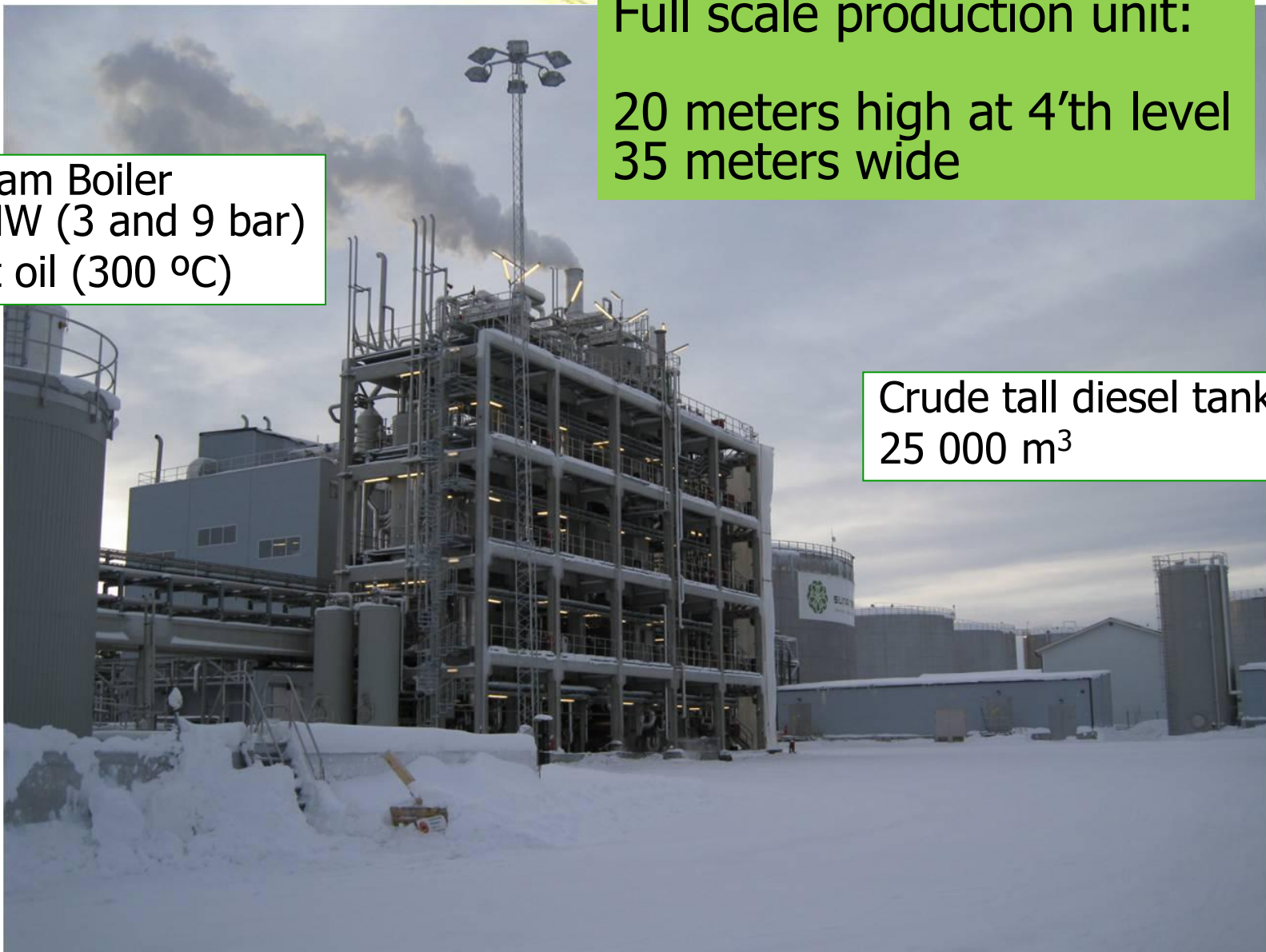


Full scale production unit:

20 meters high at 4'th level  
35 meters wide

Steam Boiler  
5 MW (3 and 9 bar)  
Hot oil (300 °C)

Crude tall diesel tank  
25 000 m<sup>3</sup>



Methanol condensers

Steam stripper

Fractionation reactor  
(3mBar, bottom temp 240°C)

Methanol reactor

Esterification reactor

Vacuum system  
Spray condenser  
Steam Ejectors

Reactor flash

Gas collection

Thin-film evaporator

Turpentine decanter

Methanol

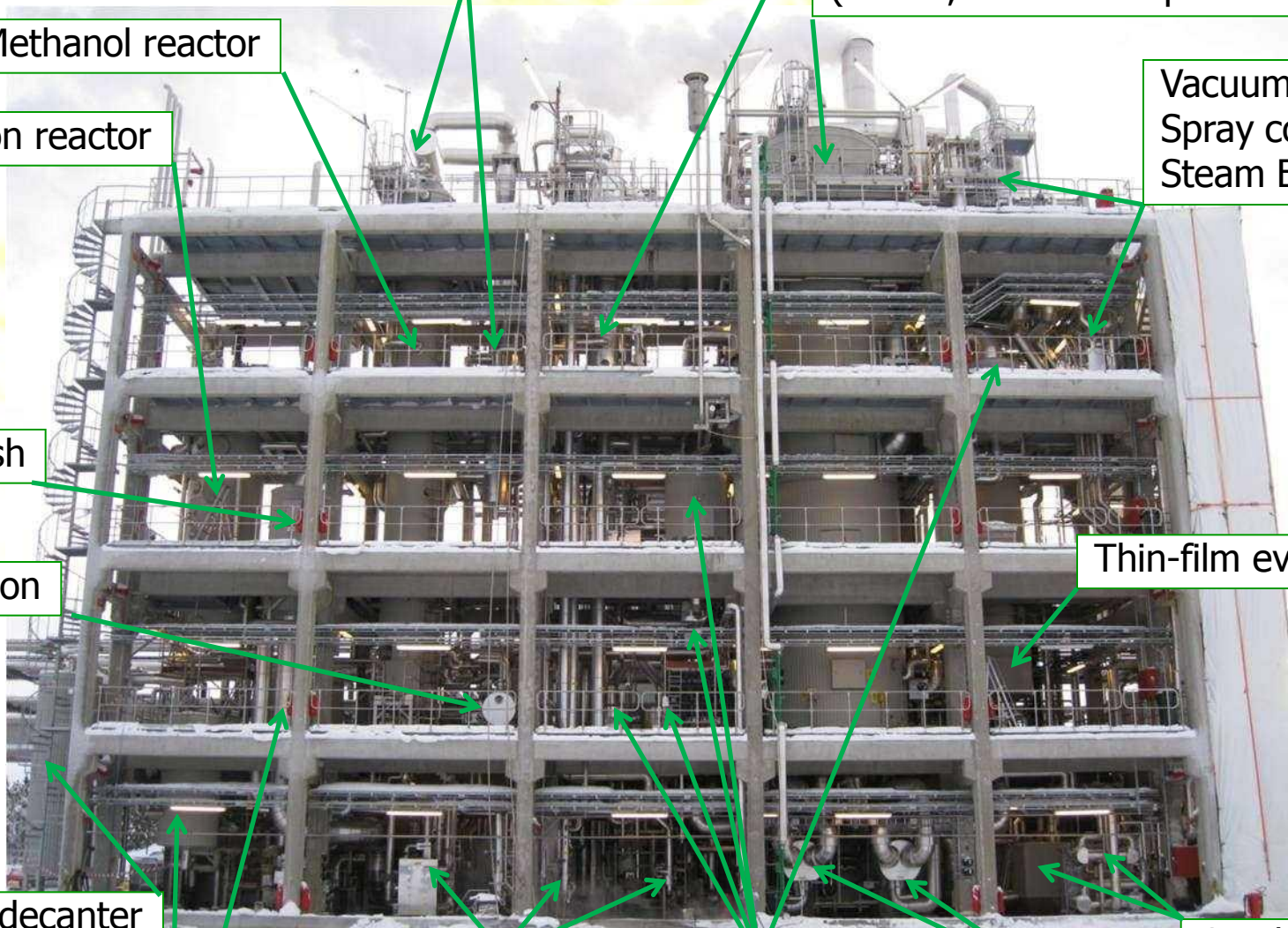
Turpentine

Heat exchangers

Flash tanks

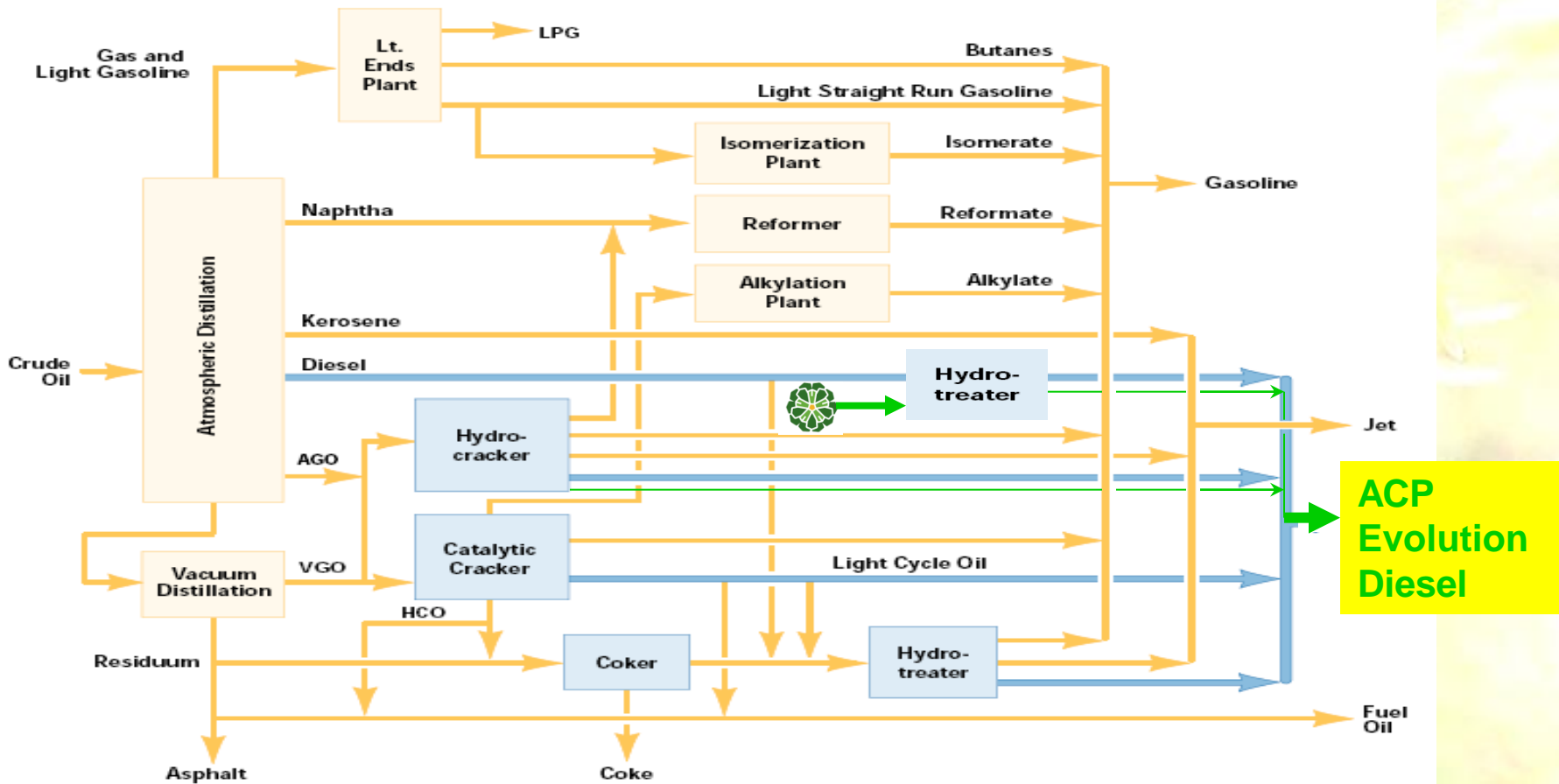
Re-heat

Condens tank  
and coolers



# SunPine crude tall diesel

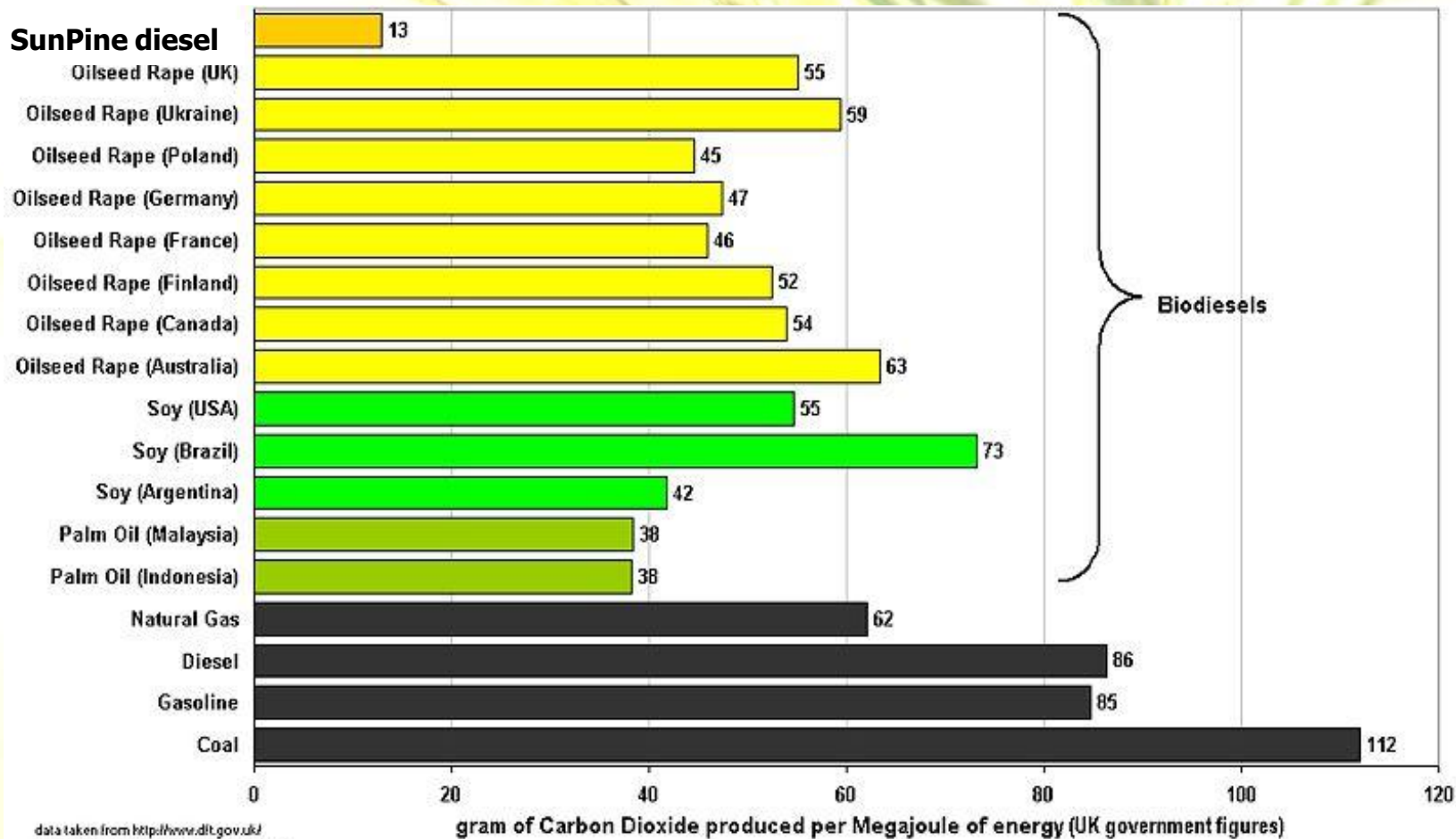
## Renewable feedstock for the refinery at Preem in Gothenburg



# Traditional raw materials for renewable diesel fuels.....



# ...and CO<sub>2</sub> aspects



data taken from <http://www.dit.gov.uk/pg/roadst/environmenkt/infogov/cefa.pdf>





# Nov 2008: Frost protection



# May 2009: "Green field"



# Aug 2009



# Nov 2009

2009-11-30 08:22:29



Dec 2009



# Feb 2010



Feb 2010 (-30 °C)



# Feb 2010: Boiler start





# April 2010: "Lysekil oilers"



# April 2010: Production start

2010-04-14 08:55:55



# May 2010: Opening ceremony



# October 2010: Vessel to Preem

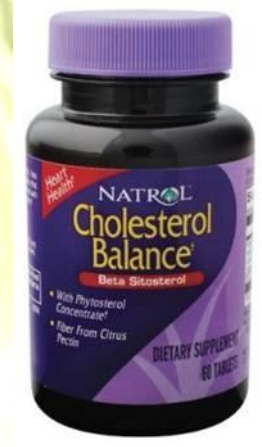
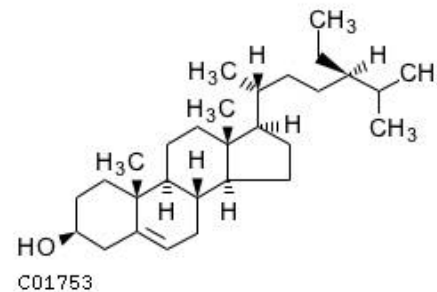


# October 2010: Maintenance shut



# Valuable components in tall oil pitch

- Resin acids
- Phytosterols



## ■ Future

- Increase feed
- Increase yield
- Process optimization
  
- Recovery of resin acids (30-40 % of pitch)
- Recovery of anthraquinone
- Recovery of phytosterols

