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## FEATURES

- Water treatment
- Separation and filtration
- Supply chain management
- Control and instrumentation





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viruses & bacteria



pollen



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chemical fumes



dust



smell & odours



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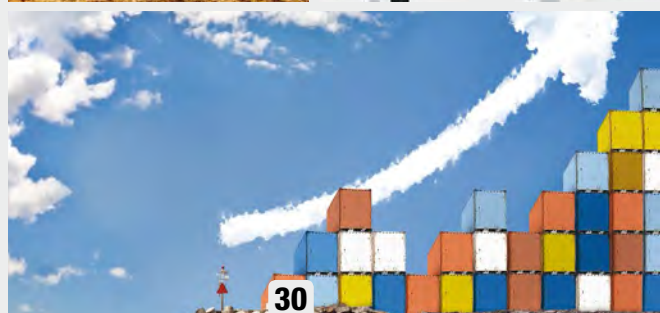
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## Where to drink in the solar system

by David Rothery, Professor of Planetary Geosciences at The Open University, UK

Any civilisation coming to our solar system in need of water, would be foolish to plunge all the way inwards to the Earth, from where they'd have to haul their booty back against the pull of the sun's gravity. Until recently, we believed that the Earth was the only body in the solar system that had water in liquid form. While it is true that the Earth is the only place where liquid water is stable at the surface, there's ice almost everywhere. Many scientists also infer that liquid water may exist beneath the surfaces on several bodies.

But where in the solar system are we likely to find it and in what form? Could we ever get to it and, if so, would we be able to drink it?

If you are interested in finding places where extraterrestrial microbial life might occur, then you should look for liquid water, or at least 'warm' ice within a few degrees of melting. Those places are widespread, if you are prepared to look below the surface of cold bodies or around the edges of patches of permanent shade on hot bodies.

Furthest from the sun is the Oort Cloud, a region where most comets spend most of their time some 10 000 times further from the sun than the Earth is. They are mostly water-ice, with traces of various carbon and nitrogen compounds.

In the Kuiper Belt, about 40 times further from the sun than the Earth is, there are bodies up to just over 2 000 km in diameter, like Pluto. These are mostly water-ice surrounding rocky cores, but ices made of more volatile substances may coat their surfaces. A few may even have oceans of liquid water tens or hundreds of kilometres below their surfaces.

Neptune, Uranus, Saturn and Jupiter are the giants of the solar system. Deep inside, and confined by very high pressure, each of these

is believed to contain several Earth-masses of water, sandwiched between its rocky core and its outer layers of hydrogen and helium gas. The giant planets each have numerous moons that are made mostly of ice. There is compelling evidence that several icy moons have internal oceans.

Closer to the sun, Mars, Earth, Venus and Mercury are in a region that was too hot for ice to condense when the solar system was forming. Consequently the planets are mostly rock, which can condense at higher temperatures than ice. The only water on the rocky planets was either trapped inside minerals and then sweated out from the interior, or was added at the surface by impacting comets.

Whereas Mars is too cold, Venus has been too hot for liquid water for most of its history. However, there are water droplets high in its atmosphere. This is not worth collecting as a resource, and a very long shot as a means of supporting microscopic airborne life.

The last place you might expect to find water is Mercury, because it is mostly far too hot. However, there are craters near the poles onto whose floors the sun never shines. The presence of water-ice in these regions, delivered by impacting comets, has been demonstrated by several techniques and cannot be doubted.

Similarly 'cold-trapped' water-ice has also been found inside polar craters on the Moon. This may be one of the first solar system resources that we, rather than visiting aliens, exploit as we leave our home world and make our way into space.

This is a shortened version of an article originally published in 'The Conversation' online, at <https://theconversation.com/water-water-everywhere-where-to-drink-in-the-solar-system-46153>

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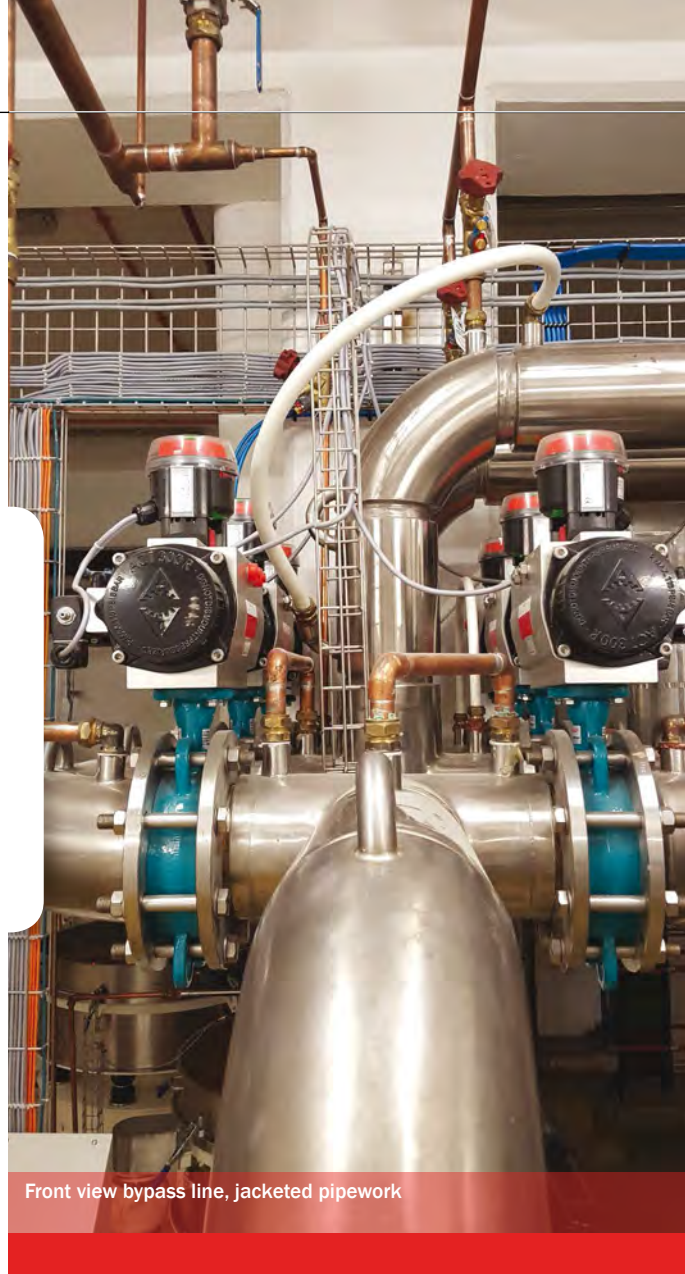
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From butterfly to chocolate –  
**the GEMÜ valve experience**

**The Victoria range of metal butterfly valves, especially the white NBR liner, is used extensively in oily, greasy and fatty applications such as the manufacture of chocolate.**



Front view bypass line, jacketed pipework

Chocolate was originally a bitter-sweet drink dating back to the ‘tribes’ of Mexico and Guatemala such as the Aztecs and Maya. They would pound cacao beans and spices to make ‘Nahuatl’, the Aztec word for chocolate, which was believed to be an aphrodisiac. It was only in the 16th Century that Christopher Columbus stumbled upon the cacao bean on his travels and brought it back to Spain, where Spanish Friars introduced it to the Spanish Court. Only after the Aztecs were conquered by the Spanish, was the cacao imported into Spain and served as a drink.

Over time, various processes evolved for the grinding of the cacao bean and various ingredients that were either removed or included to produce the forerunner of what we now know as the chocolate bar or sweet. The humble chocolate has become a symbol of passion and love due to its exotic history.

### **GEMÜ valves in the food processing industry**

Today’s chocolate-making processes hinge upon mass production in ultra-sterile environments, with manufacturing equipment needing to meet United States Food and Drug Administration (FDA) standards. GEMÜ Valves, of Germany, is one of the few companies in the world that offers an FDA-approved, white NBR liner in their Victoria range of butterfly

valves, which are approved for use in foodstuff applications. The NBR white liner is used extensively in oily, greasy and fatty applications and does not contaminate the content, thereby making it perfect for use in the manufacture of chocolate.

Claudio Darpin, Managing Director at GEMÜ Valves Africa said: “Our GEMÜ Victoria range of metal butterfly valves has recently been installed in a local chocolate manufacturing plant. Our unique valve liner meets FDA standards, making it the most reliable and effective liner in our ranges of butterfly valves aimed at the confectionary sector. Very few valve suppliers can offer this speciality liner, and we are at the forefront of this technology.”

“GEMÜ Valves Africa, via our Port Elizabeth-based distributor, Instruments4You, was selected to supply these specialised valves not only based on the quality of our product but also the service and after-sales technical support that we offer to our customers.

“One hundred and fifty GEMÜ Victoria butterfly valves, varying in sizes from DN80 to DN 150, have been installed at a chocolate manufacturing plant in the Eastern Cape, most of them automated with pneumatic actuators. Due to the Victoria Butterfly valve’s ability to withstand elevated temperatures and various chemical environments such as acid and alkaline conditions, as required in CIP operations, it is the preferred choice of valve for environments of stringent



Powder feed line



Tank bottom valve and manual shut-off valve, both with electrical position indicator LSR

hygiene and sanitation standards,” explained Darpin.

Chris Frauenstein, Managing Director of Instruments4You commented: “When chocolate is manufactured and becomes a liquid state, then all pipelines need to be heated to keep product from drying and becoming like concrete. This is done by passing warm water through jacketed pipework. GEMÜ valves have been used to shorten the dead space between flanges (where they do not have the space to jacket the pipework)”.

### Technical data

The GEMÜ Victoria butterfly valves range in size from DN 25-DN 600 and offer manual, and pneumatically operated options with traditional Normally Closed, Normally Open and Double Acting action. A complete range of measurement and control systems, designed by GEMÜ to suit the exact requirements of valves to be operated as ON/OFF or control valves, complements the scope of products which GEMÜ is offering to industrial customers.

Maximum operating pressures of 16 bar and operating temperatures of up to 150 °C (depending on version and materials used) can be matched by using the seal material accordingly. Most commonly materials used are EPDM, NBR and FPM.

The mirror polished disc surface of the valve offers a high surface quality which prevents particle build-up making it

easier to clean and providing more stringent security where hygienic conditions are important.

The butterfly valves have undergone rigorous testing at the GEMÜ testing laboratory, based in Germany, which is able to test to the most varied of customised cleaning and sterilisation requirements such as CIP/SIP, as well as conducting validation and quality testing. Temperature and cycle simulation tests are also conducted for warranty specifications.

The lifespan and reliability of elastomeric seated butterfly valves is largely dependent on the choice of valve liner; this is why the white NBR liner was utilised in the Eastern Cape chocolate plant as it complies with all global hygiene standards, including the UK’s Water Regulatory Advisory Scheme (WRAS). In addition it offers a long working life span.

Furthermore, GEMÜ supplies solutions for filling, cleaning, mixing, separating, sterilising, autoclaving and pasteurising machines and plant, with all design conforming to the EU framework regulation 1935/2004.

**Further information** is available from: Claudio Darpin, Managing Director, GEMÜ Valves Africa on tel: +27 11 462 7795 or email: [Claudio.darpin@gemue.co.za](mailto:Claudio.darpin@gemue.co.za) and Chris Frauenstein, Managing Director, Instruments4You on tel: +41 451 0614 or email: [chris@instruments4you.co.za](mailto:chris@instruments4you.co.za) ■



## Design guidelines for the chemical treatment of distillation columns – Part 1

by Karl Kolmetz, KLM Technology Group, Johor Bahru, Malaysia

**Proper chemical treatment in distillation systems involves understanding distillation principles such as the chemistry of the process. Successful application must also include reviews of fouling, corrosion and economic and environmental constraints.**

**D**istillation is the application and removal of heat to separate hydrocarbons by their relative volatility or boiling points. This necessary addition of heat normally in the feed stream, or at the tower bottoms via a reboiler, can also lead to unwanted consequences such as polymerisation, corrosion and reverse solubility. The removal of heat can lead to sedimentation, solubility effects, corrosion and precipitation. The concentration of certain constituents by the distillation process can cause corrosion, polymerisation, sediment fouling and flow phenomena effects.

A properly designed distillation column can reduce the effects of these consequences, but in certain applications, the polymerisation, corrosion and other effects are very prominent, leading to reduced separation efficiency in the column. This reduced separation efficiency increases the need for column maintenance and unit down time. In these applications a review of tower internal design and process chemical treatments should be initiated. A review of tower internal design has previously been published [1], whereas this article will discuss the application of chemical treatments in distillation columns.

### Distillation economics of fouling

Distillation is the most widely used separation technique and there are basically two main types of chemical treatments

in distillation columns; one is for corrosion control and the second is for fouling control.

Distillation can be utilised in very clean services, such as ethylene fractionation, which might fractionate for greater than ten years with no loss in efficiency due to corrosion or fouling; to very highly corrosive and fouling services. In butadiene distillation, which is a highly fouling application, some fractionation applications are measured in days.

There are at least four types of chemical treatments in the process industry distillation.

- Antifoulants, which include dispersants, inhibitors, metal deactivators, retardants, antiscalants, and antipolymerants
- Corrosion inhibitors which include neutralisers, and both nitrogen and non-nitrogen-based filming corrosion inhibitors
- Phase separation chemicals which include emulsion breakers, defoamers, antifoams, extraction aids, and solids-settling aids
- Scavengers which include agents to remove sulfides, oxygen, peroxide, and carbonyls.

Several general factors influence the corrosion or fouling potential of a distillation process. These include feedstock, temperatures, reboiler heat fluxes, and hydrocarbon residence time. The type of feedstock for a distillation column has a large influence on the fouling potential. Many crude







types have high higher fouling and corrosion potential than others. Feeds that have olefin or diene concentrations will have increased foaming and fouling potentials. The general symptoms of tower corrosion or fouling are many but they may include:

- Increasing or decreasing tower pressure drop
- Inadequate separation leading to reduction in product capacity and purities
- Tower temperature profile changes
- Requirement to run the reflux rate higher or lower than design
- Short reboiler run lengths
  - Increasing steam chest pressure increasing condensate temperature
  - Increasing steam flow
  - Products not meeting specifications
- Reboiler fouling and plugging
- Level control issues
- Instrument issues such as the lead line to instrumentation plugging.

There are many benefits to be gained from utilising chemical treatments, including increased capacity, reduced maintenance, and reduced environmental exposure leading to improved worker safety. By reducing the corrosion and fouling of a distillation column, a tower may have higher separation

efficiency. This increased separation efficiency can improve product quality while increasing capacity and production. Additionally increased separation efficiency can lead to lower energy consumption in reboilers and refrigerated condensers.

Reducing the corrosion and fouling of a distillation column will reduce turnaround frequency. In one case at an ethylene plant the de-ethanizer reboiler cleanings averaged 21 days, and with proper chemical treatments went to eight months. The increased run length will reduce maintenance costs with the added benefit of reducing personnel exposure to carcinogenic chemicals found in fouling deposits, while cleaning the tower or reboiler. Some species, such as butadiene and benzene, have been shown to be carcinogenic. The species can be released when cleaning the tower and reboilers leading to unnecessary exposure to personnel. This benefit extends beyond the typical return on investment.

A typical return on investment for a chemical treatment program should be 100%. If you extend your run length from one month to eight months it can be as high as 1 000%.

Each chemical treatment programme needs to be evaluated correctly to calculate the return on investment. The total maintenance cost of cleaning a tower or reboiler needs to be calculated and plotted against the cost of the chemical. Each cost is inverse to each other.

As chemical treatment increases, the maintenance cost

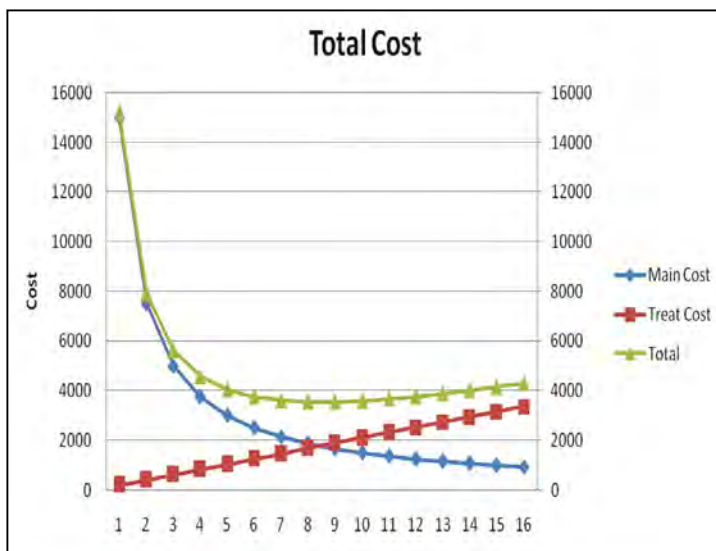


Figure 1: Cost of chemical treatment and maintenance

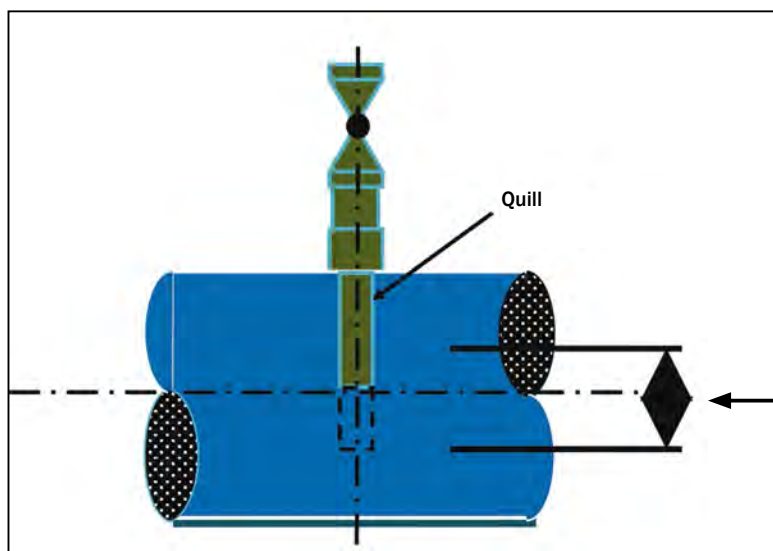


Figure 2: A typical injection quill

decreases, but the chemical cost increases. The sum of the two costs will form a minimum at the optimum treatment dosage and maintenance interval. Environment considerations may shift this minimum to reduce potential exposure.

For example, if it costs US\$15 000 to clean a heat exchanger, the maintenance monthly cost will be US\$15 000 divided by the number of months on line. Do not forget to factor in the environmental decontamination cost. If the chemical cost is US\$200 per month and increases 5 % per month for each month of increased life, these two costs can easily be plotted to obtain the proper desired run length of the application. In this example energy cost was not considered.

The goal would be to achieve the calculated run length at the lowest possible cost. Treatment targets might be 10 % residual chemical and 90 % consumption of the chemical injected. It is a good practice to measure the residual chemical in the tower bottoms because of the reboiler circulation rate is much higher than most people envision. A typical reboiler will only have about 30 % vaporisation rate and can have three to 10 times the tower bottoms' product flow rate.

A good rule of thumb is 25 ppm or less of chemical treatment based on the feed stream. This rule of thumb, like most rules of thumb, depends on many factors such as the chemistry, concentration of the inhibitor and severity of the fouling potential.

### Corrosion control

Corrosion is a major issue in distillation equipment even with proper designs. Multiple factors can interact and create corrosive attack. With the current run length of plants between maintenance outages approaching five years, corrosion control is a must to maintain distillation efficiency and recovery.

Areas of corrosion in distillation include: crude distillation, vacuum distillation, and solvent extraction. Proper metallurgy selection and then proper chemical treatment is essential to prevent corrosion in the distillation equipment for hydrocarbon and chemicals processing.

Corrosion treatment chemicals include neutralisers, filmers, and other corrosion inhibitors. These chemicals can

prevent or mitigate damage from galvanic bimetallic, aqueous acidic, and under-deposit corrosion, as well as pitting.

### Crude distillation

Corrosion in refinery crude distillation units is a common industry problem. Acids or salts present in the distillation column overhead system may cause corrosion when the right conditions exist. For this reason, it is common practice to inject corrosion inhibitors, neutraliser chemicals, or, in some instances, wash water to control corrosion in the column overhead system.

Crude distillation unit overhead corrosion diminishes unit reliability and operation in a number of ways. Some effects of overhead corrosion include equipment replacement and repair, lost throughput, reprocessing costs, offspec products, and downstream unit fouling. The two most common causes of overhead corrosion, acid corrosion and under salt corrosion, stem from the presence of hydrochloric acid (HCl). Acid corrosion occurs when a condensed water phase is present and is most often characterised by a general metal thinning over a wide area of the equipment. The most problematic form of acid corrosion occurs when a pipe wall or other surface operates at a temperature just cool enough for water to form. HCl in the vapours forms an acidic azeotrope with water, leading to potentially very low pH droplets of water.

Under-salt corrosion occurs when corrosive salts form before a water phase is present. The strong acid HCl reacts with ammonia (NH<sub>3</sub>) and neutralising amines—both weak bases—to form salts that deposit on process surfaces. These salts are acidic and also readily absorb water from the vapour stream. The water acts as the electrolyte to enable these acid salts to corrode the surface. Pitting typically occurs beneath these salts. [3]

The principal agent causing overhead corrosion is hydrochloric acid, although amine hydrochlorides, hydrogen sulfide, organic acids, sulfur oxy-acids, and carbon dioxide can also contribute to overhead corrosion. Oxygen, introduced through poorly managed water wash systems, can make corrosion worse.

Hydrochloric acid-induced overhead corrosion is primarily



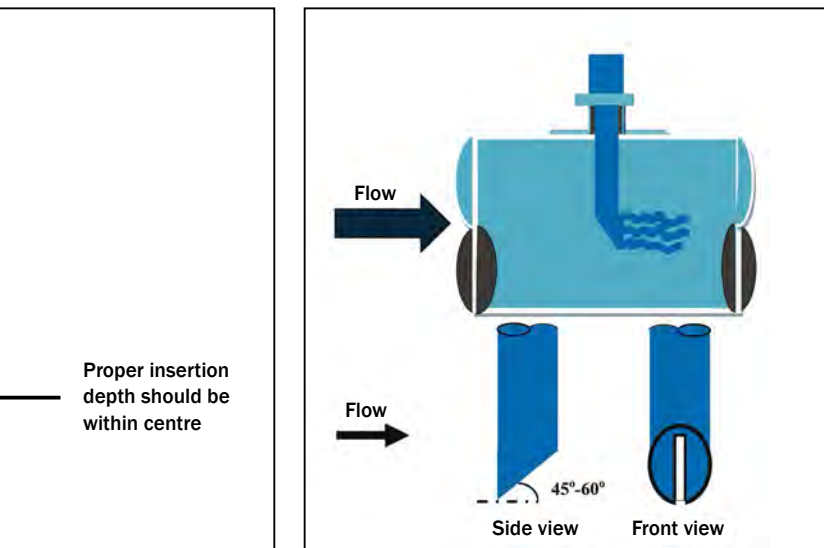


Figure 3: Variations on quill design

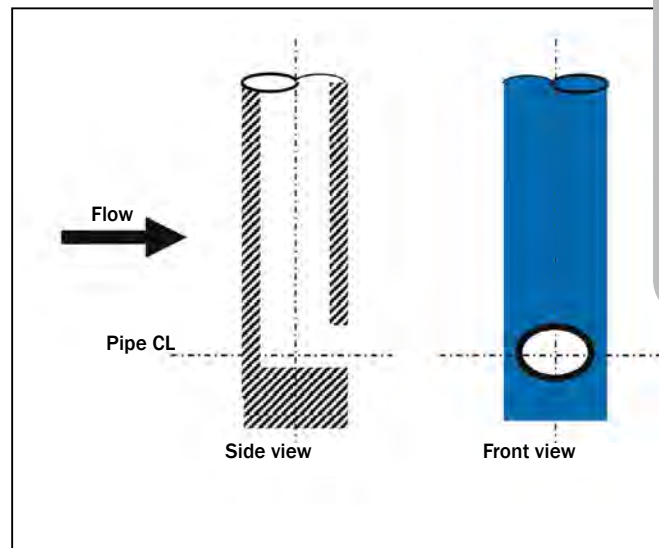


Figure 4: Preferred design of a caustic injection quill

controlled by chloride management in the incoming crude oil and secondarily controlled by the use of supplemental injection of organic neutralisers and corrosion inhibitors in the overhead system. Chloride management consists of good crude tank handling, desalting, and then polishing/neutralising with aqueous sodium hydroxide, which is commonly called caustic.

Refinery crude feeds contain water and inorganic salts (sodium, magnesium, and calcium chloride).

Hydrolysis of calcium and magnesium chlorides ( $MgCl_2$  and  $CaCl_2$ ) occurs when crude oil is heated in the pre-heat exchangers and fired heaters [2]. Many refiners inject caustic into the crude feed to the crude unit distillation tower to control condensation of hydrochloric acid downstream of the distillation tower in the overhead line. Caustic injection is carefully balanced with chloride levels measured in the overhead receiver.

Typically, operators specify chloride levels to be between 10 and 30 ppm. The lower limit is set to avoid over-treatment with caustic. Over treatment with caustic can result in contamination of the heavy products from the crude distillation tower with sodium, which can affect downstream units such as cokers, visbreakers, and Fluid Catalytic Cracking (FCC) Units. One best practice limits sodium to 25 ppm in the visbreaker feed.

Caustic treatment has been ongoing for many years and the lessons learned from caustic treatment can be applied to other types of chemical treatments. How the chemical treatment is introduced to the process is very important to the success of the treatment. A typical injection quill might look like that shown in Figure 2.

Generally, the most effective position for chemical injection is at the centre of the pipe. The highest fluid velocity is normally at the centre of the line, therefore, injection at this point is intended to prevent concentration of the chemical at the edge where the velocity is low due to friction and will ensure efficient distribution of the chemical treatment.

The design of a chemical injection quill uses an open end quill with a beveled tip that is slotted. The concept for this design is that the process stream pushes the treatment mix-

ture through the slot in the quill which will create turbulence and mixing downstream. Moreover, this design restricts the treatment flow to the pipe centreline area promoting mixing and dilution prior to contacting the pipe wall. It is also used to minimize the vortices that form on the back side of a non-angled quill. The angle and the slot minimise the downstream vortices that are formed. If non-slotted, one recommendation is to reverse the angle.

The preferred design of a caustic injection quill is one that directs the caustic flow downstream, such as the side-hole quill, with the opening oriented downstream.

### **Naphthenic acids in crude and vacuum tower**

Processing crude oils containing high levels of calcium naphthenates can present a number of operating challenges. Two processing technologies can help refiners successfully process these crudes. The first is a metals removal technology developed to remove calcium in the crude unit de-salting operation and the second would be chemical treatments in the crude and vacuum columns [3].

Several crude oils have come into production within the last few years that contain high levels of calcium naphthenates. Typically, these crudes are medium to heavy (specific gravity 0.89 – 0.95 kg/l), highly biodegraded oils, high in naphthenic acid content, and containing high concentrations of calcium ion in the formation water.

The calcium naphthenates found in many crude oils are largely insoluble in oil, water and solvents. Calcium naphthenates can cause fouling in separators, hydrocyclones, heat exchangers and other upstream production equipment. When blended into refinery crude oil feedstocks, these crudes can create a number of processing and product quality challenges in the tank farm, crude unit and down-stream units.

These processing issues result from several observed attributes of crude oil blends containing calcium naphthenates :

- High calcium content of atmospheric and vacuum resid
- Higher levels of low molecular weight organic acids in crude unit distillation column overheads
- Increased high temperature naphthenic acid corrosion activity

Continued from page 9

### Higher levels of organic acids in crude unit overhead systems

Processing crudes high in calcium naphthenates, as with many high TAN (Total Acid Number) crude oils, can result in higher loadings of low molecular weight organic acids and CO<sub>2</sub> in the upper portions of the crude and vacuum columns and overhead condensing systems. The amount and distribution of lower molecular weight acids and CO<sub>2</sub> in these systems is a function of the distribution of organic acid molecular weights in the crude oil, plus heater outlet, side cut, and column overhead temperatures.

The higher loadings of organic acids and CO<sub>2</sub> in crude unit distillation towers and overheads from processing high TAN crude oils may cause higher than desired corrosion activity in these areas.

In some cases, the current means of controlling aqueous overhead or tower corrosion may be inadequate under these new conditions. Refiners may need to re-assess the

capabilities of their overhead wash water systems, or have to utilise different corrosion inhibitor chemistries that are more effective under the new system conditions.

An additional concern for chemical treatment in the crude unit overhead is the application of the filmer technology. This filmer, commonly known as the corrosion inhibitor, forms a thin film on the metallurgy and prevents corrosion. However most of the commercial filmers have a certain surfactancy and can cause a water emulsion to occur in the naphtha product stream. The water in the naphtha stream can cause down stream unit problems, mainly corrosion issues. Proper selection of corrosion inhibitors to minimise this effect should be taken into consideration when refiners consider different filmer technologies.

References are available from the editor at [chemtech@crowne.co.za](mailto:chemtech@crowne.co.za) ■

## FMS brings home Pall HCP200 Turbine Oil Coalescer

Filtration Management Solutions (FMS), a leading provider of high quality oil maintenance and monitoring services to the energy market in South Africa, has recently imported the Pall HCP200 Turbine Oil Coalescer – the first of its kind in Africa.

A fully fledged services and rental business servicing the local energy market, FMS recognised that the principles of centrifuge and vacuum dehydration for free water removal commonly used in South Africa were not as efficient in the removal of high levels of free water contamination, especially over a short period of time.

Says Steven Whitcher, General Manager of Filtration Management Solutions: "Centrifuge removes only free water, while vacuum dehydration removes free and dissolved water, although it does generally take a lot more time. This prompted us to find the most effective and fastest free water removal machine in the Pall Corporation range, which led us to the Pall HCP200."

Developed by Pall Corporation, global experts in filtration, separation and purification solutions, the HCP200 Turbine Oil Coalescer is used in the filtration and water removal of turbine oil, incorporating the functions of absolute fine filtration with the latest high performance Pall Coralon efficiency free water removal of the oil.

### Particle filtration

The HCP200 comes with a host of functionalities and benefits. It can be used independently as a solid particle filtration unit, which means that it can bypass the

coalescer function if water removal is not required. The unit uses high performance Pall Coralon filters, which incorporate state-of-the-art design technology, including a unique patented 'helical wrap' pleat support system, as well as composite element structure for unsurpassed strength, optimum performance and service life.

### Water removal

The HCP200 can also be used to remove both particle contamination and free water in turbine oils. When oil enters the coalescer unit, after particle filter, its point of contact is the coalescer elements. Free and emulsified water become larger droplets of water after passing through the filter elements due to the peculiar polarity molecules in the coalescer element materials. "Before the oil enters the separator element, gravity causes the relatively large water drops in the oil to fall into the water bag below. However, as a result of inertia, some water droplets go up to the separator element along with the oil. The separator element is made up of special hydrophobic materials, so that when the oil passes it, water droplets are kept outside," explains Whitcher, continuing: "The oil then enters the separator element and discharges from the machine outlet. Water droplets gather and become larger and at last, they fall into the water bag. Once the water bag reaches a level of 221 mm, it discharges the free water through its own outlet pipe."

After debugging, the unit can run smoothly during normal operating conditions and requires no manual operation. It is equipped



The HCP200 developed by Pall, is dedicated for particle filtration and water removal of turbine oil.

with an emergency alarm, which will automatically sound when abnormal conditions occur or when maintenance is due and, in case of an emergency, the automatic emergency stop will shut down the system.

### HCP to the test

A field test on a 10 000 litre tank using the HCP150, with a water removal capacity of 150 litres per minute or 9 000 litres per hour, showed a water content reduction to 157 ppm from an initial water content of 6 950 ppm after 32 hours. Initial ISO 4406 results of 21/19/16 reduced to 17/15/12 after 32 hours of operation.

For more information contact Steven Whitcher on tel: +27 11 996 4060/+27 (0)82 964 5817, email: [steven@fmsafrica.co.za](mailto:steven@fmsafrica.co.za) or go to [www.fmsafrica.co.za](http://www.fmsafrica.co.za) ■



## A breath of fresh air: Pitney Bowes' easy solution for clean indoor air

There is much hype surrounding how the food and drink we consume affects our long-term health, but relatively little about the quality of the indoor air that we breathe on a daily basis, and how that affects our well-being, particularly in the workplace.

For Pitney Bowes South Africa, a company which helps businesses achieve their commercial potential through technology, one can easily overlook the importance of air quality in the work environment and how this can affect productivity. The introduction of Ideal Air Purifiers to the South African market offers an effective and easy way to cleanse and ionise indoor air.

"The air inside our buildings can be several times more polluted than the air outside, particularly in the context of an industrial processing plant. Our lungs work overtime to filter harmful particles out of the air. This can lead to one feeling unwell and exhausted," says Michael Springer, Managing Director of Pitney Bowes South Africa. "People who work in clean, healthy indoor air are more energetic."

Ideal Air Purifiers use AEON Blue® technology, which means that they are able to filter almost 100 % of the smallest particles and pathogenic germs from polluted ambient air before they reach a person's airways in a multiple-stage filtering process, according to Springer. In addition, the system creates an abundance of negatively charged ions which help to destroy harmful substances (such as bacteria and mould spores) in the air.

The fact that the Ideal Air Purifiers make use of HEPA (High-Efficiency Particulate Arrestance) filters, means they are able to filter 99,97 % of all airborne fine dust and ultra-small particles up to a minimum of 0,3 microns. In addition, the technology features an activated carbon filter which effectively absorbs odours, including tobacco smoke and chemicals.

The Ideal air purifying system boasts a high CADR (Clean Air Delivery Rate) which has been verified by an independent rating authority. Verification tests were based on the elimination rates of bacteria and mould, pollen, Formaldehyde, and smoke and odour.

"The Ideal Air Purifier constantly measures and monitors the pollutant levels of the air and automatically controls the filtering levels and performance. It has an intelligent sensor which measures both odours and particles, while at the same time enriching the air with negative ions," says Springer.

"The air purifiers have application in any industrial environment where dust, chemical fumes, odours, or mould affects the air quality. The AEON Blue® technology ensures 100% filtration of these substances through a multi-stage cleansing system," he continues. "In addition, the purifiers are extremely easy to operate and a filter change display indicates when a filter should be replaced, which is simple and quick to do."

The very energy-efficient and smooth running motors, in combination with flow-optimised radial fans result in low energy consumption, and because they are extremely quiet, they are also ideal for home use. The purifiers are available in three capacities, depending on the size of indoor area: 15 m<sup>2</sup>, 30 m<sup>2</sup> and 45 m<sup>2</sup>.

"It is not only asthmatics and highly allergic people who suffer from the effects



of polluted air. Every person who spends prolonged time indoors, such as in an office, plant or factory, will be affected by constantly rising levels of pollutants.

"In short, good quality air has an enormously positive impact on our well-being and vitality. Using state-of-the-art AEON Blue® purification technology, the Ideal Air Purifier quietly gets on the job of ensuring a clean work environment at any industrial processing plant, for optimum productivity. It is literally a breath of healthy, fresh air for those of us who spend most of our days indoors," Springer concludes.

**For more information** contact Kendal Hunt on tel: +27 11 462 6188/082 823 6533 or email [kendal@kendalhunt.co.za](mailto:kendal@kendalhunt.co.za) ■



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## Reuse of augmented wineries wastewater for vineyard irrigation

**Wine production is an important industry in the Western Cape and the Lower Orange region in the Northern Cape region of South Africa. Wineries produce large volumes of low quality wastewater, particularly during the harvest period.**

Treated winery wastewater, in combination with other water, should be used for beneficial irrigation of agricultural crops, such as vineyards.

Furthermore, if winery wastewater could be used in a sustainable way, it would have the following benefits:

- Reducing the energy presently required for wastewater treatment, eg, using pumps to aerate the water in ponds.
- The presence of plant nutrients in the wastewater, eg, N, P and K, could also reduce the cost of fertilisation.
- Where irrigation water is limited, the reuse of wastewater will have a positive impact on grape yields if additional irrigation could be applied.
- If possible, the water saving and higher yields will contribute to the sustainability and economic viability of wine production.

Considering the foregoing, winery wastewater should be treated to specific quality standards, whereafter it could be stored in irrigation dams, and used for irrigation of crops. Until now, the impact of this practice has, however, not been studied comprehensively.

Thus, to know the impact of irrigating with winery wastewater, the chemical composition and physical structure of the soil, grapevine performance, and wine quality, is indispensable.



As a result, the WRC, together with Winetech and the Agricultural Research Council, launched a research project to investigate the possible use of augmented winery wastewater for vineyard irrigation.

### Experiment layout

The project was a multidisciplinary study which evaluated the impact of augmented winery wastewater on soils, vineyard performance and wine quality. The possibility of recycling winery wastewater for vineyard irrigation was investigated in a field trial near Rawsonville in the Breede River Valley.

Wastewater obtained from a cooperative winery was augmented to levels of 100 mg/l, 250 mg/l, 500 mg/l, 1 000 mg/l, 1 500 mg/l, 2 000 mg/l, 2 500 mg/l, and 3 000 mg/l chemical oxygen demand (COD), respectively, using raw water obtained from the Holsloot River.

The augmentation was carried out individually for each concentration in 15 m<sup>3</sup> tanks at the vineyard. Raw water from the river was used to irrigate the control grapevines. The irrigation treatments were applied to Cabernet Sauvignon grapevines planted in a sandy alluvial soil.

Each treatment was replicated three times in a randomised block experiment layout.





Determining the effect of augmented winery wastewater on the chemical properties of four different soils in a pot trial also formed part of the project and results are discussed in the final report.

## Soil chemical status

### Field trial

Soil samples were collected in the work rows of selected treatments after the application of wastewater irrigations in May, and again from all treatments at bud break, ie, following winter.

Although there were no clear trends in soil pH, EC or acidity, EC was substantially higher after the seasonal wastewater irrigations compared to bud break. This was probably due to the higher salt content in the augmented wastewaters.

There was a close correlation between P applied via the irrigation water and the P levels in the 0 to 30 cm soil layer in the work row. Under the prevailing conditions, soil K increased with a decrease in the dilution of the wastewater during all four seasons.

After four years, only the lowest level of augmentation, ie, 3 000 mg/l COD, maintained baseline K levels. Soil Ca and Mg did not show any consistent responses to the different levels of wastewater augmentation because there were no

substantial differences to amounts of these particular elements applied via the irrigation water.

Generally, soil Na increased with a decrease in the dilution of the wastewater. There were substantial differences in the amount of Na applied via the irrigation water. Although irrigation with winery wastewater had almost no other effects under the prevailing conditions, element accumulation, particularly with respect to K and Na, might be more prominent in heavier soils or in regions with low winter rainfall.

## Element uptake and removal

Cover crops, ie, oats and pearl millet were established in the work rows during winter and summer, respectively. The dry matter production (DMP) and element content of the above-ground growth of these crops was determined over a period of four and three years, respectively.

Oats tended to produce more dry matter when irrigated with augmented winery wastewater compared to raw water irrigation, if not preceded by pearl millet as a summer interception crop. Oats continuously produced acceptable amounts of fibre.

The levels of Ca, Mg and K in the above-ground growth did not differ between treatments. Although differences occurred, no trends with respect to level of augmentation were



observed for N and Na. However, the Na levels increased over time.

Being sown on 10 January allowed the growth of pearl millet to peak, while 91 % of the augmented winery wastewater was applied. The latter improved DMP of pearl millet.

The augmented winery wastewater did not affect the levels of N, P, Ca and Mg in the above-ground growth, but increased the level of Na slightly over time. Although the levels of K differed between treatments, no trends were observed. Using both species, too much N, K, P, Mg and Ca was intercepted. However, the amounts of Na removed remained insignificant.

The fertiliser added (about R2 800/ha/yr) to compensate for excess N and P intercepted by pearl millet, is much less than the R15 000 to be made by selling the harvested crop to fodder. Employing only pearl millet as an interception crop could, therefore, be a sustainable practice if the COD level of the winery wastewater is between 1 500 mg/ℓ and 2 500 mg/ℓ. The use of species normally planted for grazing as interception crops deserves investigation.

### Soil microbial status

Soil microbial activity by enzyme analysis using a colorimetric assay was carried out in soils collected at different soil depth layers in grapevine rows over four seasons. This was supported by coarse-level comparisons of total heterotrophic and actinomycete populations by dilution plating on growth media, monitoring shifts in microbial communities as well as measuring soil glomalin.

It was found that soil microbial enzyme activity was most sensitive to changes triggered in the top soil layers where it was highest in the 0 to 10 cm layer, and gradually decreased with increasing depth.

Since this gradient in enzyme activity was observed, not only during pre- but also after-treatment assessments, it implies that irrigation with winery wastewater was of no negative consequence to organic matter breakdown processes in soil.

In fact, the findings suggest that when irrigation was applied, easily decomposable organic matter would have been added to the soil, which, when assessed, over the entire trial period, promoted soil enzyme activity, which coincided with an increase in organic loads, ie, an increase in COD concentration.

Enzyme activity also seemed to have been stimulated over time as more irrigation was applied. When assessed over the entire trial period, microbial population sizes also decreased with depth, but the impact of irrigation with winery wastewater on general microbial counts was inconclusive.

Likewise, the shifts in soil microbial communities were inconclusive, primarily due to inconsistent results. Glomalin content also decreased with an increase in soil depth, but did not respond to level of COD in the augmented wastewater.

Given that both glomalin and soil microbial enzyme activity are considered good indicators of soil health, irrigation with winery wastewater should be of little to no consequence to general soil health. Furthermore, soil fertility may even be improved given the marked positive effects of winery wastewater on soil microbial enzyme activity under the prevailing conditions of the current study.

The foregoing findings should nevertheless be received with great caution as some of the findings should be substantiated with further research.

### Grapevine responses

#### Vegetative growth and yield

Irrigation of grapevines using winery wastewater augmented up to a maximum COD level of 3 000 mg/ℓ did not affect vegetative growth or any of the yield components compared to the raw water control. Consequently, evapotranspiration and grapevine water status were not affected by the wastewater irrigation under the given conditions.

#### Juice and wine characteristics

Under the prevailing conditions, irrigation of grapevines using winery wastewater did not have any detrimental effects on juice ripeness parameters and ion content. Wine sensorial quality was also not affected.

Under the conditions of the study, the high irrigation volumes were generally detrimental to wine quality. Since wine quality is an important aspect, particularly if wine needs to be exported, the poor overall quality is of great concern.

However, there is ample evidence that less frequent irrigation, which allows higher levels of plant available water (PAW) depletion between irrigations, will enhance wine quality. This implies that the winery wastewater will probably have to be applied over large areas to allow sufficient PAW depletion between irrigations.

Distribution of winery wastewater over large areas will need additional infrastructure, which could be expensive. A pilot study carried out in the third season suggests that grapevine bunches exposed to direct contact with winery wastewater may decrease in spicy character, increase wine volatile acidity and cause a winery wastewater-like off-odour in wines.

Furthermore, as the quality of the water decreases, these off-odours may increase. Therefore, even though wine colour and common sensory wine descriptors were not affected by the various treatments, any further increase in wine volatile acidity or wastewater off-odour may reduce wine quality.

Although wastewater odours may differ from winery to winery, the risk for off-flavours cannot be excluded. The foregoing also clearly demonstrates that overhead sprinkler irrigation will not be suitable if winery wastewater is recycled for vineyard irrigation.

### Recommendations

Several recommendations are included in the final report for this study, such as that the COD must be augmented to 3 000 mg/ℓ or less to avoid unpleasant odours while irrigations are applied and that it should preferably be a sandy soil with low CEC.

### Further reading

To order the report, 'The impact of wastewater irrigation by wineries on soil, crop growth and product quality' (Report No. 1881/1/14) call: +27 12 330 0340, email: orders@wrc.org.za or visit: www.wrc.org.za to download a free copy.

This article was based on a Technical Brief published by the WRC in May 2015 and is published with kind permission. ■





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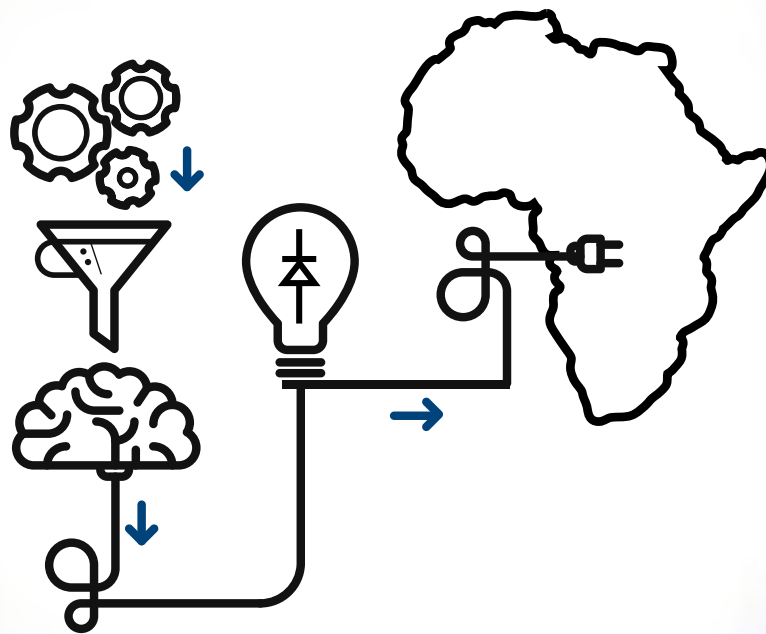
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Veolia Water Technologies South Africa –

## Resourcing the world

**Dr Gunter Rencken, Managing Director, and Chris Braybrooke, General Manager - Business Development at Veolia Water Technologies South Africa, recently met with the editor of 'Chemical Technology' to talk about the company's plans for the future and to outline its latest activities in the water technologies sector.**

The Veolia Group began 160 years ago and now has a presence in more than 50 countries. Veolia Water Technologies South Africa (Veolia), the southern African subsidiary of the Veolia Group, with offices in Johannesburg, Durban and Paarl in South Africa, also has representation in Gaborone, Botswana and Windhoek, Namibia, and is responsible for business in southern and sub-Saharan Africa. The company is presently further diversifying into surrounding countries where, as is the case worldwide, there is a scarcity of water and thus an urgent need for innovative water treatment solutions and environmentally friendly technologies.

Apparent from the outset is the fact that Veolia remains a 'total water solutions-based company' at core, simultaneously pro-actively offering its newest water and waste water treatment technologies while putting customers' benefits and returns on investment at the top of their list of priorities. These benefits are the result of a value-added service offered by Veolia and include reduction of costs, re-use of waste byproducts in positive ways and attention to environmental impact, energy-efficiency and carbon footprint.

This affirms the parent company's value proposition: 'Resourcing the world', a slogan which Veolia embraces

wholeheartedly by constantly developing access to resources, preserving resources, and replenishing resources, ie, providing optimised resource management to all its customers.

### What does Veolia Water Technologies offer in terms of services?

Veolia Water Technologies describes itself as 'a holistic water and wastewater treatment company', offering a full range of services, from turnkey contracting for large and small projects, both municipal and industrial, to speciality chemicals. Included in the company's scope is the designing and building of plants, static as well as mobile, modular plants (particularly important in African countries north of South Africa) and engineered systems; supporting project teams; and managing plant operations on site. Services include membrane cleaning and replacement, plant refurbishment, maintenance, chemicals and consumables supply. Thus, it treats and monitors water quality at each stage in the water cycle, from extraction of the natural resource through to its discharge back into the natural environment.

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Resourcing the world





efficient, effective and responsible way by Veolia, enables what is discarded in one process to become a resource for others. Water and waste are able to be re-used for cooling, heat, steam, energy, bioplastics, biofertiliser, biofuels and secondary raw materials. These new materials are then used, recovered and re-used again and again. That is the principle behind 'the circular economy', which, according to the Ellen MacArthur Foundation in the UK (<http://www.ellenmacarthurfoundation.org/>), is one that is "restorative by design, and which aims to keep products, components and materials at their highest utility and value, at all times".

Creating value for both business and society at the same time, make sense since it is impossible to create shared value without thoughtful partnerships across the business, non-profit, and government sectors. According to a recent column in the 'Ecolnnovator Blog' (<http://www.corporateecoforum.com/saving-water-as-a-business-imperative/>), this partnership model is seen in Veolia's partnering with the city of Durban's municipal authority, eThekweni Water Services (EWS), KwaZulu-Natal, to recycle 98 % of wastewater at the Southern Works for industrial use. The treatment options include a variety of sewage and drinking water treatment options that facilitate greater population health, quality of life and water sustainability.

Veolia is highly experienced in all industrial water treatment markets in sub-Saharan Africa. By combining intellectual property from the global Veolia network with Africa-specific application know-how, its industrial water treatment solutions ensure compliance with discharge standards, reclaim water for industrial re-use, or evaporate/crystallise highly concentrated wastewater streams for a zero liquid discharge status. Other specialties include: desalination, biogas, and sludge dewatering, oil and gas, power, food and beverage, and mining markets, amongst others.

### Aspects of the sustainability solution

The 'True Cost of Water' measurement tool, developed in-house, is actively employed by Veolia. This tool constitutes a framework for more accurately pricing water and is offered to all customers as a sustainability solution in order to:

- assist companies to better manage risks and externalities
- optimise costs associated with water management
- enhance competitiveness
- secure their social license to operate, and
- ensure long-term profitability.

In addition, Veolia works with municipalities and industrial companies to evaluate both the direct and indirect economic impact of CO<sub>2</sub> reduction. The company put in place a carbon footprint reduction tool that offers a carbon-efficient solution.

The 'Water Impact Index' (another Veolia tool) expands on existing volume-based water measurement tools by factoring in three essential elements: quantity of water used, level of stress upon water resources and overall water quality. Thus it is possible to measure human impact on water volume, resource stress and quality, enabling better informed water management decisions.

Development of environmentally conscious water technologies and solutions enables Veolia to position itself as



### Durban, eThekweni Water Services (EWS), KwaZulu-Natal

This Veolia Water Technologies South Africa flagship plant treats domestic and industrial wastewater to near potable standards for use in industrial processes by high volume industrial customers. The plant needed to free up potable water for municipal use in peri-urban communities, by reclaiming water at a maximum rate of 47,5 M<sup>3</sup>/day. EWS performs initial screening, degritting and primary settling of raw municipal wastewater. After clarification and as the water leaves the activated sludge plant, it is dosed with polyaluminium chloride to remove residual iron and enhance the filtration process. The dosed water is sent to the dual media filtration stage where ozonation occurs to break down remaining non-biodegradable organic compounds. The water is then polished using activated carbon filters, chlorinated and transported to a storage tank for distribution to industrial customers.



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### Energy from effluent in anaerobic waste water treatment facility in Stellenbosch, Western Cape

Veolia was recently awarded the contract to design, build and operate the country's first Biobulk® waste water treatment facility. Distell had, over four years, developed its Green Plan to install a common anaerobic water treatment facility that will lower the chemical oxygen demand load in the outfall to the municipality, harvest the energy in the wastewater and lower the overall cost of effluent treatment. The ten-year Build Operate Transfer contract was financed by Veolia and will enable Veolia to optimise commissioning and operation of the plant.

the water treatment company to go to, as it continues to maximise the financial benefits for every customer.

For more information about Veolia's water treatment technologies and solutions contact Chris Braybrooke on tel: +27 11 663 3608, email: [info.southafrica@veolia.com](mailto:info.southafrica@veolia.com), or go to [www.veoliawaterst.co.za](http://www.veoliawaterst.co.za) ■

## Study reveals need for better understanding of water use

A new study reveals a pressing need to better understand water use in America's rivers, with implications for drought-stricken regions of the country. Findings from the study showed that virtually all of the water entering the Wabash River in Indiana during summer months is withdrawn and then returned to the waterway.

"In a nutshell, in the summertime we generally use what is equivalent to the entire volume of the Wabash River so that by the time the river reaches the confluence of the Ohio River, the water in the Wabash on average has been through one human engineered system, which includes wastewater treatment plants and power utilities," said Loring Nies, a professor in the Lyles School of Civil Engineering and in the Division of Environmental and Ecological Engineering at Purdue University. "The Wabash river basin, which encompasses most of the state of Indiana, is already at a tipping point of fully exploiting its water resources."

The research also has implications for other US rivers, which undergo the same cycle of low rainfall during summer months.

"The amazing thing about this is that in Indiana we rarely have droughts, but we're still using the whole Wabash River," said Chad Jafvert, also a Purdue professor in the same programs.

Doctoral student Julia Wiener led the research. Findings are detailed in a paper appearing online this week in the journal 'Science of the Total Environment'. The paper was authored by Wiener, Jafvert and Nies.

One hurdle in better understanding how much water is flowing into and out of America's waterways is the patchwork of data available from various agencies. No central clearinghouse exists for this type of information.

"State and federal agencies collect plenty of data, but it's not coordinated in a way that anybody who's managing water resources in a large basin like the whole Wabash River can easily combine and use," Wiener said. "There needs to be a watershed-scale understanding that simultaneously keeps track of the volume of water flowing into the river and how much water is being extracted, and not just from the surface sources but from the groundwater sources as well. That way, we will be able to better understand the human-driven water cycle in our watersheds."

The Wabash River has peak flows in January, February and April. In August, September and October the river flow is at its lowest flow rate, a cycle seen in most US rivers, Nies said. "At the low-flow rates we are essentially using all of the water, which until this research nobody understood," he said. "Another way



to put it is that we are essentially emptying the river out and then filling it back up continuously."

Based on the findings, the researchers have determined that suggestions of reusing wastewater for irrigation and other consumptive purposes may be detrimental to the river.

"Back in 2012 when we were having a drought in Indiana, people were looking at reusing wastewater for irrigating," Jafvert said. "Well, if you diverted wastewater to irrigation instead of letting it flow back into the river, then the river flow's going to get even lower. The point is, the river is not this immense untapped source of water that's available for us to use in times of stress. It's already being used."

A potential strategy could be to collect and store water during times of high flow.

"But where would you store it?" he said. "Reservoirs are expensive."

During low-flow periods, water flows into the river at a rate of 165 m<sup>3</sup> per second, and people are withdrawing about 162 m<sup>3</sup> per second, according to data from gauging stations dotted along the river throughout the state.

Water being discharged into the river from power utilities during the summer accounts for most of the inflow – about 80 percent – with the remainder coming from sources such as municipal wastewater treatment facilities.

"This is not bad as long as the treatment plants are doing what they are supposed to be doing," Jafvert said.

For example, the treated wastewater is disinfected to remove any remaining pathogens. Power utilities use the water to cool power plants. "We do a lot of unplanned water reuse because we discharge it at one point and then a city downstream withdraws it. So part of what they are withdrawing is treated wastewater," Jafvert said. "It's been in the river for maybe one or two days, but it still has that treated wastewater component."

During the driest months water enters the river from the surrounding aquifer, a natural subsurface source. "So when you have two weeks of no rain in the summer, the river is still running because you've got groundwater going into it," Jafvert said. "But you also have pipe flow going into it from people, from wastewater treatment plants, from power utilities, and from other industries."

The findings have implications for water-challenged California, where residents have resisted calls to reuse treated wastewater that is now discharged to the Pacific Ocean. "People are resistant to reusing water because they don't want to use treated wastewater as their drinking water source, but in the Midwest we do it all the time. It's called a river system," Jafvert said.

The work is ongoing, and Wiener will extend the research into a larger watershed, possibly the Mississippi River system.

Story by Emil Venere, 765-494-4709, [venere@purdue.edu](mailto:venere@purdue.edu) ■



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The new sample preparations of the Liquiline System product family enable optimised sampling for CA80 analysers - and they do so under a wide variety of process conditions.

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function and various hose lengths. Compatibility with the modular Flexdip CYH112 holder provides support for this.

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**Liquiline System CA80AM** All sample preparation systems have been developed so that they make it easier to commission the measuring point as well as to operate and maintain the system. The project participants of all departments have contributed to this success with their high motivation and expertise.

For more information contact Jan Swart on tel: +27 11 262 8000 or email [info@za.endress.com](mailto:info@za.endress.com) ■



## SAICHe IChemE in our diary

- LOPA (Layers Of Protection Analysis): 2-day course from 19 to 20 October 2015 and is new to SA.
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- Go to our website for more information: [www.saiche.co.za](http://www.saiche.co.za)

## Western Cape Member Group



SAICHe-IChemE WC Site visit Tongaat Hulett Bellville Cape Town

A number of Chemical Engineers from different industries in the WC showed up at the event on the 30th of July 2015, which included a tour of the process plant. Chemical Engineers were exposed to several unit operations (size reduction, mixing, momentum transfer, evaporator, condenser, steam

generation, drying, screening, ion exchange, chemical and biochemical reactor technology, filtration, pneumatic conveying) involved in the conversion of maize into starches, sugars, proteins and animal stock feeds.

There was a question and answer session, serving of snacks as well as an opportunity for exchanging notes and networking by the different Chemical Engineers throughout the event. SAICHe-IChemE Western Cape Members Group, Industrial Liaison, Ronald Gunda, thanked Pierre Giles, Process Engineering manager at Tongaat Hulett for facilitating the event.

Written by Ronald Gunda on behalf of SAICHe IChemE WC Member Group

## KwaZulu-Natal Member Group

The South African Institution of Chemical Engineers KwaZulu-Natal Member group hosted their Research Day on the 17<sup>th</sup> of July 2015 at the University of KwaZulu-Natal School of Engineering building. The Research Day is an annual event that provides a platform for chemical engineers from the region to present, share and discuss their studies on a wide range of research topics. The half-day programme consisted of nine presentations by post-graduate students based on their studies



in bioresource technology, thermodynamics, wastewater and sanitation.

The overall winner was Albert Muzhingi, an MSc student from the Pollution Research Group at UKZN, for his presentation entitled "Forward osmosis of urine". His experimental and modelling study of the desalination of urine using forward osmosis is linked to the re-invent the toilet challenge funded by the Bill and Melinda Gates Foundation. The first runner-up was Blessing Makunika, also from the Pollution Research Group. His project involved the measurement of the drying kinetics of faecal sludge. In third place was UKZN student Paul Kekana, whose project on the ultrafiltration of lignin from black liquor was carried out as a joint study with the CSIR. The event was supplemented with an exhibition by laboratory equipment suppliers Labotec and Swagelok.

Written by David Lokhat on behalf of SAICHe IChemE KZN Member Group ■

## Wind window

# An effective user interface for wind farm operations

by Maria Ralph and Susanne Timsjö, ABB Corporate Research, Västerås, Sweden, Adrian Timbus, ABB Power Systems, Zurich, Switzerland, and Stefano Doga, ABB Power Systems, Genoa, Italy

**Wind farm operators have to handle a relatively large amount of data compared to other, similar installations. By interviewing and observing users in their real working environments, valuable insights can be gained into the key HMI design considerations. Situation awareness is further improved by the alarm management system, helping guide the operator's attention toward important events in the field.**

**W**ind farm operations often involve remote interactions with off-site control rooms. This poses a challenge because every wind turbine generates a large amount of information related to running conditions and power production. When the sheer number of turbines in some farms is taken into account, it becomes clear that the operators have to handle a much larger amount of data than their counterparts in installations such as hydropower or thermal plants. Further, it is critical that the remote operator is able to easily and effectively assess situations, access the right information, and react quickly and appropriately. Therefore, the design of the interface that provides operators with the information they need, while bridging the distance to the installation, is very important. This is where ABB's wind farm automation comes into play.

Wind farms are often monitored and controlled by operators sitting in off-site control rooms. As with any control room, it is essential that the operator has timely access to the right information so that the installation can be kept running smoothly. Furthermore, it is of the utmost importance that the information is presented in an intuitive way as this will enable the operator to perceive, interpret and react appropriately. In order to do this effectively, it is necessary to understand the needs of the operators.

Every wind turbine generates large amounts of data – such as wind speed, wind direction, ambient temperature, bearing temperature, rotor speed, nacelle direction and hydraulic pressure. Add in production data such as active power, reactive power and daily production, and multiply this all by the large number of turbines found in many farms and it becomes clear that operators have to handle a relatively large amount of data compared with other, similar installations, such as hydropower plants.

By interviewing and observing users in their real working environments, valuable insights can be gained into the key human-machine interface (HMI) design considerations that relate to how all this data can be best presented. From a series of interviews and observation sessions with control centre personnel who deal with renewable plants, in particular wind farms, various high-level operator requirements have been identified.

The requirements include the need to:

- Understand and interpret the layout of the wind farm.
- Detect, comprehend and resolve alarms quickly.
- Get support for planning ahead (eg, maintenance).
- Be aware of the current situation.
- Quickly navigate between different parts of the system to access the right information – energy produced, trend data, alarm data, nacelle information, etc.







Wind farms produce a lot of data. Filtering, decluttering and presenting this information to operators in an effective way is essential to ensure they are not overwhelmed and can act quickly and appropriately.

- Be informed about the status of the electrical substation linked to the wind farm.

### Design concepts

With these considerations in mind, ABB has developed two prototypes. The first prototype used 2-D visualization to display wind farm information. This design focused on a PC-based user interface integrated into the Symphony® Plus system (ABB's automation platform for the power generation and water industries). A first phase of the prototype was made available to customers at the end of 2014 and the remaining features are scheduled to be released in 2015.

Features of this prototype are based, in part, on the ASM (abnormal situation management) Consortium Guidelines for Effective Operator Display Design 2008 [1] and include the ability for operators to:

- Easily navigate between different information levels (eg, nacelle view, trends, alarm list, diagnostics) (Figure 1-2).
- Access details (eg, wind speed, wind direction, target values, generation performance) of individual wind towers by using hovering inter-actions (Figure 3).
- Switch between different views of the entire wind farm. This could be a representation of the wind turbines in a straight-line, schematic fashion, for example, or a view reflecting the actual farm topology and turbine separation.

- Navigate to a more detailed view of the nacelle for a selected tower (Figure 4).
- See desired information on a single screen (eg, wind farm overview, single nacelle view, alarm list).
- Compare certain parameters for several nacelles on the same screen.
- Save a wind tower's data in a 'safe area' in order to analyse its behaviour later.

The second prototype investigated if three-dimensional techniques could be applied to visualise wind farm information and thus improve the operator's understanding of weather data and the relationships between towers. A 3-D representation can be more intuitive and effective when linking specific wind farm data with the physical turbines (Figures 5-7).

Both approaches have been well received by customers and efforts are underway to provide hydropower plants and solar plants with a comparable product that has the same look and feel, and a similar type of support for decision making and monitoring.

### Operators' benefits

Following the completion of the initial designs and prototypes, the step-wise implementation into the Symphony Plus platform was continued. Further displays have been



Figure 1: Farm view with one tower selected, showing recent alarm history and power output



Figure 2: Harmonics diagnostic data

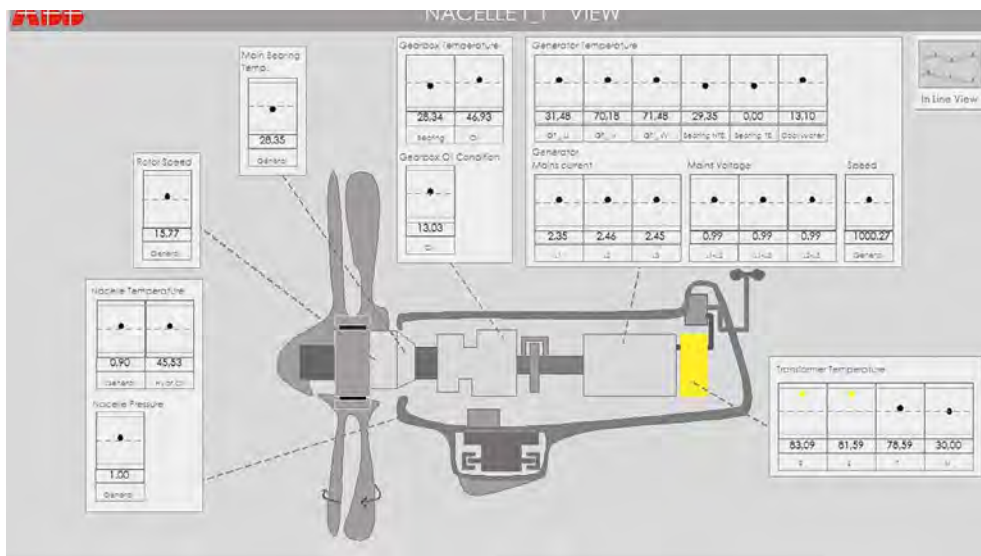


Figure 4: Detailed nacelle information



Figure 5: 3-D overview of wind farm

realised that help operators to more effectively manage their wind assets, from high-level, map-based presentations of the generation portfolio to dedicated displays for each wind farm, wind turbine and individual components. The implementations closely follow the design criteria and guidelines defined in the prototypes and also use a new color palette. The information is presented to the operator in a more structured way and the ability to smoothly navigate between various parts of the system – such as trend displays, faceplates and alarm management systems – allows operators to react to events in the field more efficiently.

For the 3-D design, a connection between the application, which resides on a mobile device or desktop PC, and the database containing the plant data was implemented. This real-time connection allows field personnel to instantaneously obtain information about the asset while they are performing repair and maintenance work.

### Customer benefits

This automation solution provides customers with an intuitive interaction experience. The design philosophy centres

on improving situation awareness and thus improving support for decision making. By providing operators with enhanced navigation and better information visualisation, the application presents the information they need, when they need it – and in a way that makes sense to them. This has a direct positive impact on the effectiveness and productivity of operators working within this domain.

With the new HMI concept, customers can see the relevant information at the portfolio level – split into country, region and plant type. Effective navigation allows a quick transition to the important details of every component – crucial when these details are needed to support informed decision making. Situation awareness is further improved by the powerful alarm management system, which helps guide the operator's attention toward the important events in the field.

Productivity and operations efficiency are boosted by an innovative way of displaying data. Instead of just showing the relevant numbers onscreen, their relation to lower and upper allowed margins is also displayed. This helps operators to more effectively detect inconsistencies or problems



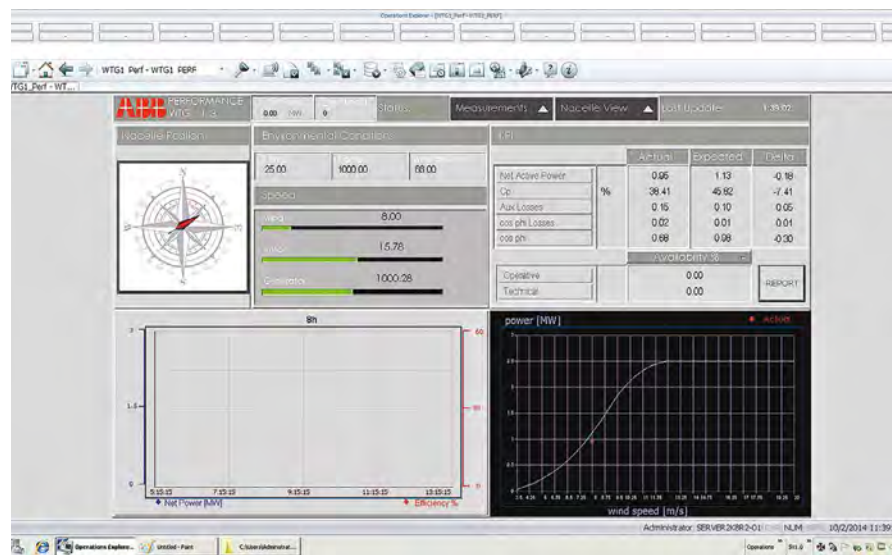
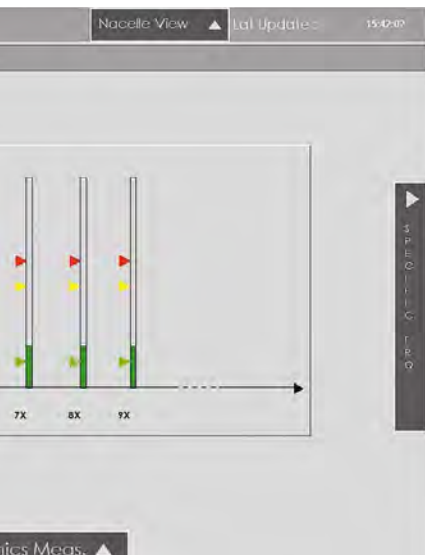


Figure 3: Performance data

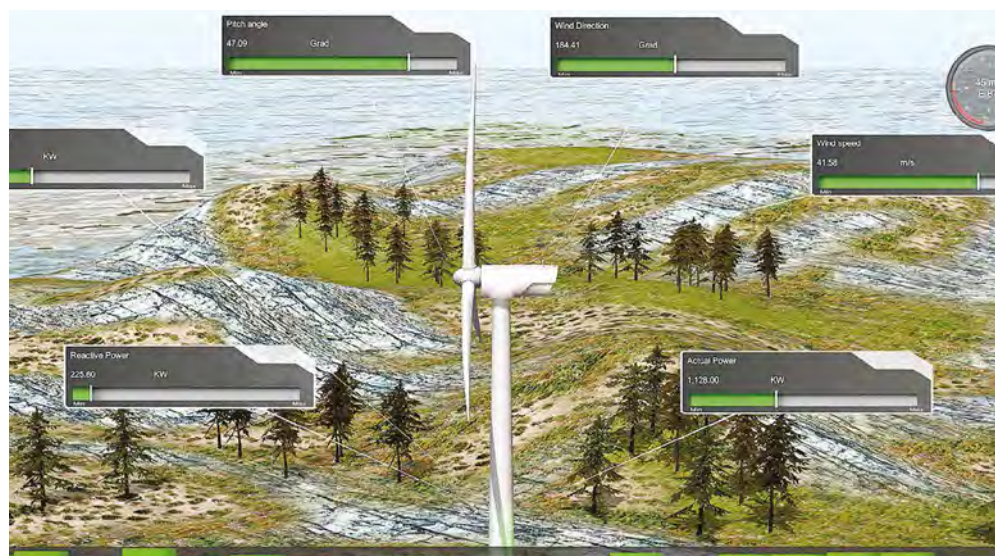


Figure 6: Wind turbine parameters in 3-D

at first glance, thus reducing the effort required to understand abnormalities in the system's behaviour.

This ABB offering for the wind power domain helps remote operators connect more directly and effectively with the process they are meant to control. With it, operators are able to make sense of the large quantity of data generated by wind farms and are in a position to easily and effectively assess situations, access the right information and act quickly and appropriately.

### Reference

- ASM Consortium Guidelines: Effective Operator Display Design. Available: [http://www.asmconsortium.net/Documents/ASM\\_Handout\\_Display.pdf](http://www.asmconsortium.net/Documents/ASM_Handout_Display.pdf)



Figure 7: Nacelle detail in 3-D



## At-Line analysis of sulphur in fuels using ED-XRF spectroscopy

A new application brief explaining how the use of ED-XRF spectroscopy for at-line analysis of sulphur in fuels can cut production delays from days to minutes is now available to download from <http://xrf.spectro.com/spectroscout/at-line/analysis-of-sulphur-in-fuels>.

Sulphur content is a key quality determinant for many petroleum products and the knowledge of the content of sulphur in fuels impacts processing and assists compliance with government regulations. Traditionally, the analysis of sulphur in fuels has been performed in the laboratory using XRF spectroscopy. However, the practice often results in production delays due to the time required to transport samples from the line to the laboratory as well as the time samples spend waiting in queue in the lab to be processed.

Now, a new generation of portable ED-XRF spectrometers is enabling rapid and accurate at-line analysis – right at the production line – for many applications requiring the detection of sulphur in fuels. According to the new application brief, "At-Line Analysis of Sulphur in Fuels According to ASTM D4294 Using ED-XRF

Spectroscopy," with a portable ED-XRF spectrometer, at-line analysis can be performed once the sample is collected from any process point – and it fully conforms to the ASTM D4294 requirement for analysis time of 1 to 5 min per sample."

In addition to an introduction and discussion of the need for at-line QC, the new brief discusses the advances and advantages of portable ED-XRF technology for at-line analysis of sulphur in fuels. The brief also documents, in detail, the at-line analysis of a series of samples using a SPECTROSCOUT portable spectrometer equipped with a transmission target X-ray tube (Rh target), a filter changer, a helium purge system and a high resolution large area SDD. The resolution of the SDD used amounted to <155 eV (Mn K $\alpha$ ) at an input count rate of up to 200,000 cps. The results from the tests showed compliance with criteria set



out in ASTM D4294.

The brief concludes with helpful guidance for the specification and selection of an at-line ED-XRF system.

For more information contact Tom Milner, in Germany, on tel: +49 2821 8920 or Don Goncalves, in the USA on tel: +1-781-793-9380 or [dgoncalves@tizinc.com](mailto:dgoncalves@tizinc.com) ■

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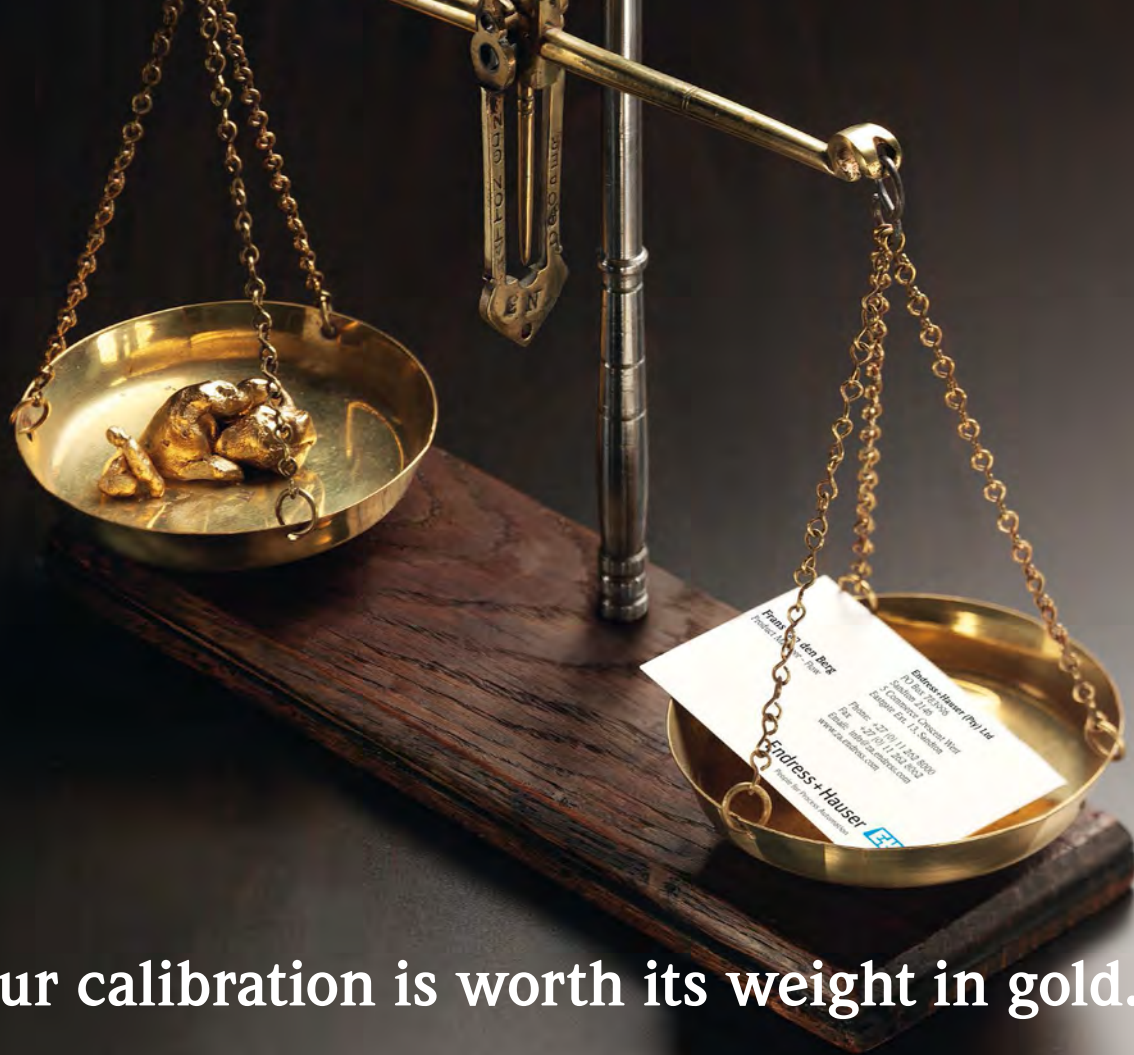
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Looking Forward

# VEGA



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People for Process Automation



## Thermal imaging camera can avert disaster

Advanced thermal imaging cameras are being used as a frontline defence against fires on conveyor belts transporting warm materials, or in instances where a risk of fires poses a danger to people or process equipment. Ruggedised versions from specialist manufacturer, Land, have been designed to work in gruelling industrial applications using non-military type technology that circumvents the need for expensive export licenses.

Introduced locally by process specialists, Protea Automation, the new range of cameras can operate in dirty, dusty and hot applications and are designed to operate reliably with little need for maintenance over extended periods of time in harsh conditions.

According to product manager Gavin Westley, the cameras are used to detect hotspots that are above the desired temperature of materials being transported. With parameters stored onboard the camera as well as on the Arc Land Imaging Processing Software (LIPS), the detection of a hotspot will trigger an alarm and set in motion a sequence of measures to prevent fire and avoid damage to the belt.

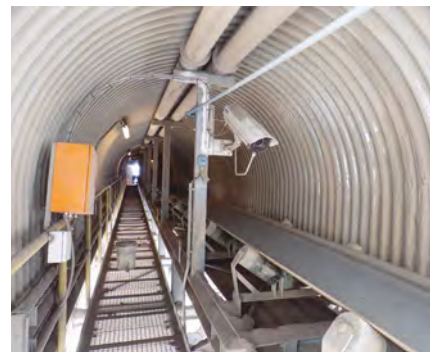
The onboard intelligence of the camera acts as a failsafe system and still triggers

an alarm that will allow appropriate action to be taken.

Westley said: "Following a recent catastrophe at a lime manufacturing plant in the Northern Cape, we were called in to design and install a system to prevent a recurrence of this type of event and subsequently installed Land Arc Thermal cameras, as well as scanners, to identify hotspots and trends which show when the temperature of clinker from the rotary kilns is rising above the normal range. With the equipment and procedures in place the plant is now able to significantly reduce costly belt repairs, reduce downtime and prevent dangerous situations from occurring."

Westley explained that many materials that are transported on rubber conveyors contain hot inclusions that can damage the belt or cause material fires. As a result processing plants usually make use of traditional temperature measurement methods to try detecting hot materials, but in many instances these are unable to detect small hotspots on the moving conveyor.

The addition of Land thermal cameras allows users to monitor the entire conveyor width simultaneously at ranges from -20 to



Land Arc thermal imaging cameras installed at a lime manufacturing plant in the Northern Cape

1 000 °C continuously. The real live imaging and software automatically detects temperature variations and can trigger a number of responses via onboard I/O s that can trigger sprinklers, alarms, strobes or stop the belt or feeders, whichever is appropriate. Images may also be transmitted to a controller for further action, while simultaneously recording alarm conditions for review at a later stage.

For more information contact Gavin Westley on tel: +27 11 719 5700, email: gavinw@protea.co.za, or go to [www.protea.co.za](http://www.protea.co.za) ■

## Guided radar level transmitters improve reliability at UK power station

Marchwood Power operates a £380 million natural gas-fired combined cycle (CCGT) power station near Southampton in the United Kingdom. The facility uses the latest technology to ensure maximum energy efficiency and minimal impact on the environment.

When originally designed and commissioned, the plant installation consisted of three differential pressure transmitters, using a 2 out of 3 voting method and a single magnetic float gauge on a bypass chamber. However, there were ongoing issues with differential pressure measurement, mainly due to the condensate-filled impulse lines and vacuum within the condenser, which meant they often had an unreliable level measurement on at least one, increasing the risk of nuisance trips.

VEGA recommended that Marchwood opt for additional interconnecting pipe work where the magnetic level gauge is installed, so that they could fit three VEGAFLEX GWR transmitters into bypass tubes, using the same 2 out of 3 voting method, which would give them reliable accurate level measurement and control. VEGAFLEX uses guided wave microwave pulses which are virtually unaffected by temperature, pressure, or vacuum to detect the level. There were no issues with the bypass tubes sharing the same vessel connection 'manifold', as it is a 'clean' process.

The units were mounted to the side of the boiler, alongside the existing MLG. The measuring range required was over 1,7 m and the temperatures were much lower than the process at 40 °C, (even though VEGAFLEX can go to 450 °C and 400 Bar if needed). Once in place, it just needed the GWR units to be cabled and they were ready to commission. As well as reducing maintenance costs, the installation of the new sensors was a more reliable, simpler system and the cost was much lower than the original arrangement.

Since installation, no outages due to unreliable levels have been recorded; there is very good correlation and repeatability between devices, which makes the 2 out of 3 system work as it should.

For more information contact Chantal Groom on tel: +27 11 795 3249 or email [chantal.groom@vega.com](mailto:chantal.groom@vega.com) ■



Direct measurement of the boiler condensate vessel level with VEGAFLEX GWR in bypass chambers.

LEAN SCM:

## A paradigm shift in supply chain management

by Josef Packowski and David Francas, Camelot Management Consultants AG,  
Mannheim, Germany

**LEAN SCM – a planning concept for harmonised production and replenishment planning across the entire supply chain with close linkages to organisational processes and IT infrastructure, was designed expressly to simplify existing planning processes and to improve the synchronisation and variability management of global supply chains.**

A recent survey of supply chain managers impressively demonstrates the urgent need to adapt existing SCM concepts to the new reality: three-quarters of top managers consider market volatility to be the biggest challenge to their supply chains, followed by supply chain complexity (Cecere, 2013). Most companies have chosen adapting their business processes to the 'VUCA' world (an acronym of the words Volatility, Uncertainty, Complexity and Ambiguity) as a major strategic target.

Particularly for companies in process industries, increasingly frequent, ever-widening market fluctuations, associated with the high level of complexity involved in globally dispersed production processes, confronts them with hitherto unknown problems and challenges. Production processes in the chemical industry, for example, are generally characterised by long production times. Production of chemical materials – the basis of numerous industries from tablet computers to cars to cosmetics – often takes months. If the chemical supply chain cannot respond quickly to fluctuations, supply bottlenecks will very quickly threaten many downstream industries. Particularly in the pharmaceutical industry, to take another example, the reliability of supply is the highest principle.

To ensure optimal responsiveness and efficiency in supply chain processes, almost all companies in process industries have, in recent decades, established global planning departments and invested heavily in their planning systems. The challenges of today's VUCA world show more and more the major flaw of Advanced Planning and

Scheduling (APS) and Enterprise Resource Planning (ERP) systems that form the planning backbone of the global value chain. They work effectively only when extremely reliable forecasts, especially regarding market trends and customer demand, are available.

### The role of APS and ERP systems

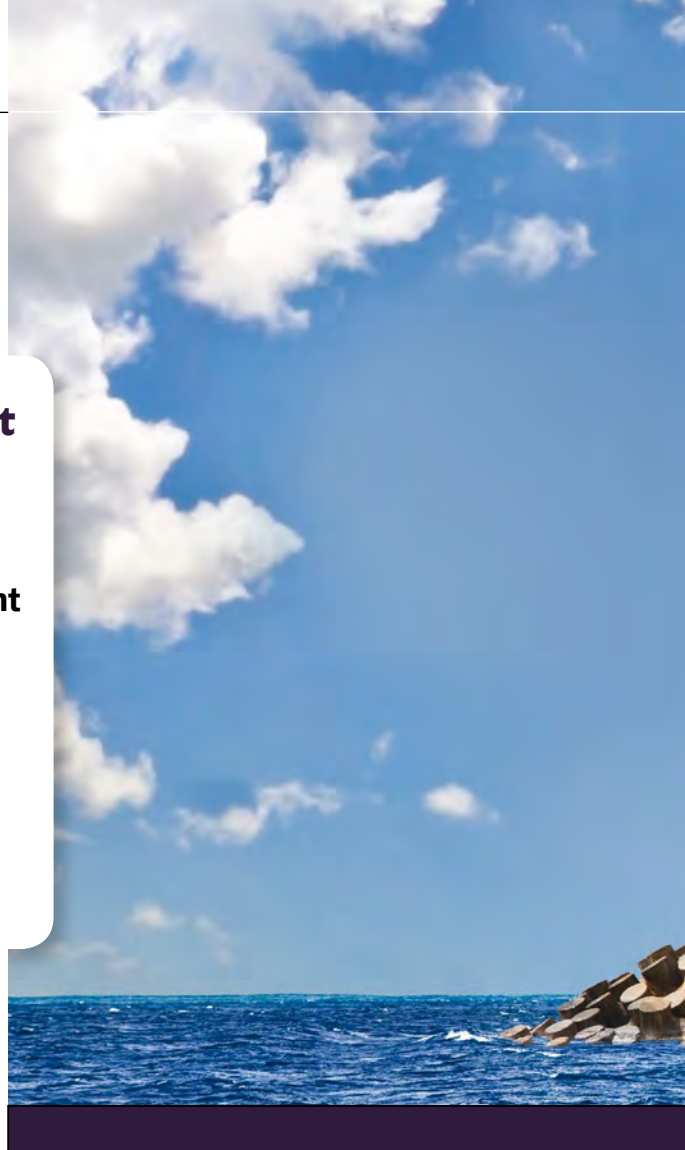
Since the advent of computers and the internet, the implementation of new business concepts for planning has been intertwined with the use of information technology (IT); in some cases, it was the availability of new technologies that led to major breakthroughs in planning and SCM. Three concepts (material requirement planning (MRP), ERP, and APS) resulted in major changes in planning approaches. However, all these concepts have an Achilles heel: depending heavily on accurate input for planning in the form of demand forecast.

A supply chain manager at one of the world's largest pharmaceutical manufacturers commented: "Can you tell exactly at which wedding or family reunion you will be in 12 months? Certainly not! But our planning systems, however, expect to be able to set production and scheduling decisions 12 months ahead." (Bohl, 2010)

### LEAN SCM: Definition and key elements

#### Definition

LEAN SCM is designed to enable production and replenishment planning across the entire supply chain in a synchronised way. LEAN SCM is influenced by two main







developments: first, traditional supply chain planning and, second, the rise of lean operations.

On the one hand, LEAN SCM aims to overcome the well-known drawbacks of (traditional) ERP, MRP, or APS – dependency on forecasts and their inherent complexity. On the other hand, it also aims to translate lean manufacturing principles such as production levelling, takts (the average unit production time needed to meet customer demand), and pull production into supply chain planning in order to allow for more simplified and consumption-driven processes. For a more detailed discussion of lean manufacturing, see Wormack *et al* (2003, 2005).

Today, however, these popular lean approaches are predominantly used at the shop-floor level in plants, but are less frequently employed in supply chain planning. Here it is important to emphasise that LEAN SCM is designed as a holistic business concept, also incorporating guidelines for alignment with organisational processes and integration into IT infrastructure (Packowski 2013).

### Key elements

Three planning and management concepts are particularly emphasised in order to effectively align planning processes in process industries with the requirements of the VUCA world. They also form the key elements of LEAN SCM (Packowski, 2013; <http://www.leansupplychainplanning.com>).

### Cyclic planning with Rhythm Wheels

Many companies have achieved great success incorporat-

ing lean manufacturing principles when designing their manufacturing operations to achieve greater efficiency. With cyclic planning and control of entire supply chains it is now possible to transfer these ideas to global end-to-end production processes. In process industries it is especially important to devote attention to the optimal design of set-up procedures and campaign sizes, as well as to orient them in accordance with rapidly changing market demand. Without optimal set-up sequences – for example shifting from bright to dark colours or from high to low concentrations – companies risk substantial production losses and cost increases.

To reduce inventory and increase the utilisation of capital-intensive equipment, more and more companies rely on 'Rhythm Wheels'. During the past decade, these planning approaches rose to popularity in process industries as a promising alternative to MRP and its variants (eg, Foster, 2007; King, 2009; Packowski *et al*, 2010). These planning models make it possible to efficiently plan a variety of products at a plant or production asset while at the same time smoothing capacity load to avoid costly production peaks.

Figure 1 on page 32 illustrates the nature of Rhythm Wheels. A Rhythm Wheel continuously repeats a given production sequence. Each spoke of the wheel symbolises the production of a certain product. The Rhythm Wheel arranges the products in an optimal order to utilise assets and operations more cost effectively. When planned according to Rhythm Wheels, production processes can even be perfectly aligned with fluctuating market demand. The lengths of the wheel's spokes, and thus production volumes, are

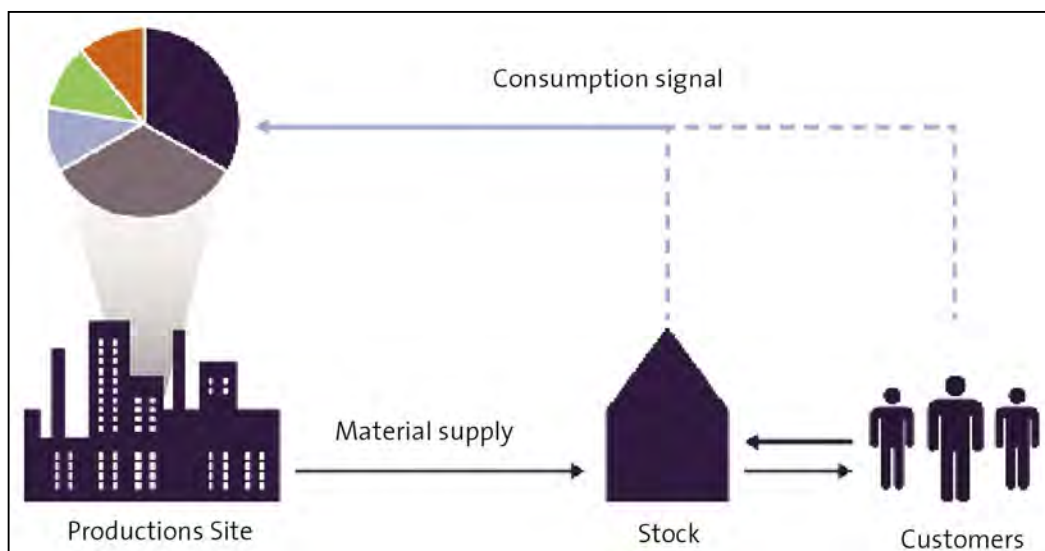


Figure 1: Real consumption should trigger pull-production.

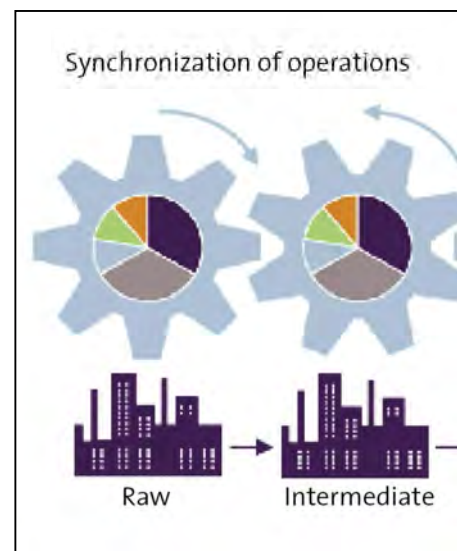


Figure 2: Operations are synchronised by the synchronisation of supply chain parameters.

continuously synchronised based on a pull-logic according to existing stocks and customer orders.

To implement Rhythm Wheels for a broader range of products, certain modifications to standard approaches in the literature (eg, King, 2009) are required: first, rules for dynamic cycle times (the time for one turn of the wheel) and second, rules for manufacturing certain products not in every cycle but, for example, in every third or fourth cycle. As part of the LEAN SCM concept, Packowski (2013) introduces novel variants of the Rhythm Wheel – Breathing and High-Mix Rhythm Wheels – to incorporate such rules.

#### **End-to-end synchronization along the supply chain**

Value chains in process industries are typically extended across a variety of production stages and are often spread over several plants around the world. In order to ensure cost effectiveness and alignment with markets, supply chain synchronisation is of utmost importance. Only effective synchronisation can relegate production delays or even failures to the past. In this context Rhythm Wheels can achieve significant improvement; they not only optimise processes in order to determine the load on a production machine, they also help to achieve effective global timing mechanisms for production processes along all parts of an international supply chain.

Two dimensions are of utmost importance for end-to-end synchronisation: first, the alignment of cycle times across different Rhythm Wheels in order to avoid starvation or idle times; second, the alignment of production and inventory planning along the supply chain. As indicated in Figure 2, all steps along the supply chain should be closely coordinated with one another, and, ideally, mesh like gears.

In the context of Rhythm Wheels, such synchronisation is achieved by establishing a global takt (the average unit production time needed to meet customer demand) in the supply chain that makes it possible to align the cycle times of the various Rhythm Wheels across the supply chain. Furthermore, to achieve stable synchronisation, inventory buffers need to be aligned with the cycle times in production (see Packowski (2013) for a detailed discussion of synchronisation approaches).

Traditional planning concepts, however, have always failed in this respect. Unless production orders are adapted to local conditions, effective synchronisation of upstream and downstream production stages is nearly impossible. By establishing a stable production takt with Rhythm Wheels, complex production networks in the chemical and pharmaceutical industries can be successfully synchronised, thereby reducing lead times and increasing responsiveness.

#### **Variability management on the capacity and inventory side**

In many companies in process industries, it has been common practice to counteract demand fluctuation primarily through adjustments of production plans. However, (safety) stocks – although the name suggests they are meant to absorb the impact of market volatility – were previously thought of only for planning a red line such that tapping into such (safety) stocks would spread panic throughout planning departments. The consequences of such one-sided variability management, however, are no longer acceptable in the VUCA world. While stocks, and thus capital costs continue to rise, production peaks can be met only by maintaining costly excess capacity and incurring overtime costs in the workforce.

LEAN Supply Chain Planning helps companies manage variability efficiently. By adjusting cycle times in production, capacity can be utilised consistently to actively counteract production peaks in capital-intensive companies. In process industries this is a key competitive advantage. If actual demand is significantly above expectations, stocks are actively used in planning. Indeed, it is among the great advantages of LEAN Supply Chain Planning that planning cyclically with Rhythm Wheels makes it possible to match production capacity with stocks more efficiently.

To bring production and replenishment planning together when dealing with volatile environments, the alignment of production planning parameters and inventory targets is elementary. LEAN SCM therefore propagates planning processes with which to determine cycle times, planned production quantities, and safety stock targets, not in isolation, but jointly, to allow for cost efficiency while meeting service targets. For instance, when changing the allowable



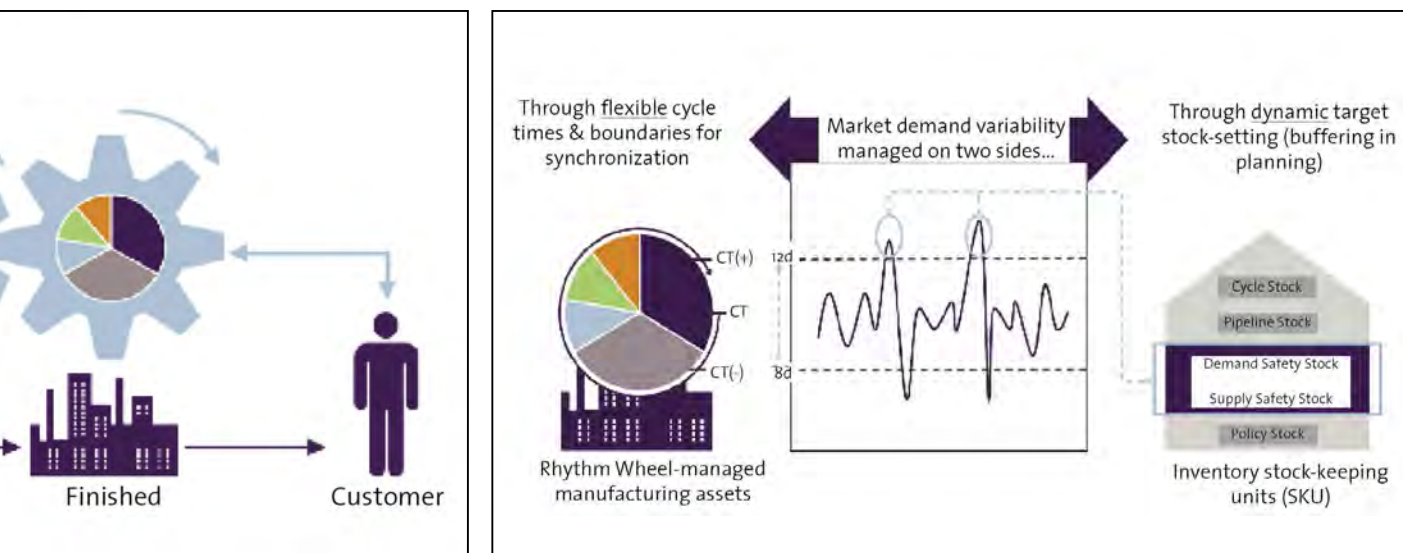


Figure 3: Market demand variability is managed on two sides

range for cycle time variations at a Rhythm Wheel-managed production asset, the safety stock targets must be adjusted as well. In any case, however, it has to be ensured that safety stocks are actively used in the planning and execution process and do not remain a 'dead' (ie, no longer used) entity.

## Results and industry trends

### Results for selected supply chain metrics

Many companies have recognised that the more complex and challenging requirements of the business world demand new and innovative approaches in supply chain planning and coordination. Many consider targeting just individual elements in their planning processes, for example, improving forecast accuracy or optimising inventory, as a failed strategy. Such piecemeal efforts at most cure symptoms on a short-term basis, but they do not create the agility and robustness needed by modern supply chains in the VUCA world. More and more companies are therefore relying on LEAN Supply Chain Planning because it greatly simplifies existing planning processes and helps in particular to improve synchronisation and variability management along global supply chains.

Companies that have implemented LEAN Supply Chain Planning report consistently positive experiences with the new approach. Through better variability management (addressing a major challenge of the VUCA world) it is possible to significantly improve the management of stocks, service levels, and lead times. The results shown in Figure 3 are based on industry cases reported in Packowski (2013). Due to concerns with confidentiality, the results from the various cases which involve leading companies such as BASF, Novartis, AstraZeneca and Eli Lilly were averaged. Overall, six industry cases are reported in Packowski (2013), providing the basis for the results reported in Figure 3.

### Industry trends

**Chemicals:** Such pioneers and industry leaders in the chemical industry as BASF, Dow Chemical, and DuPont all rely today on cyclic scheduling with fixed production sequences. A central motivation for introducing LEAN SCM for manufacturers of both specialty and basic chemicals, in

addition to generally simpler planning processes, is above all more efficient synchronisation of their often highly complex global production processes.

**Pharmaceuticals:** Due to similar challenges related to production processes, global pharmaceutical manufacturers tried very early on to adopt cyclical planning with the help of Rhythm Wheels that had been used in the chemical industry. A key milestone for companies such as Novartis and AstraZeneca, however, was the development of so-called 'High-Mix Rhythm Wheels', which enables cyclic planning in packaging plants that produce a variety of SKUs.

**Consumer goods:** Continuous production processes and batch production are also essential features of the consumer goods industry, which is why, when facing the challenges of the VUCA world, the industry has been re-thinking global supply chain planning. Industry giants such as Procter & Gamble, Coca Cola, and Nestlé rely on LEAN SCM concepts to sustainably and efficiently align their supplies with their customers. Custom-tailored IT solutions are essential to ensure rapid response in the market.

## Conclusion

In this article, we provided an overview of the concept of LEAN SCM as a response to the new supply chain planning challenges that arise in today's dynamic and volatile business environment. We highlighted cyclic planning, synchronisation and variability management on the capacity and inventory side as key elements of LEAN SCM. Based on reported industry cases in Packowski (2013), we summarised what improvement potential can be unlocked by the implementation of LEAN SCM.

## References

References for this article are available from the editor at chemtech@crowm.co.za.

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## Transport optimisation project for PPC Cement

PPC Cement transports three million tons of cement by road each year to 14 000 customer destinations from 12 dispatch points. The company produces 48 product/packaging combinations, requiring a combination of specialised and standard equipment. Approximately 500 deliveries are made each day within South Africa, and across the border. The complexities of PPC's distribution requirements are vast and this, together with the fact that distribution was being managed on a decentralised basis, made optimisation very difficult.

Barloworld Logistics proposed an integrated logistics solution which included: Design, implementation and optimisation of a new transportation process; Design, development and implementation of new software; Daily demand planning and scheduling of vehicles; Measurement and management of service providers; Electronic integration between PPC, transport suppliers and customers utilising the latest B2B technology; and Production of management information.

Following initial agreement, a model was constructed using advanced software to plan and model the expected outcome in detail, using actual customer scenarios based on historical information. The model

verified Barloworld Logistics' projected cost savings and improved service level to clients. PPC and Barloworld Logistics concluded a six-year agreement including service level criteria and risk/reward for both parties.

The solution included:

- Formation of a steering committee, consisting of PPC and Barloworld
- Logistics staff, to keep PPC continually appraised of developments and provide 'one-stop shop' access
- Deployment of dedicated, full-time Barloworld Logistics resources
- Negotiations with transport suppliers and signing of agreements on behalf of PPC to cascade PPC's service level criteria
- Establishment of a national centralised planning office and electronic order integration system
- Introduction of an Internet portal to provide simple, error-free communication between PPC, Barloworld Logistics and transportation suppliers
- Implementation of an ERP system.

In the first phase, business processes were aligned and optimised with the overall project objective, before installing software to fit the processes. A phased, region-by-region roll-out approach was taken and a pilot site

with the least risk was targeted for the first phase of implementation.

The new processes involved extensive change for the combined PPC and Barloworld Logistics staff. A specialist consultant was brought in to assist with change-management issues.

In the second phase of automating processes, an Internet portal was created. All communication relating to the scheduling, load tendering and feedback of transportation matters is now conducted over the Internet.

Operation of the contract involves a large degree of planning and execution of management, specifically service provider rate negotiation, service level management negotiation and management of ongoing logistics solutions. In addition to operational KPIs, Barloworld Logistics has implemented key performance indicators based on flexibility and customer satisfaction with all suppliers.

Source: Barloworld Logistics' PPC Cement case study

**For more information** on Barloworld Logistics tel: +27 11 445 1617/1610, email: [info@barloworld-logistics.com](mailto:info@barloworld-logistics.com) or go to [www.barloworld-logistics.com](http://www.barloworld-logistics.com) ■



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Renewable energy is very much a part of our present and will increasingly become mainstream in both our country and our continent's future. It is not surprising that the International Renewable Energy Conference (IREC), a global platform for the advancement of renewable energy is coming to Africa.

To be proudly hosted by the Department of Energy (DOE) in conjunction with the South African National Energy Development Institute (SANEDI) and the Renewable Energy Policy Network for the 21st Century (REN21), the South African International Renewable Energy Conference (SAIREC) takes place at the Cape Town International Convention Centre from 4 – 7 October 2015.

Under the theme, RE-energising Africa, SAIREC 2015 is an opportunity to demonstrate why Africa is the business destination for the renewable energy sector, given its current growth trajectory and need for investment in clean energy to underpin sustainable economic growth.

Comprising a conference, an exhibition and a series of side events, SAIREC is expected to attract 140 ministers from around the world as well as renewable energy leaders in government, the private sector and civil society.

South Africa's energy supply conundrum

reveals the limits of our old transmission and distribution grid of yester year. Our electricity grid, with its emphasis on large polluting and centralised power plants sending power long distances over transmission lines, is many years old.

Shifting to more diverse, decentralised renewable energy models will eventually reduce risks linked to fuel price forecasts and guesses about how fast electricity demand will grow. As a bonus, it will increase grid reliability.

In South Africa, our renewable energy independent power producer programme (REIPPP) has already exceeded expectations. Since the Department of Energy called for bids four years ago, it has received overwhelming interest and increasingly competitive prices from local and foreign investors.

This has enabled us to increasingly pursue clean energy solutions to meeting the needs of our constrained electricity system. Since the commencement of the internationally renowned REIPP Programme in 2011, the Department has connected 37 projects (primarily Solar and Wind) and procured 5 243 Megawatts of power in Bid Windows 1 – 4. Of that total, 1 827 MW are now connected to the grid. In addition, the 13 projects announced by Minister Tina

Joemat-Pettersson on 24 April 2015 will add another 1 084 MW to the grid when they are completed, helping to boost the power supplied by Eskom from other sources.

In all, the investment by the private sector in this programme currently stands at R193 billion. Across all bid rounds to date, a total contribution of R19,1 billion has been committed to socio-economic development (to be spent over the 20-year life span of the projects) as well as R6 billion to enterprise development initiatives.

The DOE looks forward to the first IREC to be hosted on African soil, and to the opportunity to share our experiences to date, while at the same time benefitting from global best practice as renewable energy leaders from around the world gather together under one roof at the Cape Town International Convention Centre.

Registration is free and we encourage South Africans and Africans in any way involved in powering our future, from government ministers to specialists and private sector participants, to take full advantage of our hosting of this important event.

For more information on the programme, speakers list, and for free registration please visit: [www.sairec.org.za](http://www.sairec.org.za) ■

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The company also manufactures bulk bag conditioners that utilise scissor-lifts and conditioners integral to bulk bag discharg-



ers, as well as bulk bag fillers, flexible screw conveyors, tubular cable conveyors, pneumatic conveying systems, manual dumping stations, drum/box/container tippers, weigh batching systems, and automated plant-wide systems integrated with new or existing process equipment.

New, patented BLOCK-BUSTER™ Bulk Bag Conditioner features hydraulically-actuated rams that automatically adjust in height for conditioning of short to extra-tall bulk bags, while reducing height of the loading deck by about 50 %.

For information contact Flexicon Africa on tel: +27 41 453 1871, email sales@flexicon.co.za, or go to www.flexicon.co.za ■

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Complete the grid so that every row across, every column down and every 3x3 box is filled with the numbers 1 to 9. That's all there is to it! No mathematics are involved. The grid has numbers, but nothing has to add up to anything else. You solve the puzzle with reasoning and logic. For an introduction to Sudoku see <http://en.wikipedia.org/wiki/Sudoku>

	1	8						
5						7		2
		6	9			8		5
2						5	3	
				5			2	1
		9	1					4
8		5		7			4	
	6							
		3			6			

**Solution  
for SUDOKU  
108**

1	5	6	7	8	4	2	3	9
9	2	8	5	1	3	6	4	7
3	7	4	6	9	2	8	5	1
8	3	2	9	4	1	5	7	6
5	1	7	3	2	6	9	8	4
4	6	9	8	5	7	3	1	2
7	4	5	2	6	8	1	9	3
2	8	3	1	7	9	4	6	5
6	9	1	4	3	5	7	2	8



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