Pure improvement

Reducing waste by treating and recycling sub-products and effluents

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Plant owners are always looking for ways to optimize production, ensure a reliable process performance and of course reduce costs. From the supplier's side, good engineering means anticipating a client's future needs for his plant and offering solutions that can cope with the evolution of economic and legal requirements.

Cellier Activity supplies complete automated installations for the paper, lubricants, paint and specialty chemicals industries. However, pollution from these industries has been of major concern for many years. Environmental issues now mean new technologies must be implemented that significantly lower the concentration of toxic substances in effluents. Many of the process solutions offered by Cellier do just this.

Cellier Activity, part of ABB France since 2000, is idyllically located in Aix-Les-Bains, in the French Alps and has over 50 years experience in coating preparation for the papermaking industry worldwide Factbox 1. As well as providing turnkey production units, Cellier also supplies innovative solutions for the management of chemicals, raw materials storage, powder transfer, dispersion, cooking, mixing, filtration, pipe cleaning systems and complete plant process control supervisory systems, as stand-alone equipment or as integrated process units. In addition, the company designs, engineers, procures and commissions services for the paper, board and tissue manufacturing and de-inking lines, lube oil blending plants, grease manufacturing units, production units for decorative and industrial paints and miscellaneous specialty chemicals like resins, adhesives, etc.

Because water scarcity affects an estimated four out of 10 people, it is important to conserve, recycle and protect water more efficiently.

Cellier also offers innovative solutions, such as clean-in-place (CIP) technology, filtration and piggable systems, to help its customers reduce waste generation by minimizing and recycling sub-products and effluents.

Working towards a cleaner environment

There are many reasons why companies must reduce the effluents produced as a result of their processes, but most probably the two most important ones are the scarcity of a valuable resource and compulsory regulations.

It is estimated that water scarcity already affects four out of every 10 people around the world[1], and the situation is getting worse due to population growth, urbanization and increased domestic and industrial water use. Because of this, everyone, and in particular companies, need to take responsibility by conserving, recycling and protecting water more efficiently.

For a start, companies can begin by reducing their "water footprint" (ie, reducing the consumption of fresh water) if they re-utilize filtered water in applications – such as rinsing – which normally use fresh water. In addition, they can recycle effluents by recovering concentrated raw materials or sub-products.

Growing environmental challenges and future legal requirements are creating more eco-conscious customers.

Legal requirements, such as the European guidelines known as REACH (Registration, Evaluation and Authorisation of Chemicals) and IPPC (Integrated Pollution Prevention and Control) contain measures to protect both the environment and human health. Economical factors are also important so that the plant depends less on water and chemicals supply, and more on treatment units.

Growing environmental challenges and future legal requirements[2] are creating more and more eco-conscious customers. Companies that anticipate the changes to come will, in the long run, save time and money and increase their overall profitability. Improved operation performance practically goes hand-in-hand with improved environmental performance, and this in turn leads to an improved image, a greater competitive edge and better risk management.

To help companies achieve operational- and environmental-performance improvements, Cellier provides innovative and value-adding process solutions designed to:

- Optimize consumption and resources
- Optimize process and production capacity by: operating in a closed circuit; increasing availability; reducing maintenance – by minimizing operator intervention; and reducing cycle times[3]
- Improve plant cleanliness by optimizing the cleaning phases (by scheduling a series of compatible

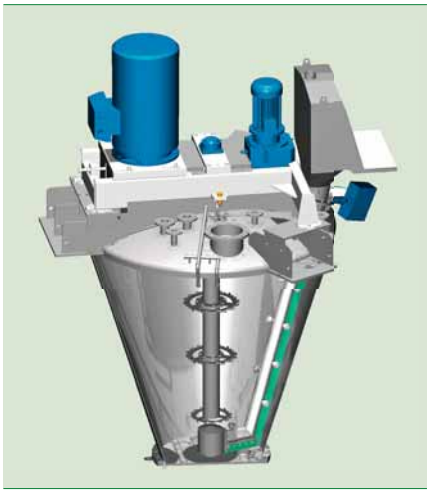
Footnotes

[1] www.who.int (Retrived December 2008.)

[2] Improved safety and working conditions as well as a duty to protect the environment.

[3] Reducing cycle times can be achieved by using high-yield reactors to reduce batch time, or pigged lines to transfer products in hidden time.

1 Clean-in-place (CIP) Delicel



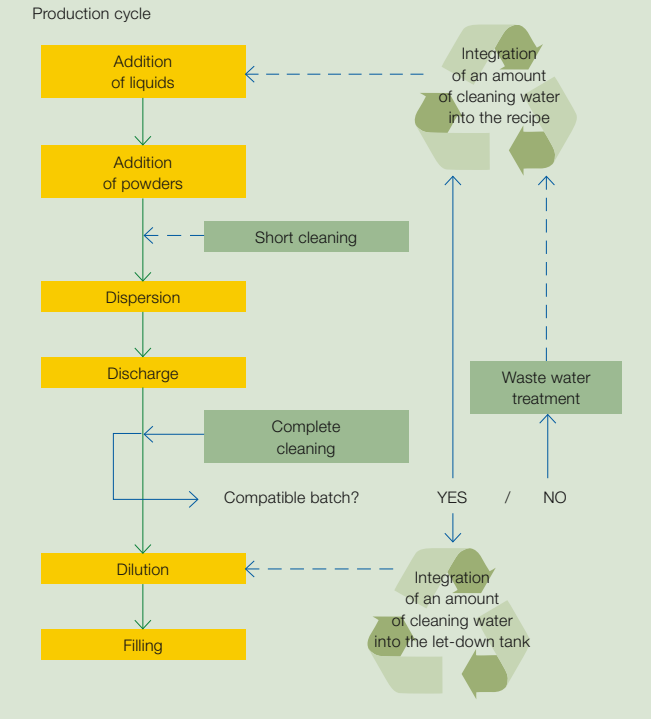
Factbox 1 Cellier Activity

Founded in 1950 the Cellier company was initially concerned with the construction of stainless steel vessels. It progressively applied its know-how to the paper industry by supplying mixers, tanks and piping to the local paper mills in the Grenoble area. In the 1970s, the company opened subsidiaries in Great Britain, Germany, the US and Brazil, and by the end of the 1980s, Cellier was considered the world leader in the paper industry, supplying chemical preparation units and so called "coating color kitchens", with a market share of 65 percent. Its know-how now extends to other industries, such as the blending of lubricants and additives, the manufacturing of paints, varnishes, resins and other specialty chemicals.

Cellier proposes optimum solutions if a company needs to increase production capacity, change a production process, improve product quality or decrease product losses and effluents. Not only that but companies that seek to revamp their plants are supplied with an installation adapted to their needs and which integrates the latest technological developments.

batches, high-pressure cleaning operations, re-circulating waste water) and performing them automatically using CIP technology
- Easily control the manufacturing process by recording, measuring and managing components, needs and the quantities used and produced. In addition Cellier solutions ensure dosing accuracy and process repeatability by guaranteeing safe (ie, less manual) operation and system connectivity (ie, traceability).
- Reduce and recover effluents by concentrating or separating solids so that clear effluents can be reused as process and rinsing media, or as utility or "recipe" components.

2 CIP Delicel production cycle



CIP technologies

Some of the best available techniques employed to reduce effluents and control their generation utilize CIP technologies.

CIP technologies clean the internal surfaces of process tanks, pipes and associated equipment without having to dismantle them.

CIP technologies are used to clean the internal surfaces of process tanks, pipes and associated equipment without having to dismantle them. The cleaning operation is performed quickly, is repeatable and requires fewer personnel. These technologies can be applied to production units with a large product slate – including variable batch sizes – that require frequent cleaning or to production cycles of incompatible products. Because it is an automated operation, CIP can optimize the amount of cleaning product used. And most importantly, the equipment is much cleaner. Among the various CIP solutions available, Cellier proposes its innovative mixing and transfer systems.

Mixing solutions: the CIP Delicel

The CIP Delicel 1 combines high dispersion yields with an integrated automatic cleaning system. It allows dispersion and rapid circulation on the entire height of the tank and is suitable for varying batch sizes. The cleaning quality is ensured by high-pressure nozzles situated on the peripheral mixing arm. Automatic cleaning sequences, which use controlled cleaning water volumes, are adapted to the process.

A typical cleaning process in paint manufacturing involves:
- Dispersing the powders in liquids in the CIP Delicel before transferring it to a let-down tank. During this step, water is supplied through the cleaning nozzles to remove any powder remaining on the tank wall.
- The CIP Delicel is cleaned (through a self-cleaning process) and the water is then transferred to the let-down tank.
- Dilution (or finishing[4]) of the water takes place before storing in a let-down tank

The benefits of using CIP Delicel are many. For a start, the amount of effluents generated is reduced by up to 90 percent and part or all of the cleaning water can be reused. Cleaning is an automatic and immediate operation using controlled cleaning-liquid quantities and without the intervention of the operator. In addition, cleaning time has been reduced by up to 50 percent. The CIP Delicel is rapidly emptied and cleaned for another dispersing operation. Dilution takes place in hidden time, ie, in parallel to some other event, in a let-down tank.

Production is also organized according to batch compatibility to optimize the cleaning efficiency in terms of cleaning media consumptions, cycle time and cleaning quality 2.

Pipe pigging solutions

Transfer operations are an effluent source. Because of this and for a line is to be completely emptied or cleaned, the pigging technology is im-

3 A piggable H-valve

Footnotes

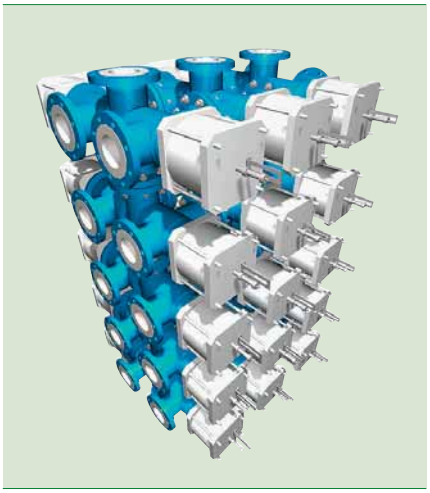
[4] A finishing phase is needed to obtain a product with a final concentration level that is lower than the initial one.

plemented in all industries where a large variety of products, whether they are compatible or not, must be transferred. This technology consists of moving a plug called a "pig" inside a pipe. The mechanical effect of the pig cleans and empties the pipe. A material recovery rate of 100 percent of the transferred product is the norm rather than the exception. Furthermore, the quantity of cleaning liquid is minimized by displacing a small buffer volume between two pigs in the pipe.

Pigging technology meets the requirements of safety and environmental protection. For example, the transfer circuits used in the reduction and recovery of effluents are closed. Another advantage of this technology is that it is capable of sequentially transferring different products in the same line. Pigged lines have become, in effect, a real process tool with the possibility to change and meter products without cross-contamination and to carry out hidden-time dosing or transfer operations. This in turn leads to more flexible workshops with greater modularity because the piping network is either simplified or it can be easily extended, and the allocation of equipment such as tanks, filling machines, etc, is optimized.

Cellier has developed a range of pigging components, including pig launching and receiving stations, distribution valves, cross-valves and so-called H-valves 3. These components are typically installed at the point where three lines – which may be of varying diameters – intersect thereby forming an interconnection 4. Assembled on a matrix principle, they enable several inlet and outlet points to be interconnected. Because they are automated, pigging systems are safer and their performance in terms of reactivity and reliability is greatly enhanced 5 6.

4 A module consisting of 15 H-valves



Drum decanting units (DDU)

Manual drum decanting operations increase the risk of spillage and/or accidents. In addition, the lack of accuracy and traceability in the product dosing is also a major drawback.

Cellier's drum decanting unit (DDU) is primarily used to transfer the liquid additives – without causing any spillage – stored in drums or containers 7. It also meters the product decanted from the drum, rinses both the drum and the transfer pipes after they have been emptied, and it either recovers the rinsing product or integrates it into the recipe as a component. In addition to these functions, the DDU is interfaced with the plant control system and contributes to the management of recipes and the planning of production operations.

CIP Delicel reduces the amount of effluents generated by up to 90 percent and part or all of the cleaning water can be reused.

The DDU enables:

- High dosing accuracy and reliability as control comes from the recipe manager
- Operation traceability. To assist him with the registration of the product to be decanted, the operator receives specific instructions on a local terminal interfaced with the plant control system. The management of any remaining volumes and inventory control are therefore made easier

5 A piggable manifold installed in the Sinopec plant (China)

6 Piggable lines installed in the Pintuco paint manufacturing plant in Colombia

7 A drum decanting unit (DDU)

A Dyrup production unit in Albi (France) manufactures wood treatment products and has reduced solvent consumption by 60 percent since 1990

- Safety, cleanliness and comfortable operation
- The recovery of high-value products and the recycling of cleaned drums
- The re-introduction of cleaning products in the recipe
- Easy maintenance.

Filtercel – the filtering solution

Filtercel is an in-line pressure filter with a filtering mesh size ranging from 50 to 500 µm 8. It automatically separates, concentrates and removes contaminants, thereby ensuring a high quality end product. As a CIP solution, Filtercel is a self-cleaning apparatus combining continuous declogging (using scrapers) and high-pressure cleaning through a rotary ramp used on the filtering basket. It is either installed as a single filtering point or on a re-circulating circuit. Filtercel is applied to products with high viscosity or solid contents. It is also used to filter pigment slurries for the paper industry and in the manufacturing of paint, resins and glues 9.

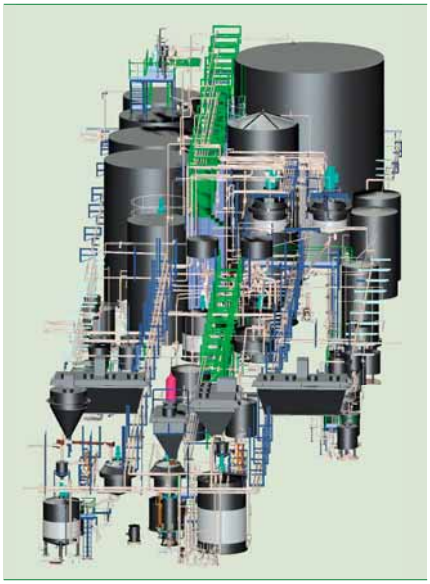
8 Filtercel

A drum decanting unit (DDU) transfers, without spilling, the liquid additives stored in drums or containers.

The advantages of Filtercel are:

- The consumption of cleaning liquid is reduced to 50 percent thanks mainly to two factors: cleaning efficiency is enhanced by the continuous action of scraper and high-pressure cleaning of the basket
- Effluent volumes and product losses are minimized because contaminants are concentrated and automatically discharged during a short draining sequence
- All functions, such as cleaning and draining according to the process

A 3-D view of a typical chemical formulation unit supplied by Cellier for the paper industry



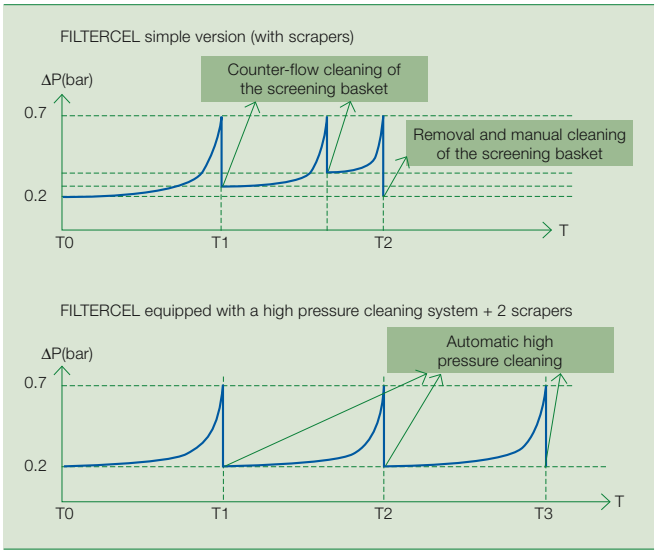
Dispersing units at the Blanchon Syntilor plant (France)

needs, are automatic with non-stop operation
- Reduced maintenance. Because cleaning is automatic, the metallic basket does not have to be dismantled.

Filtercel reduces both the frequency at which downstream filters clog up and the damage caused by the contaminants to other downstream equipment.

Filtercel is an in-line pressure filter that automatically separates, concentrates and removes contaminants.

9 Filtercel performance curves: batch after batch, the filtration efficiency remains unchanged



Complete automated installations

Within the context of effluent reduction, it is necessary to take into account defects that may occur in an automated installation which can lead to an environmental incident, such as tank overflow, the false connection of a flexible pipe, pump leakage, etc. Automation is considered the most efficient way of reducing or even eliminating the risk of human or process errors. It provides constant process management and supervision, emergency modes, organisational measures and operator acknowledgments, safety devices and interlocks.

Successfully reducing effluents depends mainly on simple and repeatable processes and measures where rigour is required. The benefits of an automated system implementing these with defined environmental key performance indicators (KPI) are given in Factbox 2.

Cellier Activity offers innovative process solutions based on continuing development. Eleven CIP Delicels have recently been installed in Thailand in a paint manufacturing plant after its owner decided to improve both operational and environmental performances. Another paint manufacturer in France included the CIP Delicel cleaning process in its quality standards. These successes show the growing interest of plant owners in exploring more environmentally friendly techniques and implementing a real water-management program to reduce water and solvent consumption as well as waste, while improving their economic efficiency by lowering production costs.

Factbox 2 The benefits of implementing simple and repeatable processes and measures with defined environmental key performance indicators (KPI) to reduce effluents

- The control of material flows because products and their containers are identified, registered and localized.
- The control of batches, quantities and status (ie, which component is in which batch, batch approval status).
- The integration of cleaning as production steps.
- The suppression or limiting of cleaning operations (line pigging).
- The concentration of effluents (pre-rinsing, high-pressure cleaning, filtering)
- Correct production scheduling to reduce the number of cleaning operations.
- The sorting of products in families according to their compatibility.
- The follow-up of equipment status (in terms of cleanliness and the name of the last product manufactured).
- The standardization of proven and repeatable procedures to minimize the risk of accidents and operator mistakes.
- The registration of manual or semi-manual transactions.
- The measurement and management of effluents. The system evaluates any performance improvement possibilities, minimizes effluent volumes and enables their re-use.
- The analysis of effluents using ABB analyzing solutions.
- High traceability including all relevant information, the measurement of volumes, and contents and histories.

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