

# SunPine tall oil diesel, Sweden

## Biofuel as enabler of the bioeconomy

<b>Year of implementation:</b>	2010, with update in 2015
<b>Location:</b>	Piteå, Sweden
<b>Technology:</b>	Biorefinery – conditioning and fractionation of tall oil
<b>Principle feedstocks:</b>	Tall oil - a by-product from the pulp and paper industry
<b>Products/markets:</b>	Transport fuel, heating oil, chemicals (resins)
<b>Technology Readiness Level (TRL):</b>	TRL 9 – actual system proven in operational environment

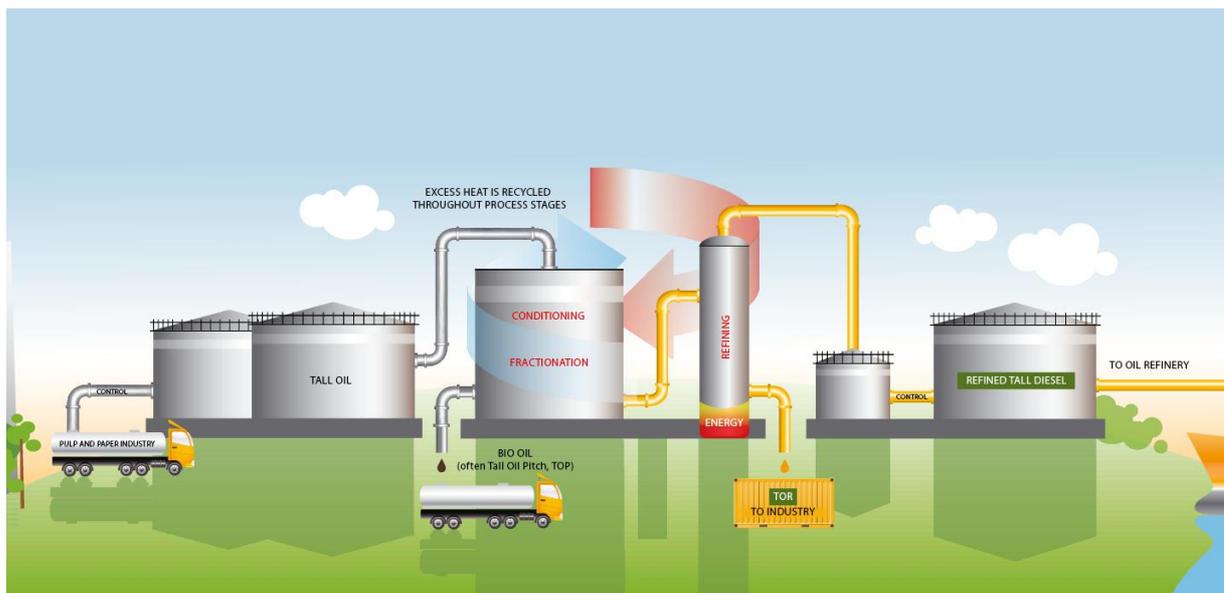
### DESCRIPTION

In 2005, innovators and entrepreneurs Lars Stigsson and Valeri Naydenov started work attempting to find a way to extract a diesel-type vehicle fuel from tall oil (a by-product from Kraft pulp mills). In 2006, their work had progressed to the point where they started a company, *SunPine*, based on their innovation. At this point they also sought contact with Sweden's largest oil refiner, *Preem*. Preem found that the technology was promising but not mature enough for commercialization.

However, in 2008, Preem still decided to invest in SunPine together with the state-owned forest company *Sveaskog* and the forest owner co-op *Södra*. The latter operates three large Kraft pulp mills in Southern Sweden.

The process of processing and refining the tall oil was gradually improved in cooperation with *Haldor Topsoe*. In 2011, Preem started marketing *Evolution Diesel*, a drop-in HVO fuel with 20% renewable feedstock, primarily based on feedstock from the SunPine process. Complementing the tall oil-based raw material with used cooking oil and animal fats, a new version called *Evolution Diesel+* now (2016) consists of up to 50% renewables and is the first liquid fuel to be certified by the *Nordic Swan Ecolabel*. SunPine has a yearly production of 100,000 m<sup>3</sup> raw tall oil diesel which is blended with regular diesel fuel, which equates to 2% of the annual consumption of diesel in Sweden.

In 2014, the global chemical company Lawter invested in SunPine and started developing methods to extract more products from the tall oil. From 2016 and in addition to crude tall diesel and a tall oil-based heating oil, Sunpine also produces substantial amounts of resin which is further refined by Lawter into e.g. printing inks and different forms of glue.



*SunPine: from forest to green diesel and resin (courtesy of SunPine)*

<p><b>Stakeholders involved:</b></p>	<p>SunPine is owned by Sveaskog, Södra skogsägarna, Preem, KIRAM and Lawter, representing the entire production chain from concept to raw material and finished product.</p>
<p><b>Contribution to Sustainable Development Goals:</b></p>	<p>The case contributes to several SDGs: delivering a sustainable and renewable vehicle fuel (SDG 7), creating employment opportunities in a region with high unemployment (SDG 8), industrial development based on renewable and sustainable feedstock (SDG 9), showcasing a method to reduce transportation GHG emissions (SDG 13)</p>
<p><b>Employment:</b></p>	<p><i>No information available</i></p>
<p><b>Replicability and scale-up potential:</b></p>	<p>The scale-up potential and replicability at local and regional level is low, medium at national level, but high at international level.</p> <p>A similar plant has later been built by UPM in Finland. However, tall oil is a limited resource. This means that further expansion or scale-up in the vicinity is unlikely. However, on an international level, there is potential to utilize similar solutions for successful outcome. Also, if using another residue from Kraft mills, the lignin in black liquor, the concept could be replicated globally on a large scale.</p>
<p><b>Success factors:</b></p>	<p>Availability of the raw material, in this case tall oil;</p> <p>A new innovation to process the tall oil into diesel fuel;</p> <p>Biofuels are exempt from energy tax and CO<sub>2</sub> tax in Sweden, creating a favorable market for biodiesel;</p> <p>The Swedish national target for a fossil free transport sector by 2030 provides stability allowing for large scale investments.</p>
<p><b>Constraints:</b></p>	<p>Limited availability of the raw material;</p> <p>Political uncertainty in the EU</p>



*SunPine's factory in Piteå, Sweden*

**Info provided by:**

Olle Olsson, Stockholm Environment Institute (SEI)

**More information:**

<http://www.sunpine.se/en/about-us/>

<http://www.sunpine.se/en/pressmeddelanden/sunpine-och-lawter-bygger-ut/>