

How to Pump Almost Dry Matter

REIJO VESALA
SULZER PUMPS

Stock pumping is one of the most important operations in the manufacturing of pulp and paper. Stock is pumped from a variety of vessels such as chests, storage towers, reaction towers, and washers, to the subsequent process stages. The consistency of the stock, or its weight proportion of dry solid matter, can be as high as 35%. The handling of high- or medium-consistency suspensions—which may also contain chemicals and abrasive media depending on the process and process stage—requires the use of efficient, dedicated machinery. Sulzer Pumps produces specialized pumps, agitators, and other equipment that allow for reliable process operation and tower management in pulp and paper mills while reducing the level of energy consumed.

▶ Many processes in pulp and paper mills involve the pumping of stock (Fig. 1). The energy required to pump stock can amount to 20% of the mill's total energy needs. Stock with high dry-solids content can be so thick that it would support the weight of a human. Material of this nature has to be fluidized before it can be pumped. In order to achieve maximum efficiency, it is first neces-

sary to remove any air that might be present in the pulp suspension: if the stock contains too much free air, pumping will be compromised unless the design of the pump takes account of this constraint. During the washing and bleaching stages of the production process, the consistency of the stock is usually raised from the low-consistency range (0–8%) to the medium-consistency range (8–18%). Typi-



1 Pulper in a paper mill: the material handled in the pulp and paper industry can have a high solid matter content. Sulzer Pumps is a full-line supplier of products to meet all medium-consistency pumping requirements.

cally, the consistency level is 4–16%, depending on the process. In the recycled-fiber deinking and mechanical pulping processes and in the washing stages of chemical pulping, it may even exceed 30%. After dispersion, bleaching, and washing, the stock is diluted to a suitable consistency for pumping. During the bleaching of chemical pulp and the preceding stages, the pressure at the inlet side of the pump may be high, and the temperature can reach 130 °C (Fig. 2). Bleaching liquid and other process chemicals are simultaneously

mixed into the stock during this stage.

Pumps to Cover the Full Range of Consistencies

Sulzer Pumps' product portfolio comprises applications for every level of consistency—with Ahlstar^{UP} stock pumps covering the lower range (see article p.11) (Fig. 3). At the upper end of the range, highly efficient MCETM pumping systems are used to handle the highest consistency fluids that can be pumped using centrifugal pumps (see STR 3/2002, p.7).

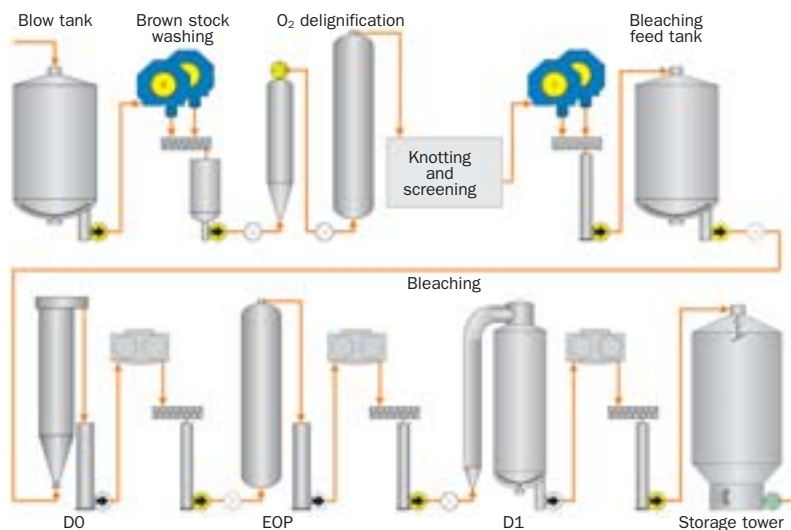
The LCETM and KCETM pumping systems produced by Sulzer Pumps were the first high-efficiency pumping solutions designed specifically for the intermediate-(Semi-MCTM-)consistency range (6–10%) to be launched on the market. Prior to the introduction of these products, manufacturers had to use adapted low-consistency stock pumps or pumping systems designed for medium-consistency stock. Sulzer Pumps therefore developed and delivered energy-saving and fiber-protecting pumping solutions to cater spe-

cially for intermediate consistencies. The power requirements of these systems are considerably lower than those of conventional products. The new solutions—mostly comprising a pumping system with a single drive unit—also feature simpler designs than previous systems.

Patented Technology

Sulzer pumps for intermediate- and medium-consistency applications feature specially designed impellers and use patented FluiderTM technology. Pumping systems with Fluider technology are used most frequently 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 help to ensure that bleaching liquid or process chemicals are mixed into the stock efficiently. The main advantages of this technology include high levels of efficiency—thus reducing power consumption—and its ability of maintaining an exact turbulence level, which prevents the overtreatment of the fiber. Medium-consistency pumps usually have either a built-in or an external degassing system powered by a high-capacity vacuum pump. The Fluider impeller offers a third option: it makes it possible to degas the fluid without a vacuum pump—a solution that does not require additional components or extra controls or drives. Another distinct feature of the Fluider impeller is its ability to work efficiently irrespective of the stock level in the dropleg (Fig. 4). The dropleg is a barrel-like tank at the low-pressure side of the pump that ensures proper inflow conditions for the pump.

2 A typical O₂ delignification and bleaching process in a chemical pulp mill. Sulzer Pumps produces equipment that fulfills all pumping and mixing requirements and enhances process efficiency by facilitating stable and reliable operation through reactors and towers.



Energy Savings and Process Upgrades

Fluid technology is used successfully in production rate and process upgrades through the installation of a retrofit unit or the replacement of an existing earlier generation MC[®] pump. Piping changes are not even necessary in most cases.

Modern Salomix[®] tank agitators provide high propeller efficiencies. In addition, dilution cone (Dilco) technology enables low-consistency zones at the tower bottom to be managed using even less energy (Fig. 5).

Effective Management of Towers

The friction between stagnant and moving pulp in the storage towers can lead to uneven consistency distribution, resulting in consistency increases of stagnant pulp and the dilution of moving pulp. This difference in consistency leads to unequal retention times—with shorter times for moving pulp and longer times for stagnant pulp—which, in turn, lowers the quality of the product. Sulzer's

Salomix mixing technology allows for effective bleaching and storage-tower management and ensures the even filling and emptying of the towers. The top entry spreader (TES) distributes the stock evenly when the tower is being filled, and agitators in the agitation zone at the bottom of the tower ensure the uniform consistency of the stock that is pumped from the tower. Sulzer Pumps has equipped 10,000 m³ volume towers in Brazil and in China with record diameter agitation zones.

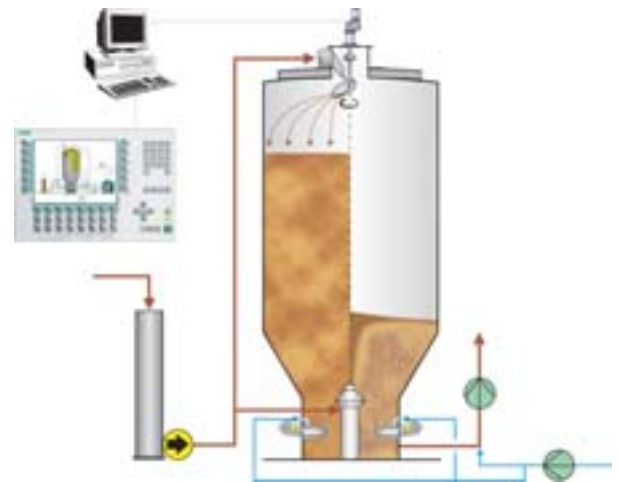
World's Largest Research Center

Sulzer Pumps operates the world's largest research and development center that is dedicated to the needs of the pulp and paper industry in Karhula (FI). As a result of continuous, specialized research work over several decades, Sulzer has been able to create stock pumping systems that have longer service intervals and consume less energy. Furthermore, Sulzer's metallurgical expertise and the company's own foundry also play an important role in developing



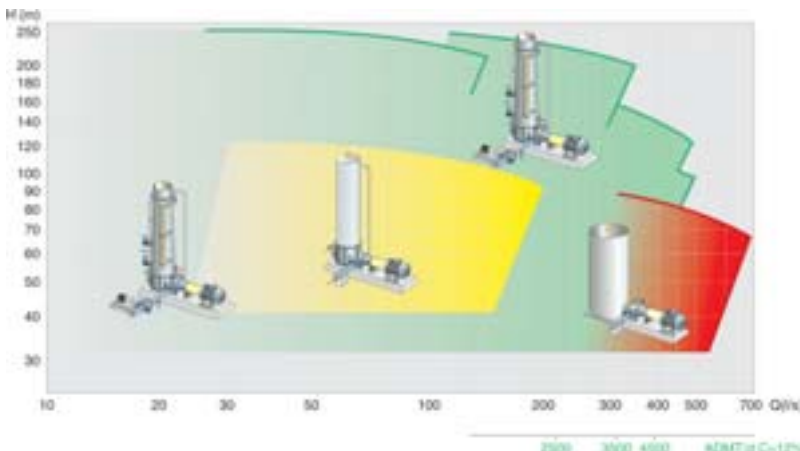
4 Typical MC[®] pumping arrangements. The stock level in the dropleg is measured and controlled, thus providing constant operating conditions for the pump.

equipment with a high level of resistance to corrosion and wear. To date, Sulzer has delivered over 3000 MC[®] medium-consistency pumping systems to customers worldwide. ◀



5 The TES and the agitators with Dilcos at the bottom of the tower ensure continuous flow and equal retention times of the pulp. The patented Sulzer tower management solutions produce a quantifiable improvement in the quality of stock, e.g., its brightness.

3 Sulzer's medium-consistency pumps cover all head and flow rate combinations in a pulp and paper mill up to 240 m head and between 20 and 5000 ADt/d (air-dry tons per day).



Contact

Sulzer Pumps Finland Oy
 Reijo Vesala
 P.O. Box 66
 48601 Kotka
 Finland
 Phone +358 10 234 31 32
 Fax +358 10 234 33 31
 reijo.vesala@sulzer.com