Paper is a commodity product and it is still hard to imagine a world without it. Water is one of the key components of paper making. Without water, the production of paper is unthinkable.

Being one of the most important industrial water consumers, paper mills were challenged to reduce their impact on water resources. Substantial progress has been made in reducing water consumption in paper mills. Due to its high competence in process water reuse the paper industry counts among the most advanced industrial sectors.

This brief will introduce the importance of water disinfection - the challenges and best practices for the paper sector.
The paper sector draws 97% of the water it uses from natural sources. Before being used for process water, cooling or other uses, the water has to be treated. Disinfection takes place at the water inlet of the plant in order to prevent microbiological growth in the system and for legionella control.

**IMPORTANCE OF DISINFECTION**

Disinfection in itself seems to sit alongside chemical processing in the paper making process, as it simply has to prevent microbiological growth. It is important to note that improper water disinfection affects plant throughput and product quality.

**TRIPPING VACUUM PUMPS**

Liquid ring vacuum pumps are used throughout the forming section of a paper machine, to remove water from the paper stock. When there has been insufficient disinfection, slime builds-up slowly in the bearings of the impellor. The result is a constant higher power consumption and eventually over heated electric motors, which trip thermally stopping of the paper machine.

**MACHINE CLEANING CYCLES**

Mills experience the build-up of a variety of deposits on their machines. These deposits can lead to loss of production, sheets defects and loss of over-all efficiency. For example microbiological slime will affect dewatering efficiency. Deposits will build-up gradually and regular shut-down cleaning is required to remove them. Optimal disinfection will lower machine pollution levels and increase uptime.

**RECOVERED WATER**

Water recovered from the closed loop systems tends to have stronger bacterial growth in the stock preparation tanks. Research shows that these deposits are being transferred into the paper sheet, leading to sheet defects.

**INDUSTRY CHALLENGES**

- Tightening regulations for wastewater
- Strive for lower Chemical and Biological Oxygen Demand levels (COD)
- Increased water reuse
- Reduce CO2 missions by 80% in 2050
- Challenging targets towards energy reduction
- Accident rate halved over last decade - Aim is an accident-free workplace
- Chemicals, representing over 10% of the total costs of the paper manufacturing

**CHEMICAL DOSING CHALLENGES**

**Safety**

Misuse of equipment causes 18% of injuries within the pulp and paper sector. Most disinfectants are chlorine-based and therefore bring potential risks for workers involved in their use.

When machine maintenance is carried out, operatives can be exposed to the chemical disinfectants whilst dismantling dosing pumps, potentially causing burns and breathing difficulties.

**Degassing**

Chlorine-based disinfectants can de-gas which causes vapour locking in the transfer lines.

The diaphragm pumps which are widely used for chemical dosing in this sector, suffer vapour locking and in turn a drop in flow and significant under dosing of the process water.

**Dosing**

Process conditions such as flow and system pressure can fluctuate. Again, diaphragm pumps fail to perform well – an increase in just 1 bar (15psi) discharge pressure, will often see a reduction of 25% in flow. In many instances, the pump display shows accurate dosing, but in fact there is a constant under delivery of the disinfectant chemical.

It is this lack of pump performance which requires machine and water pipeline cleaning cycles to be increased and in many instances, causes paper defects, so loss of production.

**QDOS DOSING SOLUTION**

Qdos has been tailored to handle corrosive, toxic and degassing chemicals safely and accurately. The contained pumphead design with integral leak detection, eliminates operator exposure to chemicals. The pumphead can be removed and replacement, with no need for tools, no specialist training and no maintenance technicians.

Disinfectants have been tested thoroughly resulting in a peristaltic metering pump which delivers predictable and accurate at variable pressures up to 7 bar (100 psi), even with fluctuating process conditions.

**Value curve shows user appreciation of dosing pump technologies**

- **Optimal**
- **Poor**
- **Dosing Accuracy**
- **Vapour Locking**
- **Ease of Maintenance**
- **Safety**
- **Control Functionality**

= Qdos  = Diaphragm
Mill throughput +15%

As a result of high machine bacterial pollution levels, a paper mill in the UK suffered an average 12 paper sheet failures a day. The mill implemented a cleaning program to reduce the build-up of deposits. The existing diaphragm dosing pumps, were replaced with Qdos pumps, resulting in a 50% reduction in wet-end breaks.

As a direct result of improved disinfection, mill throughput has risen by 15%, contributing significantly to the profitability of the operation.

The paper sector experienced an average operating margin of 9.6% in 2015, so increased throughput such as seen in this UK mill is notable.

Energy savings - 50K per year

A Global Molded Fibre Company with multiple mills, struggled with overloaded vacuum pumps caused by high microbiological contamination levels. This was in spite of sealing water disinfection.

The diaphragm pumps installed for disinfection suffered vapour locking and inaccurate dosing due to changing process conditions. After replacing the diaphragm pumps with Qdos pumps, full control over the critical disinfection step was regained.

Net effect per operation:

- Vacuum pumps run more efficiently, saving 10% over the installed power of 550 kW, resulting in a reduction of 50,000 Euro per year on energy

- 75% reduction in unplanned maintenance of the vacuum pumps, saving 5000 Euro per breakdown.