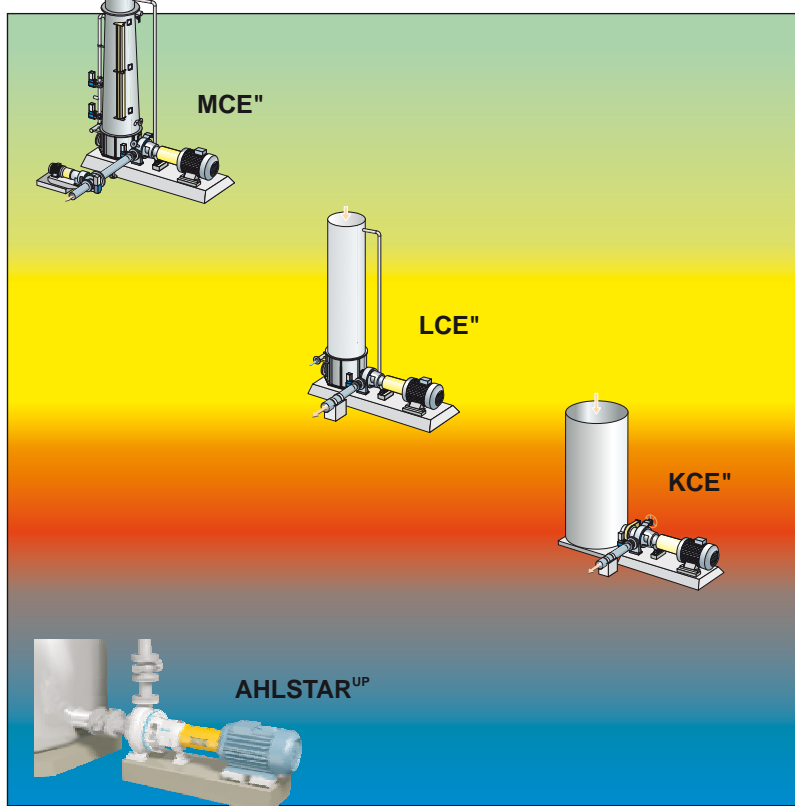


Sulzer Pumps New Stock Pumping Concept



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The Heart
of Your
Process

Stock Pumping in Pulp and Paper Mills

Pumping, especially the pumping of stock, is one of the most crucial operations in the pulp and paper industry. Stock is pumped from chests, storage towers, reaction towers, pulpers and other equipment to the subsequent process stage. If the pumps do not work properly, the entire process may stop.

Stock pumping consistencies range from a low consistency (0 - 8 per cent) to medium consistency (8 - 18 per cent) and even beyond.

Stocks may contain various amounts of impurities depending on the process and process stage. The forward end of deinking lines contains stock with plastics, staples, polystyrene, sand etc., which cause clogging and wear. Chips at the beginning of mechanical pulp lines may also cause clogging.

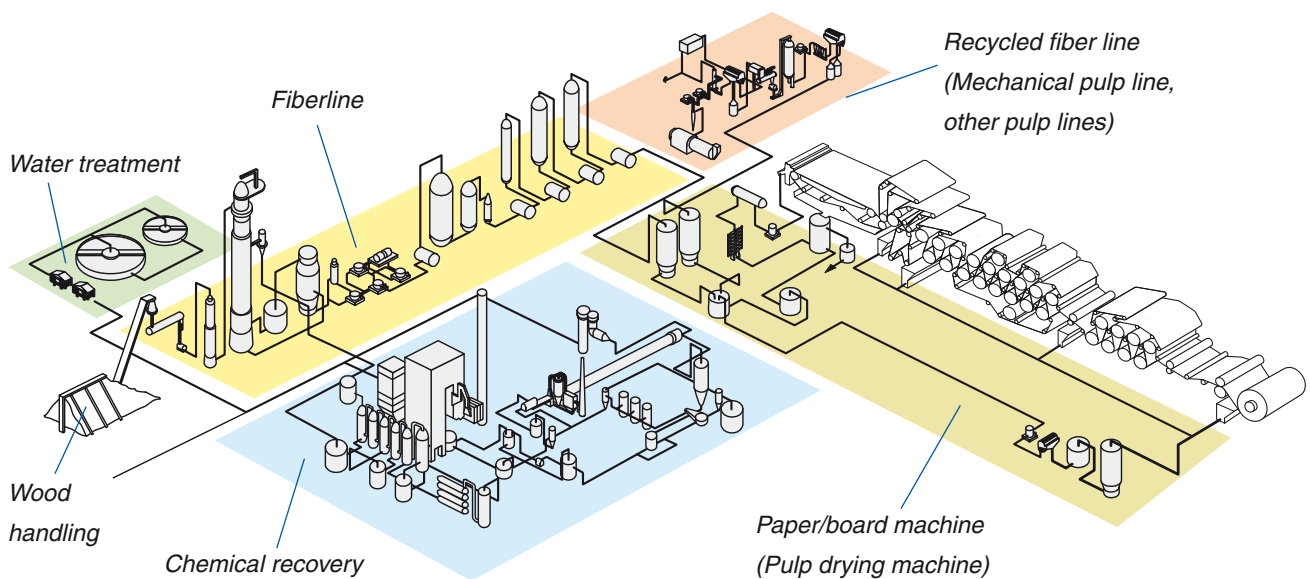
Stocks also contain various amounts of air or gases. The amount of air depends on factors such as stock consistency, stock type, and application. The air can be strongly bound or so-called free air or gas. If the stock contains too much free air, pumping will be compromised unless this has been taken into account in the pumping solution used.

In the stock washing and bleaching stages, consistency is usually raised from a low consistency to the medium consistency range. Typically, consistency here is from 4 to 16 per cent depending on the process. In dispersion, the consistency may even be 35 per cent. After dispersion, the stock is diluted to a consistency suitable for pumping. In the bleaching of chemical pulp and in the preceding stages, the pressure at the inlet side of the pump may be high and the temperature could be as much as 130 °C. Moreover, bleach-

ing and other process chemicals are mixed into the stock simultaneously. The processes are long and tubular, and they are required to function reliably even in varying conditions.

Sulzer Pumps possesses long-term experience and solid expertise in the processes used in the pulp and paper industry as well as in all their pumping, mixing and agitation applications. Good relations with our customers, such as pulp and paper mills, process suppliers and engineering consultants, have strengthened our process proficiency and underlined our leading technical position in the market.

Our pumping and mixing systems are renowned for their innovative solutions and sturdy designs. Continuous R&D has always constituted one of our cornerstones. Sulzer Pumps is the forerunner in stock pumping technology.



Typical pulp and paper mill processes

Energy-Saving Concept

Stock pumping solutions are traditionally divided into low consistency (0 - 8 per cent) and medium consistency (MC[®], 8 - 18 per cent) range pumping applications.

In the intermediate consistency range (6 - 10 per cent), there have not previously been high-efficiency pumping solutions specifically designed for this range. Pumping in the intermediate consistency range has utilized pumping systems designed for medium consistency stock, or low consistency stock pumps with accessories as follows:

Firstly, pumping systems consisting of several devices. Such systems typically contain many installed drive units and other equipment requiring maintenance. Overall economy is poor, and the complicated system undermines reliability.

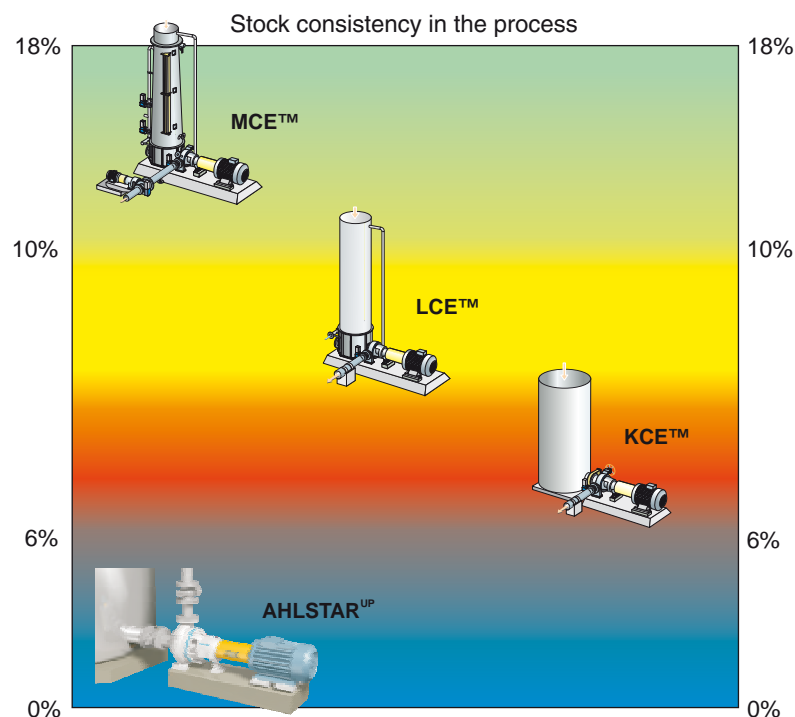
Secondly, conventional pumping systems for medium consistency stock. This type of pumping system is a compromise which takes into account the fiber flow characteristics at a lower and/or higher consistency. Overall economy not well optimized.

Finally, low consistency pumps. Pump performance has been improved by means of auxiliary equipment arrangements improving the fiber flow. Consistency variations in the applications are more difficult to control when using pumps which were originally designed for a lower stock consistency. The overall economy of such systems is also poor.

Pumping Systems for Intermediate Consistency (Semi-MC[™]) Range

Sulzer Pumps has developed energy-saving and fiber-saving pumping systems for the intermediate consistency range. The power need of these systems is considerably lower than in conventional solutions. The solutions, mostly comprising a pumping system with a single drive unit, also feature simpler designs than earlier.

The diagram shows the consistency range of 0 - 18 per cent used in the pulp and paper industry. At the lower end of the range, where the process consistencies are as high as 8 per cent, the new energy and water saving AHLSTAR^{UP}(* stock pumps are used. At the upper end of the consistency range, medium consistency MCE[™] pumping systems are used for the highest potential process consistencies, which can usually be pumped using pumping systems including centrifugal pumps. In the intermediate consistency (6-10



per cent, Semi-MC[™]) range, high-efficiency KCE[™] and LCE[™] pumping systems are used depending on the application.

*) AHLSTAR^{UP} is a trademark of Sulzer Pumps.

Stock Pumping at the Low Consistency Range 0 - 8 per cent

The New AHLSTAR^{UP} Stock and Process Pumps

Especially designed for the needs of the pulp and paper industry. The new pumps save energy, sealing water and environment.

Each pump in the AHLSTAR^{UP} range is tailored to the particular pumping application. This guarantees a reliable process, constantly high efficiency and low operating costs.

The pump range features shaft sealing options that deliver the lowest overall costs. Seal options include the dynamic seal and integrated mechanical seals. Other sealing options are also available.

All pumps in the AHLSTAR^{UP} range are designed in accordance with the EN ISO 5199 reliability standard.

Complete interchangeability of parts ensures lower spare parts costs.

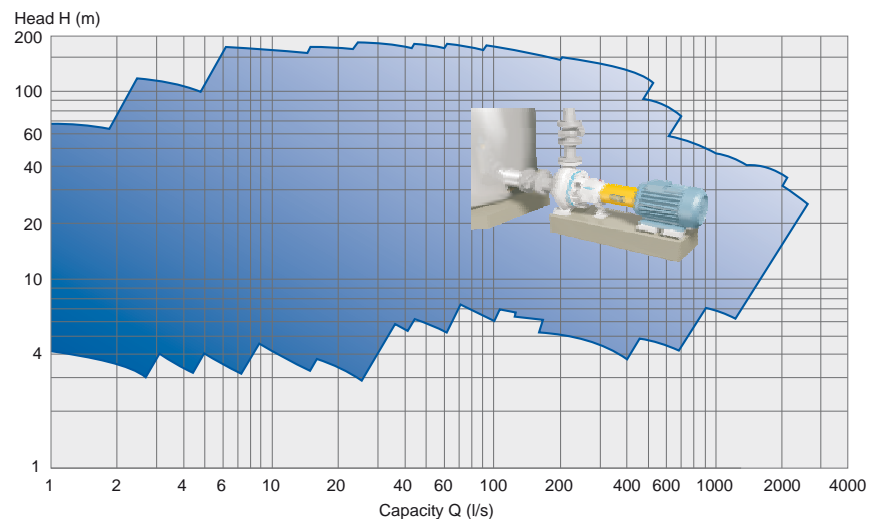
The pumps are so designed that their installation and service are very quick and easy.

The pumps feature renowned reliability. This is indicated by world-wide references.

Capacity Range of AHLSTAR^{UP} Stock Pumps

Capabilities:

- to 160 m head
- to 2500 l/s capacity
- to 180 °C temperature



AHLSTAR^{UP} A Stock Pumps

- For all pumping applications within the 0 - 8 per cent consistency range.
- Special stock pumping hydraulics (A) guarantee stable pumping and low energy consumption.
- Pumps stock like water.



AHLSTAR^{UP} N Non-Clogging Pumps

For applications where normal stock pumps cannot perform reliably and in a stable manner due to plugging and abrasive particles.

For unsorted stocks, slurries, rejects, chips and other liquids containing large solids or impurities.

Non-clogging stock pumping hydraulics (N).



AHLSTAR^{UP} Gas Removal Pumps

These pumps are used for pumping various air or gas containing stocks within a consistency range of 0 - 8 per cent, foaming liquids, and liquids with a low level in the tank.

Depending on the application, air or gas removal can be arranged by means of a built-in degassing system or gas separator.

The AHLSTAR^{UP} range includes a pumping concept for air containing liquids, covering stock pumping hydraulics (A) and non-clogging and wear resistant stock pumping hydraulics (N).

Benefits and advantages of the solution

- Stable pumping with no fluctuation in pressure or flow rate.
- Reduced need for expensive and environmentally damaging anti-foaming agents.
- Real problem solver.
- The reliability of subsequent process equipment is improved since air or gas is removed early on within the pump.



AHLSTAR^{UP} Self-Priming Gas Removal Pumps

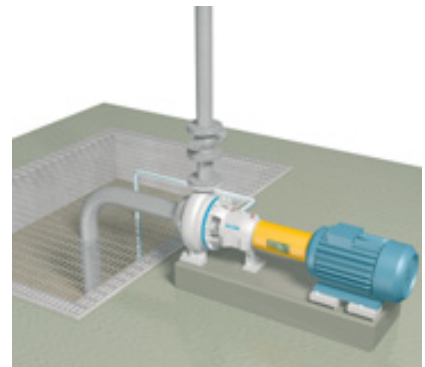
Used for pumping stocks and other liquids from seal pits and floor channels.

The pump is a horizontal centrifugal pump which is easy to maintain.

Thanks to the built-in degassing system, the pump is self-priming and can remove gas.

The pump can replace a vertical pump which requires much maintenance and a submersible pump not conforming to an industrial standard.

The pump also removes air or gas potentially disturbing the process.



Stock Pumping at the Semi-MC™ and MC® Range 6 - 18 per cent

Sulzer Pumps' MCE™ pumping systems for medium consistency stock have proven to be the most reliable solutions on the market for bleaching processes in chemical, mechanical and deinked pulp, and in other medium consistency stock applications. Long-term expertise and innovative design have established our pumping systems as pioneers that also feature the best efficiency and lowest energy consumption on the market.

Sulzer Pumps utilizes application-related, fiber and energy saving Fluider™ technology when selecting pumping solutions for pulp and paper mills.

The Fluider™ technology include the following reliable and patented pumping solutions:

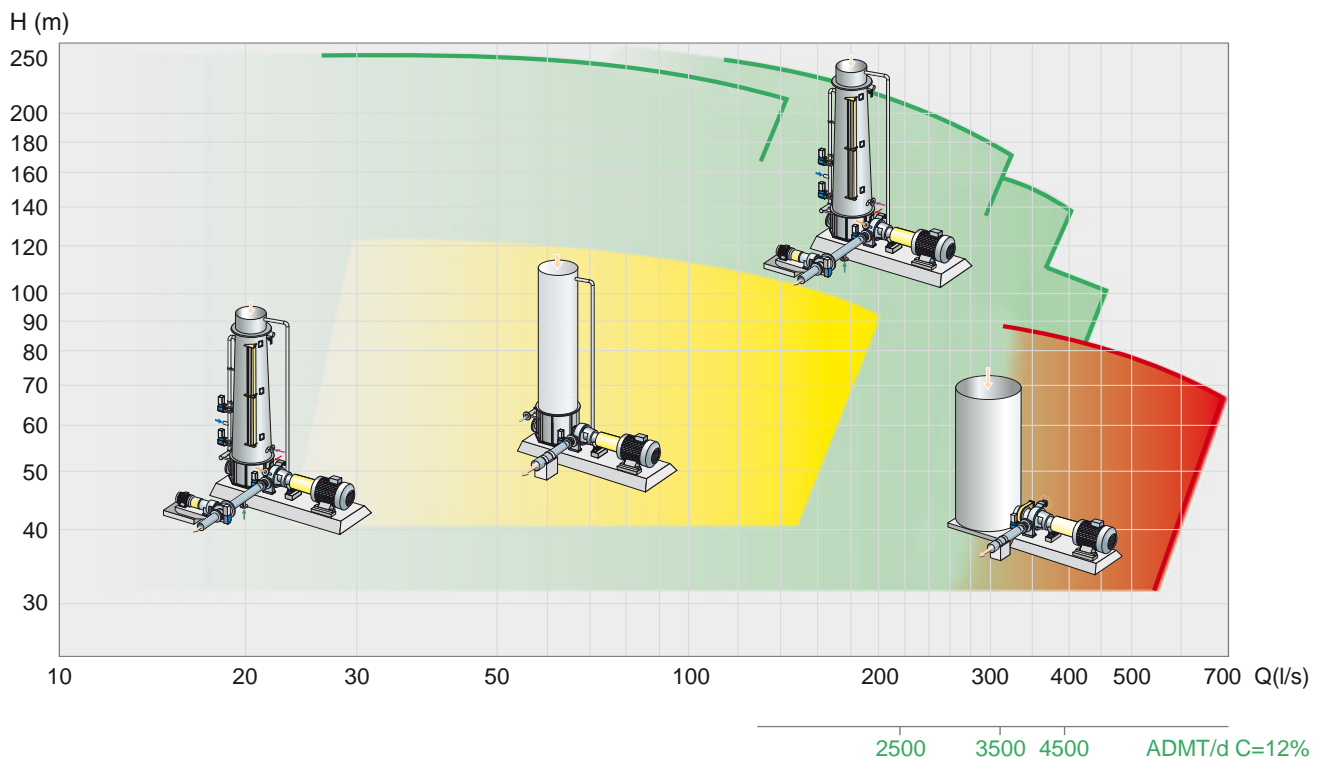
- KCE™ pumping systems
- LCE™ pumping systems
- MCE™ pumping systems



Stock Pumping Technology for the 6 - 18 per cent Consistency Range

- high head MCE™ pump range
- low-capacity pumping systems
- high-capacity stock pump ranges

- Capabilities
- to 240 m head
 - from 20 to 5000 ADMT/d

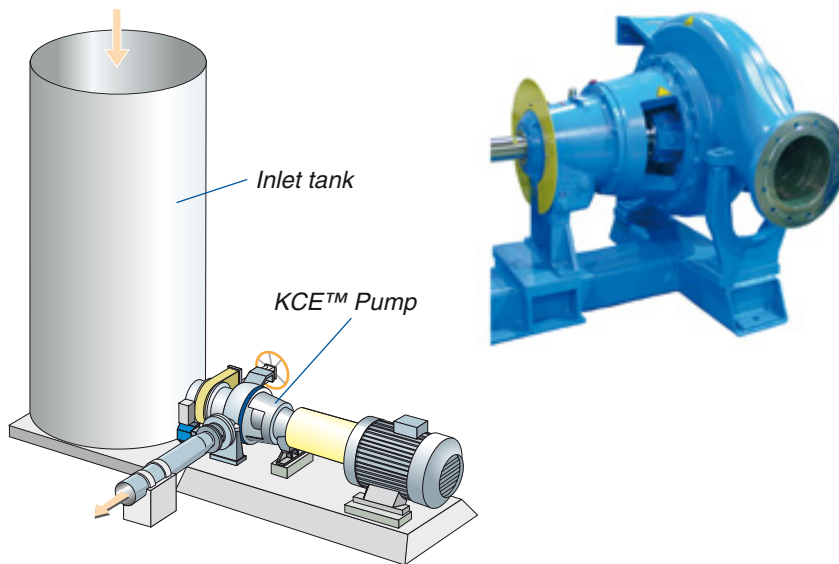


Primary Benefits and Advantages of Fluider™ Technology

- Highest efficiency, reducing power consumption and installation costs
- Correct fluidization prevents fiber over-treatment
- Degassing options:
 - a built-in degassing system
 - a separate external MDS degassing system
 - degassing without a vacuum pump.
- Allows pumping at a very high temperature.
- Allows pumping with a low stock level in the dropleg.

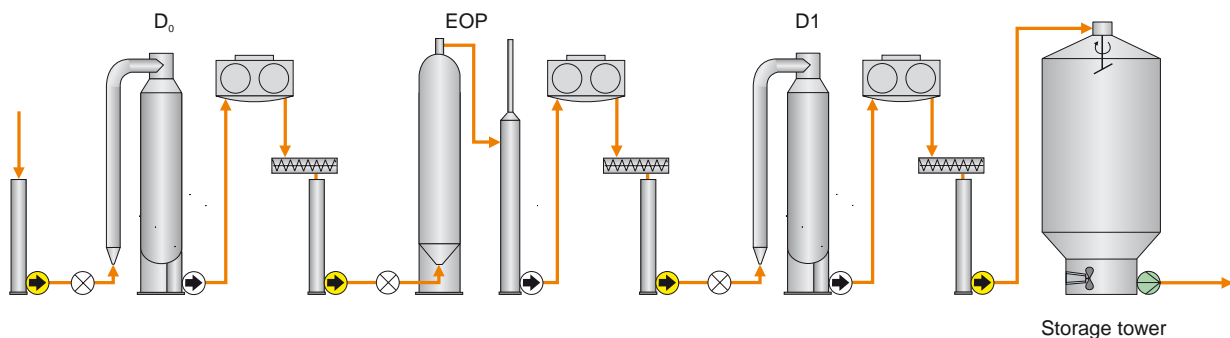
- Allows pumping with a high stock level in the dropleg.
- In most applications one-drive unit system.
- Proven, sturdy mechanical design.

Pumping systems utilizing Fluider™ technology are used most commonly after washers, thickeners, filters and reaction towers to pump the stock to the next process stage or to a washer. The pumping systems can also be used for the efficient mixing of liquid bleaching or process chemicals into the stock.



KCE™ Pumping System

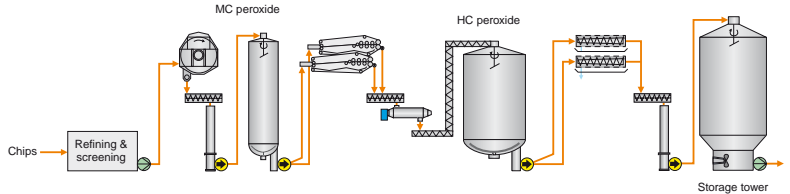
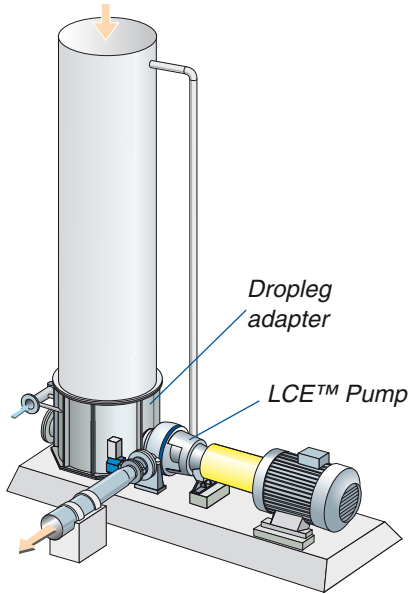
The most recent and highly efficient KCE™ pumping technology is typically used in the pulp and paper industry to pump stock to washers and other equipment in the Semi-MC™ range when high capacities are required.



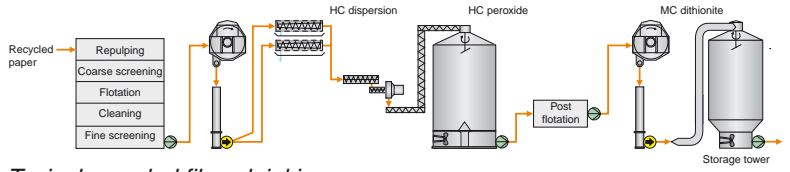
Typical chemical pulp bleaching process

LCE™ Pumping System

Highly efficient LCE™ pumping technology is typically used in mechanical pulp and in recycled fiber processes.



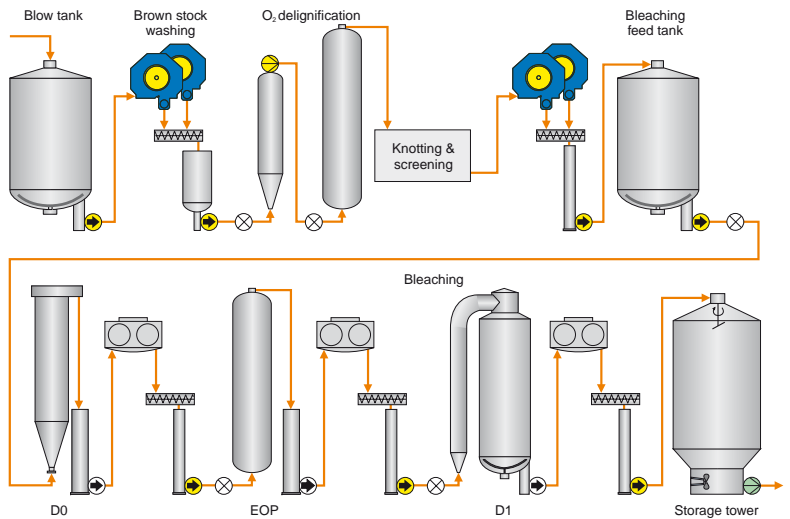
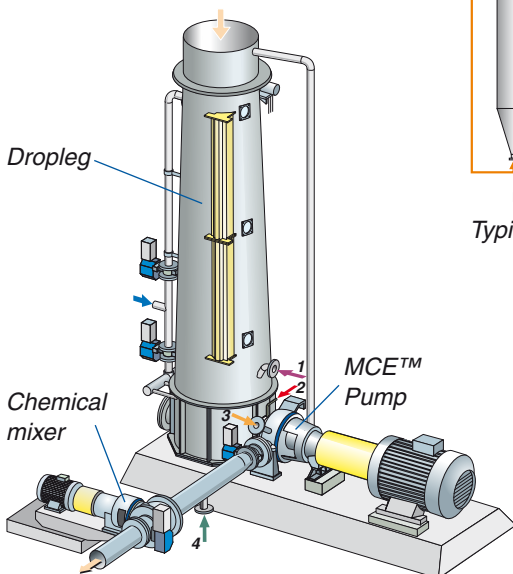
Typical mechanical pulping process



Typical recycled fiber deinking process

MCE™ Pumping System

MCE™ pumping technology, the most advanced pumping technology on the market, is used in pulp and paper mill processes.



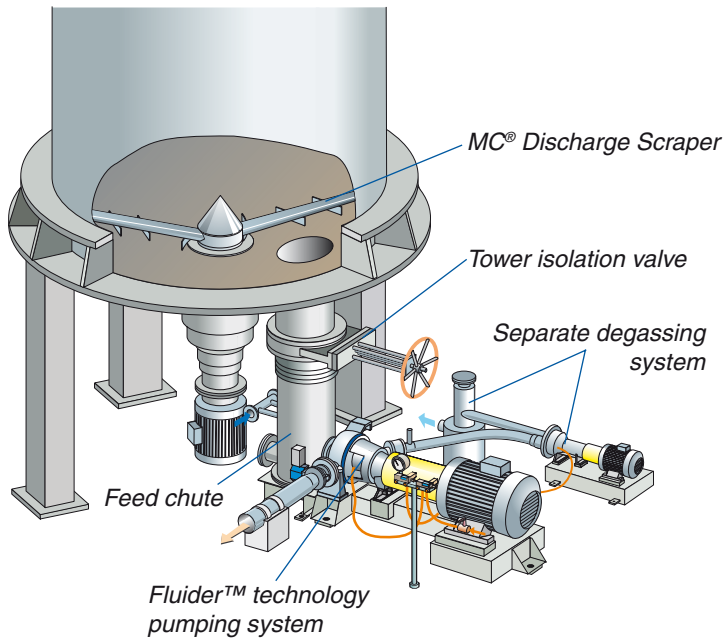
Typical chemical pulp O₂ delignification and bleaching process

Chemical injection points in a pumping and mixing system:

1. NaOH
2. H₂O₂, H₂SO₄
3. ClO₂ (without the use of separate chemical mixer)
4. O₂, ClO₂

MC® Discharge Scraper and Tower Discharge Pumping System

The well proven MC® Discharge Scrapers are designed for transferring stock from storage or bleaching towers at medium or high consistency to the feed chute of the pumping system, from where it is pumped to the next process stage or to washers.

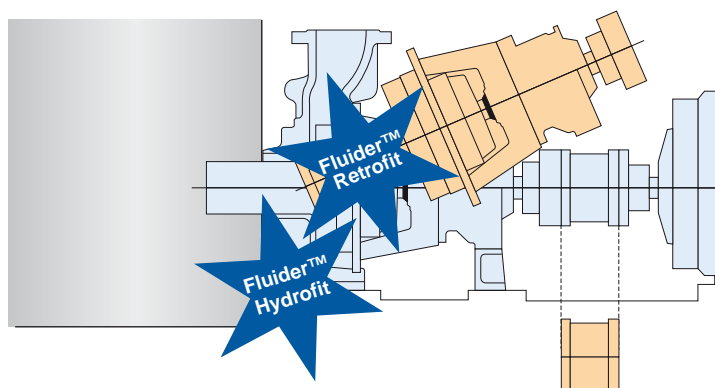


Capabilities

- to 13 per cent tower consistency without dilution
- to 20 - 35 per cent tower consistency with dilution
- the pumping consistency from the tower is typically 8 - 13 per cent

KCE™, LCE™ and MCE™ Pumping Systems in Process Upgrades

The efficient Fluider™ technology is used successfully in production and process upgrades by installing a retrofit unit or to replace an existing MC® pump of an earlier generation. In most cases, not even piping changes are required.



Fluider™ Retrofit and Hydrofit

Benefits and advantages

- Bleaching efficiency improves.
- Consumption of chemicals decreases.
- Capacity increases.
- Lower energy consumption.
- Rapid reported pay-back times as short as 2 - 3 months.

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