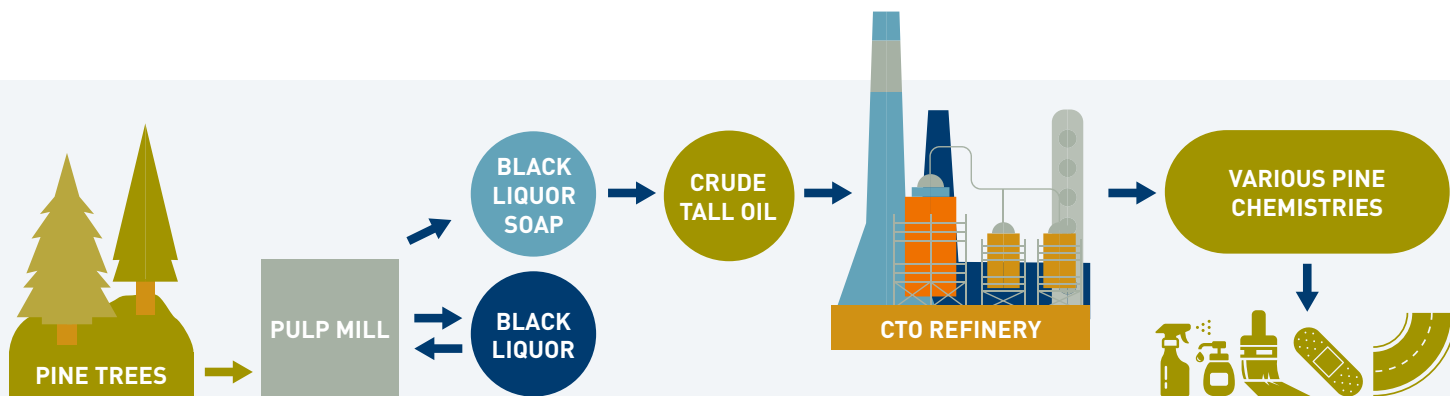


**\$10 billion
dollar global
industry in
2016**

PINE CHEMISTRY: THE BIOECONOMY IN ACTION

Pine Chemistry has been around for approximately 100 years and is a long-standing example of bio-based chemistry that **utilizes natural, renewable products from pine trees as raw materials**. Crude tall oil (CTO) is a prominent example of Pine Chemistry, and CTO refining is at the heart of a well-functioning bioeconomy. It uses renewable resources in a smart, efficient way by maximizing the value of raw materials, minimizing waste and emissions, and creating jobs and economic growth.



CTO originates from pine trees and is a **co-product derived from the kraft pulping process**. It is refined and upgraded in biorefineries into a wide range of biobased specialty chemicals, which are crucial ingredients used to make a variety of goods important to our everyday lives. Pine chemicals can **improve product performance, reduce greenhouse gas emissions, and increase reuse of materials**.

CONCERNS ABOUT CTO FOR ENERGY

Governments around the world are contemplating policies that would reduce carbon emissions. Unknowingly, they may classify CTO as a feedstock to develop transportation fuel to satisfy such policies. This could result in an unjustified incentive or mandate that leads to companies burning CTO for energy.

The resulting artificially-created demand can:

- ⊘ Prohibit the Pine Chemistry industry from upgrading CTO to high value-added products beneficial to society
- ⊘ Hinder the use of this renewable resource to its fullest potential
- ⊘ Harm a well-established and economically important sector

Notably, any diversion of already scarce CTO feedstock from products to fuel provides no significant carbon emission reduction.

GOODS MANUFACTURED FROM CTO

Products from CTO are **naturally functionally complex**, allowing their use in many technically challenging applications. For example, they are used in the resin, asphalt, oil field, coatings, and lubricants industries to solve specific application challenges.



These products can offer a **low carbon footprint** and also serve as a **renewable substitute** for petroleum-based materials in everyday products such as inks, paints/coatings, adhesives, fuel additives, soaps/detergents, and cleaning products.¹

¹ Buisman G. And Lange J. 2016. Industrial Biorenewables: A practical viewpoint.

CTO is a valuable raw material with finite availability. It has **strong market demand and remarkable value-adding capabilities**. There are numerous possibilities to use this material for upgrading and higher value purposes in the biobased chemical sector and downstream industry.

