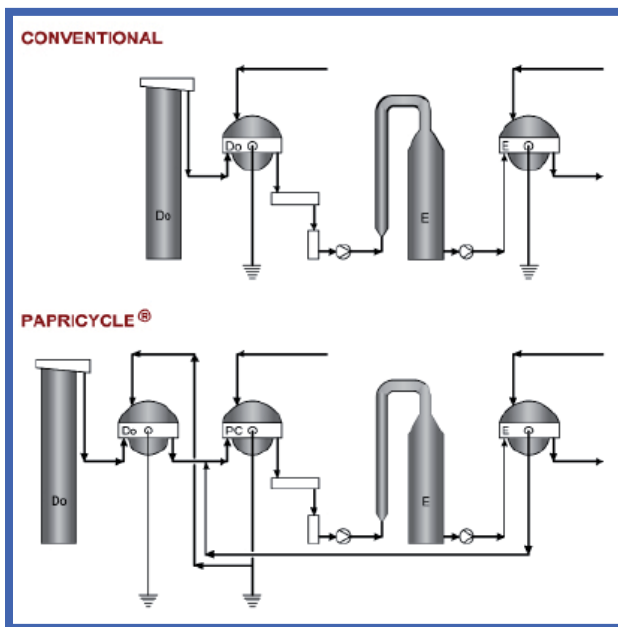


Save Bleach Plant Caustic

with PAPRICYCLE®

“Approximately 10% of oxygen delignification lines and 25% of conventional lines use PAPRICYCLE® to minimize sodium hydroxide consumption...saving 7-9 kg / 1 pulp”



Simplified Flow Schematic of PAPRICYCLE®

FEATURES AND BENEFITS

- Mill Proven Process
- Saves 25-35% of First Extraction Stage Caustic
- Saves Energy

Applications

PAPRICYCLE® is particularly attractive in mills where an existing washer can be utilized for the wash step. In some cases, a washer may become available by elimination of hypochlorite stage during ECF conversion. Experience has shown that the redundant washer is better utilized for PAPRICYCLE® than for its common deployment to double the extraction stage washing. A spare washer may also become available through the replacement of the second stage extraction by a D1nD2 sequence. A variety of shower and piping arrangements may be utilized depending on the mill's existing water conservation strategy and layout.

NORAM offers the PAPRICYCLE® Process under license from FPIInnovations. NORAM will work with the mill staff to determine the preferred implementation strategy and will provide detailed engineering specifications and drawings for construction.

Process savings

The PAPRICYCLE® Process was developed by Paprican and proven through many installations in Paprican's member company mills. PAPRICYCLE® saves caustic by utilizing the alkali value of the sodium carbonate present in first extraction stage effluent. The pulp from the chlorination or D0 stage is mixed with the extraction stage effluent and then washed. The washed pulp is then mixed with a reduced amount of caustic and sent to the E-stage tower. Typically, the extraction stage charge is reduced by 25 - 35% without affecting the chemical charges in subsequent bleaching stages. For mills with cold chlorination stages, steam is also saved because the hot extraction stage effluent heats the cold pulp before it enters the E-stage tower. Typically, 0.5 MM BTU/ ADT pulp is saved.

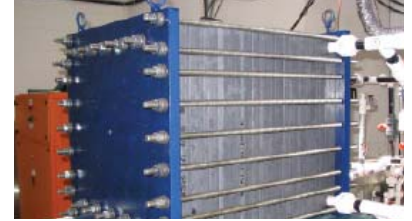
technology and engineering solutions for the process and resource industries



Nitration



Sulfuric Acid



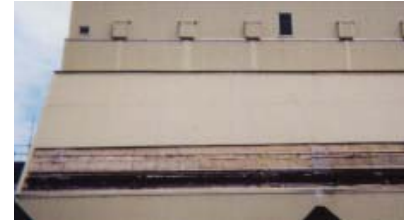
Electrochemical



Biosystems



Pulp&Paper



Environmental

Company Profile

NORAM is a private engineering and technology firm based in Vancouver BC, Canada. We specialize in the development, engineering and commercialization of new chemical processes, and in the improvement and optimization of existing technologies. Since 1988 NORAM has provided leading-edge technologies to the chemical, pulp and paper, minerals processing, wastewater and electrochemical industries.

Today NORAM is the world's leading supplier of nitration technology. In addition, we offer sulfuric acid plants, biological treatment facilities, energy systems, and technologies for the clean-tech sectors.

Our business has developed around the supply of proprietary engineering and equipment packages to our clients.

Core competencies include:

- Nitration and NO_x Technology
- Electrochemical Systems
- Sulfuric Acid Manufacture
- Biological Wastewater Treatment
- Computational Fluid Dynamics & Finite Element Analysis
- Heat Transfer & Heat Exchangers
- Hydrogen, Sulfur and Chlorine Chemistry
- Fluidised Bed Systems
- Energy Storage
- System Closure

Partnering with Innovation and Experience

NORAM works extensively with early-stage technology companies. We draw on established competencies in process design and engineering, provide custom in-house fabrication capabilities, and offer pilot plant and contract research facilities to support the commercialization process.

We've teamed up with organizations around the globe to allow project execution on 5 continents. Our strategic relationships include:

- Bateman Engineering BV
- Canadian Hydrogen and Fuel Cell Association
- ECO-TEC Inc.
- First Chemical Corporation (a DuPont Company)
- FP Innovations
- Kemetco Research Inc.
- Membrane Reactor Technologies
- Ostara Nutrient Recovery Technologies Inc.
- Radiant Technologies Inc.
- Siloxy Limited
- Simon Carves Ltd (Punj Lloyd Group)
- Electrosynthesis Company Inc.

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