The Talloil and Resin Industry: Global overview and Trends
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Pine Tree composition

• Pine trees contain 2-5% of extractives
• Rosin, Fatty acids, Turpentine and Sterols are the main components of the extractives
Pulp Production

- **Global Pulp Production from virgin + recovered fibers**: 330 Million T
- **Global Virgin Wood Pulp Production**: 160 Million T

- **Softwood Kraft pulp from coniferous trees**: 42 Million T mainly concentrated (almost 90%) in North America and Europe.

- **Softwood kraft pulp production** is forecast to increase by 1-2% pa in coming years.

- **Crude Tall Oil** is obtained from softwood kraft pulp.

- **40-50 Kg CTO/T softwood kraft pulp**.

- **Global Crude Talloil production**: 1.65 Million T (theoretically max. 2.1 Million T)

*forchem*
KRAFT Process

- Invented in Danzig/Prussia in 1879 by Carl Dahl
- Superior strength of the resulting paper (Kraft = Strength in German)
- Invention of the recovery boiler in 1930 enabling the recovery and reuse of the inorganic pulping chemicals
- Raw Talloil soap which rises to the surface of the intermediate black liquor tank is skimmed off and acidified with sulfuric acid to produce Crude Talloil
- Dissolved organic compounds in heavy Black Liquor are burned to produce steam and power.
- **Black liquor can be considered as the most important renewable bio-fuel**
**KRAFT Process**

- **CaCO₃ = CaO + CO₂**

1. **First step:** 20-30% solids.
   - CTO soap rises to surface and is skimmed off.

2. **Degraded soluble lignin & hemicellulose + extractives**
   - 15% solids

3. **Acidulator**
   - Crude Talloil 65-80% solids

4. **Heavy Black Liquor**
   - 65-80% solids
   - Heavy black liquor burned to recover inorganics for reuse.
   - \( \text{Na}_2\text{SO}_4 + 2\text{C} \rightarrow \text{Na}_2\text{S} + 2\text{CO}_2 \)
   - Boiler generating steam and electricity

5. **Ca, Na and S: closed cycle**

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*Extra energy needed (CTO, Talloil Pitch or Fossil Fuel)*

- Green liquor mixed with \( \text{CaO} \) becoming \( \text{Ca(OH)}_2 \) in solution to regenerate white liquor.
- \( \text{Na}_2\text{CO}_3 + \text{Ca(OH)}_2 + (\text{Na}_2\text{S}) \rightarrow 2 \text{NaOH} + \text{CaCO}_3 + (\text{Na}_2\text{S}) \)
- \( \text{CaCO}_3 \) precipitates and heated in Lime Kiln.

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*Removal of CTO soap improves further evaporation step*
Pulp And CTO Developments

• Global paper and paperboard market forecast to grow 1.1% per year to reach 480 million T by 2030. Shrinking demand for newsprint papers but the annual consumption of packaging material and tissue/hygiene product will rise by almost 3% per year.

• Conversion of newsprint machines to packaging production is likely to accelerate.

• Softwood price index at its lowest level since 2006. Downward price trend except in South USA.

• Price of wood pulp is forecast to rise at an annual rate of 5% in the next three years according to IBISWorld?

• New CTO production in North Europe 2016/2020 : Up to 150 000 T ? Metsä fibre/Äänekoski, Södra Värö/, UPM//Kymi, Stora Enso/Varkaus, SCA/Östrand, Finnpulp/Kuopio…..

• New pulp mills in Brazil , USA and Russia 2016/2020
How will we consume paper in 2030/2050?


- The paper market is in transition.

- The use, requirements and functionalities of paper might no longer be recognizable as paper as we know it.

- New uses in hygiene and health, architecture, packaging, agriculture… products.

- Demand for sustainable bio fibre-based materials will grow.
Crude Talloil Production

Global CTO Production and Fractionation Forecast (MT)
2016 Global CTO Fractionation Capacity

Global CTO fractionation capacity: 1,7 Million T
23 units

- USA: 32%
- Finland: 20%
- Russia: 20%
- Sweden: 20%
- France: 10%
- Japan: 5%
- Austria: 4%
- Brazil: 3%
- China: 2%
- Others: 2%

Source: www.forchem.com
2016 Global Tall Oil Rosin (TOR) Production

Forecast Total TOR production: 420,000 T
Production limited by CTO availability and fractionation capacity.

- USA: 43%
- Finland: 16%
- Russia: 7%
- Sweden: 15%
- France: 5%
- Japan: 4%
- Austria: 3%
- Brazil: 3%
- China: 2%
- Others: 2%
Talloil Rosin Production

Global TOR Production Forecast (MT)

2016

2020
2016 Global Rosin Production

2016 Forecast Total Rosin Production: 1,210,000 T

- Gum Rosin, 64%
- Tall Oil Rosin, 35%
- Wood Rosin, 1%
2015 CGR Production: 490 000 T
China domestic demand: 560 000 T
2016 Global Resin Production

2016 Forecast Total Resin Production: 2 460 000 T
HR Resins gaining market share

- Rosin, 49%
- Hydrocarbon Resins, 48%
- Terpene Resins, 3%

Information obtained from public sources (pulpapapernews.com, Nanning Songtao business, etc.)
C5 Hydrocarbon Resins / Crude Oil Prices

[Graph showing the price trends of US C5 Resins cts/lb and Crude oil Nymex WTI USD/bl from Q4/2013 to Q2/2016]
Hydrocarbon Resin Situation Update

- Crude oil prices have collapsed from USD 100 / bl early 2014 to around USD 30/40 / bl early 2016.

- Plant outages at ethylene and resin producers in USA and Europe during 2014/2015 have resulted in tight supplies of monomers and resin prices have stayed at a high level until mid 2015.

- Resin prices then started to decrease due to the crude oil price situation, and the oversupply of monomers and resins, from new production capacities in USA and Asia. Price pressure also came from low demand in China which is the key market driver.

- Q2,2016: Crude oil price recovering towards USD 50/bl and feedstock prices increasing but hydrocarbon resin prices remain stable due to oversupply.

- Q3,2016: Crude oil prices down again to USD 40/bl but back to USD 50/bl by year end according to analysts.

- 2017: Start up of the new ExxonMobil 90 000 T per annum resin plant in Singapore
Forecast Y2016/2017 GDP Growth %

Les prévisions de croissance du FMI
Variation annuelle du PIB, en %

2016 | 2017
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Etats-Unis | 2,4 | 2,5
Monde | 3,2 | 3,5
Economies avancées | 1,9 | 2,0
France | 1,1 | 1,3
| 7,5 | 7,5
Inde | 6,5 | 6,2
Zone euro | 1,5 | 1,6
Russie | +0,8
Brésil | 0

« LES ÉCHOS » / SOURCE : FMI
GDP Growth Asia Pacific %
2016 World Major Risks

- Economical: Financial crisis, Uncontrolled large scale immigration
- Environmental: Natural disaster, Energy price decrease
- Geopolitical: Government policy failure, Interstate conflicts
- Societal: Unemployment, Social instability
- Technology: Cyber attack, Data stealing

LES ECHOS/ Source Bank of America/ Merrill Lynch/ World Economic Forum

Protectionism, Brexit ...?
World Population (Billions people)

Billions

1950  1980  2010  2030

World
Asia
Asia Middle class
Households’ Financial wealth

Le patrimoine financier des particuliers
En milliers de milliards de dollars.
Variation annuelle, en %

In Thousands of Billions USD
Annual variation %

*LES ÉCHOS*/ SOURCE: BOSTON CONSULTING GROUP
Reasons to be optimistic?

• World population will reach 8.4 billions people by 2030

• Middle class will grow at higher rate in Asia

• GDP growth especially in China and India will drive the demand for Pine Chemicals

• Pine-Derived Chemical market represents 4 Billions USD and will grow 4 to 5 % per annum in the coming years

• Paints, Coatings and Adhesives will have the fastest growth

• Low carbon footprint of Pine-Derived Chemicals

• Continue challenging tax credits and improper classification of Crude Talloil for biodiesel production

• Develop Pine Chemical production to follow the market growth and avoid substitution by alternatives