



## TECH 2020-1: Caprolactam

Caprolactam is one in a series of reports published as part of NexantECA's 2020 Technoeconomics – Energy & Chemicals (TECH) program.

### Overview

Caprolactam is one of the most widely used chemical intermediates and nearly all of its annual consumption is by conversion into polyamide 6 - more commonly known as Nylon 6.

This report focuses on caprolactam production from a variety of conventional and non-conventional feedstocks. Most caprolactam processes occur in co-generation of ammonium sulfate, which increases or decreases profitability depending on local market conditions.

In recent years there has been a large amount of new caprolactam capacity built in China, the result of historical global increases in the demand for polyamide products, which in turn has led to an oversupply of the global market.

Caprolactam producers are increasingly integrating downstream, both to improve profitability but also to consume caprolactam captively and reduce dependency on merchant market prices and demand. For this reason, NexantECA developed a model examining the effect of integrating a caprolactam facility both upstream and downstream.

This report provides an overview of technological, economic and market aspects of the caprolactam industry. The following issues are addressed in the report:

- What are the major technologies used in caprolactam production?
- How much does it cost to produce caprolactam through each technology and what are the key cost sensitivities?
- What are the key end-uses and market drivers for caprolactam currently?
- To what extent does integration benefit the caprolactam producer?

### Commercial Technologies

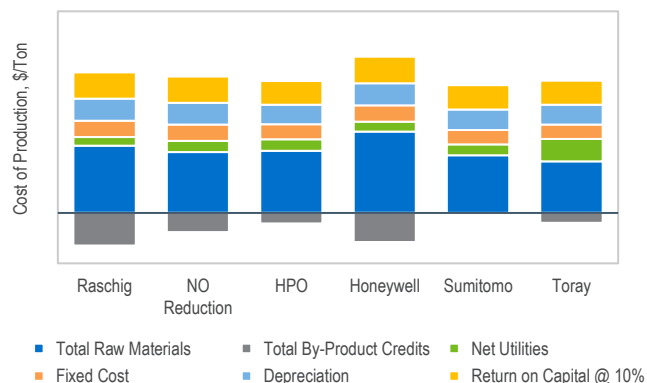
NexantECA has analyzed the process technologies developed for the production of caprolactam from both commercial cyclohexane and phenol feedstocks, as well as non-aromatic alternative feedstocks.

### Process Economics

This economic analysis provides an overview of production costs for six different aromatic feedstock caprolactam technologies (see figure below) in Western Europe, the United States and China in 1Q 2020. Production costs are also estimated for two alternative feedstock caprolactam technologies.

NexantECA has investigated the sensitivity of relevant technologies to the significant cost of production factors. Production cost and potential margins are also analyzed for an integrated facility, including both upstream and downstream configurations.

Aromatic-Based Caprolactam Process Comparison  
(USGC, Q1 2020)



### Commercial Overview

Caprolactam is derived almost entirely into polyamide 6, with a wide variety of applications traditionally within textile fiber and engineering resin industries, further elaborated in this report. Synthetic fibers are used for carpet, textile, and industrial applications whilst resins are used within the automotive and electronics industries, often substituting metals due to their mechanical properties.

The supply and demand for caprolactam is analyzed on a global and regional basis, including forecasted values. The key market drivers for demand evolution historically and over the medium-term are outlined.



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