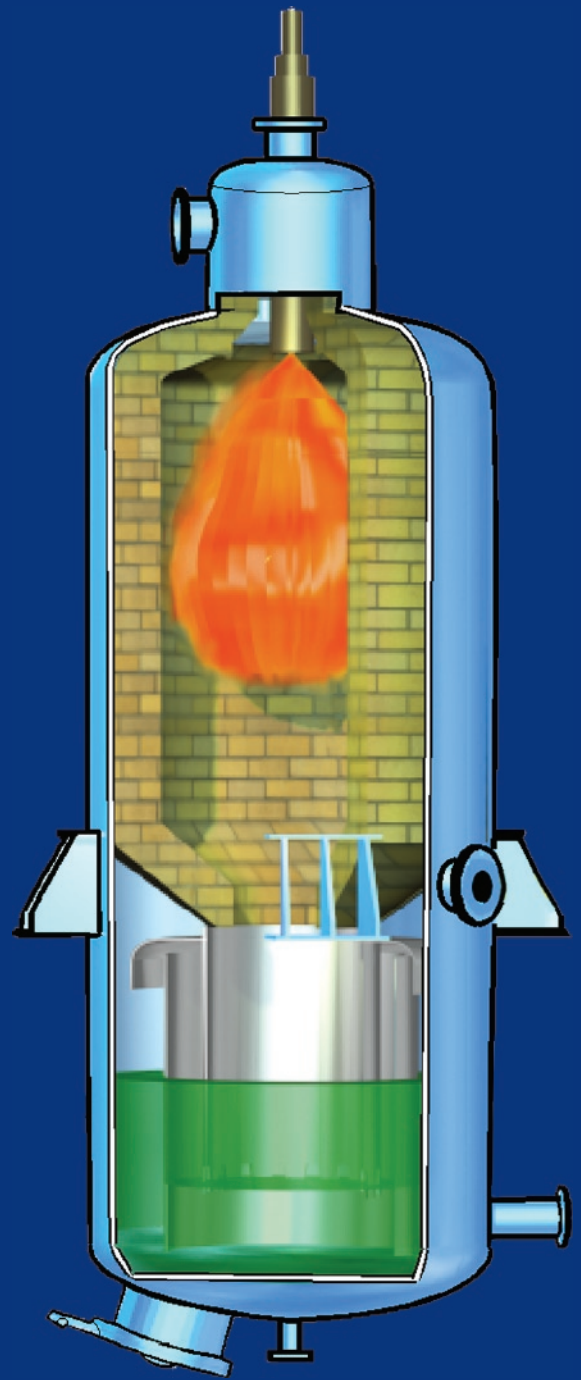


**Processes for
energy and chemicals
recovery from black
liquor in pulp mills**



BOOSTER

The CHEMREC® Recovery Booster

The CHEMREC Recovery Booster has been developed to enable pulp mills restricted in capacity, because of recovery boiler limitations, to increase production.

The booster adds significantly to recovery capacity, and compared to retrofitting a recovery boiler, which requires shutting down production, this stand-alone system can be installed without interrupting pulp production.

The capital outlay for the system is moderate, resulting in a fast return on investment.

The CHEMREC system features unique process solutions protected by numerous patents.

Boosts recovery capacity

The system is particularly beneficial in mills having a built-in but unused pulping capacity, and where fibre line modifications add more dry solids to the recovery systems.

The nominal capacity of a pulp mill can often be increased by 10 to 20 % through process tuning and minor modifications of process equipment. However, recovery boilers often operate at maximum capacity, limiting further pulp production increases.

Environmentally driven changes in pulping technology tend to increase the dry solids load on the chemical recovery systems. This is particularly true for process chan-

ges such as the introduction of low Kappa pulping and oxygen delignification.

The current trend towards increased recycling of effluents from the bleaching system will also increase the dry solids load on the recovery systems. These changes can force a mill to either install additional recovery capacity or reduce pulp production.

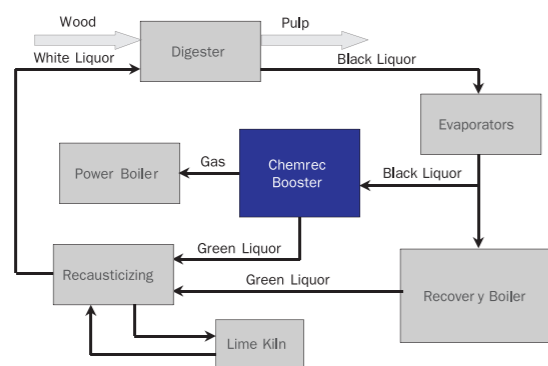
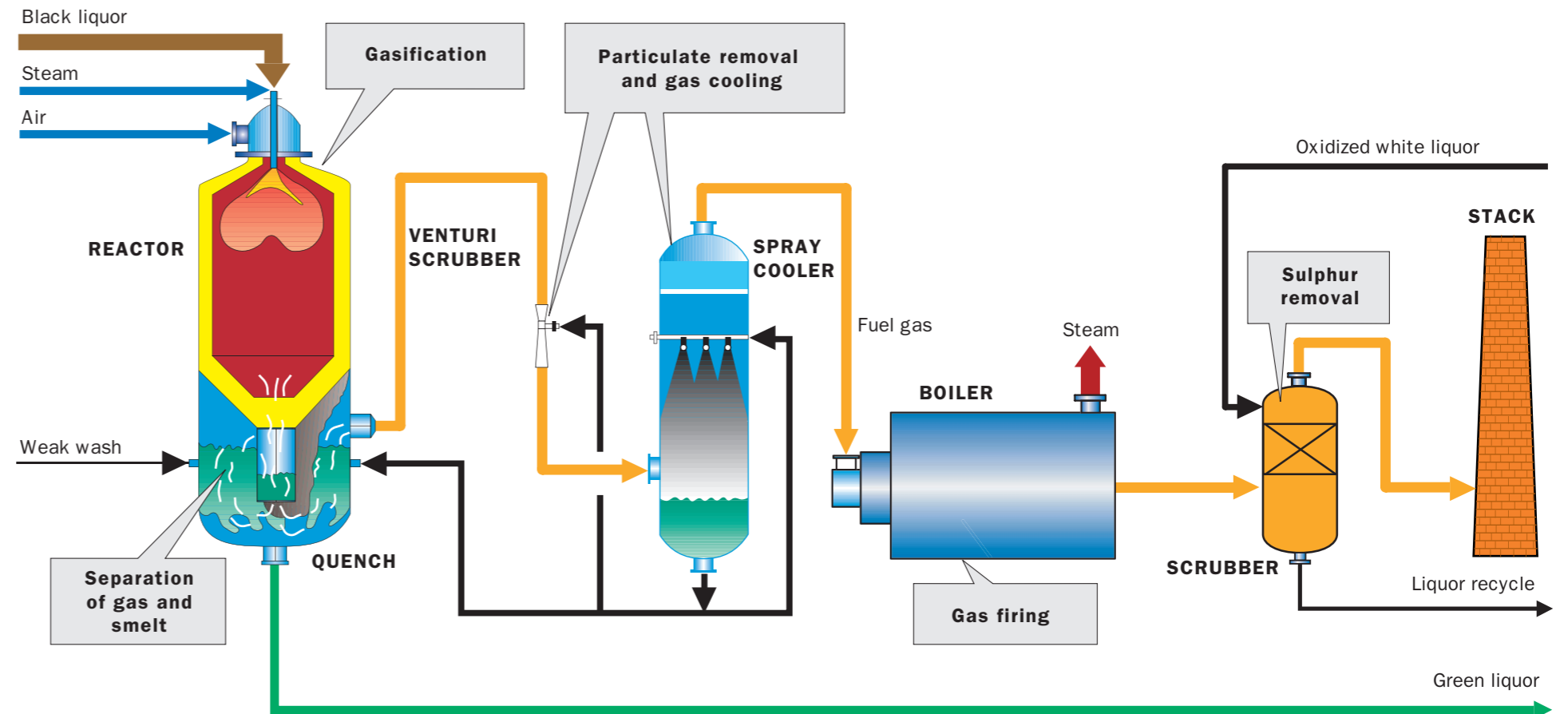
Environmentally friendly

NO_x formation is low because of the reducing conditions in the reactor and the moderate combustion temperature during final combustion of the lean gas. The sulphur containing compounds in the gas are removed by scrubbing of the gas either before or after combustion.

The CHEMREC system is also advantageous as a recovery boiler reliever in mills where shutdowns for removal of deposits on recovery boiler heat transfer surfaces occur frequently.

Flexible

The CHEMREC system can be operated on various spent liquors with different sulphidities and solids content.



The CHEMREC Booster system increases the mill's recovery capacity.

Benefits

- Compared to recovery boiler retrofits, the stand-alone CHEMREC system can be installed without interrupting pulp production
- High reduction and carbon conversion efficiency
- Requires little space and is easy to operate and maintain
- Environmentally friendly
- Handles the extra solids from oxygen delignification and from recycling of chemicals from the bleaching system

Design and Operation

The core of the CHEMREC system is the gasifier unit, a refractory-lined entrained flow reactor where concentrated black liquor is gasified under reducing conditions. Air is used as the oxidant.

Black liquor is decomposed in the reaction zone into smelt droplets consisting of sodium and sulphur compounds and a combustible gas.

The smelt droplets and the combustible gas are separated in a quench dissolver where

they are simultaneously brought into direct contact with an aqueous cooling liquid. The smelt droplets dissolve in the liquid to form a green liquor solution. The gas leaving the quench dissolver is scrubbed and cooled and then used as a fuel. Sulphur dioxide in the flue gas is removed by scrubbing.

The reactor is designed to achieve high carbon conversion and sulphur reduction, exceeding what is normally obtained in a recovery boiler. The quantity of unburned

carbon and sulphate in the green liquor is consequently low.

The CHEMREC Recovery Booster is easy to operate and maintain, and it can be operated from existing control rooms. The combustible gas generated in the process can be burned in an existing power boiler or in a separate package boiler for steam generation.

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CHEMREC Development Milestones

The Chemrec processes are based on patented and proprietary technologies as demonstrated in several atmospheric (A) and pressurized (P) plants.

- **1991:** (A) Booster demonstration plant, 75 tDS/d
AssiDomän, Frövi, Sweden
- **1994:** (P) Pressurized air-blown pilot plant, 6 tDS/d
Stora Enso, Skoghall, Sweden
- **1996:** (A) Commercial Booster plant, 300 tDS/d
Weyerhaeuser, New Bern, NC, USA
- **1997:** (P) Pressurized oxygen-blown rebuilt pilot plant, 10 tDS/d
Stora Enso, Skoghall, Sweden
- **2003:** (A) Rebuilt second generation commercial Booster plant, 300 tDS/d
Weyerhaeuser, New Bern, NC, USA
- **2005:** (P) Pressurized oxygen-blown development plant, DP-1, 20 tDS/d
Kappa Kraftliner, Piteå, Sweden



The CHEMREC Booster at the Weyerhaeuser New Bern, NC mill is a commercial scale plant which has demonstrated that black liquor gasification is a viable method of debottlenecking a mill limited in chemical recovery capacity. The reactor vessel at New Bern was re-engineered to a second generation version and restarted in June 2003. Since the restart the plant has been operating very well.

This is CHEMREC

Chemrec AB is a Swedish based company dedicated to the technical development and commercialisation of energy and chemicals recovery systems for pulp mills based on black liquor gasification.

For more information see www.chemrec.se

Chemrec AB is since June 2003 fully owned by the Nykomb Group. The Nykomb Group is a privately owned technical and commercial development organization with activities focused in the following areas:

- Innovative solutions for energy conversion through gasification
- Utilization of renewable energy sources
- International engineering, consulting and advisory services in the energy sector

For more information see www.nykomb.se