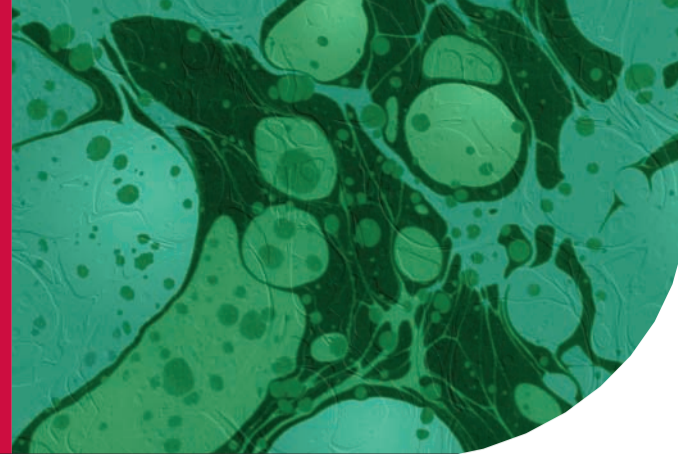


# Laboratory Products Focus



## Chill Out & Scale Up

*In many pilot-plant or production facilities temperature control systems are like a wallflower at the junior high school dance – they are not the most technical, expensive or exciting equipment in the room and are easily overlooked. But, when the most popular person in the class asks the wallflower to dance, everyone notices! Likewise if a problem occurs with the temperature control system the process stops and the repair team dances into action. Actually ‘wallflower’ is a respectable moniker for a chiller; meaning that the chiller performs reliably but by no means belies its importance.*

*Scaled up processes in the pilot or production scale introduce new challenges for temperature control systems. The thermodynamic profile of the process must be thoroughly known with sufficient cooling capacity to reach the desired process conditions. Typically processes incorporate a capacity safety factor of ~20-30%. Any process cooling applications using tap water should have a thorough cost analysis and environmental impact study conducted. Switching to a recirculating cooler with automated process control and data capture systems increases efficiency and accountability. Keeping the chiller running to the manufacturer’s specifications is crucial for optimal operation and longevity.*



*These euros down the drain are linked to the overhead operating budget for water/sewer fees and the unnecessary waste of a natural resource.*

### ARE YOU TAPPED OUT?

The use of tap water for cooling purposes is common in small-scale operations. However, at the pilot or production scale (>20L) the use of tap water for cooling purposes should be avoided. Tap water temperatures fluctuate greatly throughout the year. The inability to lower temperatures when needed eliminates any capacity safety factor. This lack of cooling capacity control and consistency could lead to a reduction in process efficiency or the potential loss of production. The cost of the water supply/sewer charges weighs significantly in operating budgets. Cooling rotary evaporator condensers is a typical application of recirculating coolers. An average three litre rotary evaporator uses approximately 230,000 litres of cooling water per year. This corresponds to an annual water consumption of a family of four. If the annual costs for cooling water of €2,212.80 (consumption per year 461m<sup>3</sup> x costs per m<sup>3</sup> €4.80) are compared with the running/operational costs of a recirculating cooler to the amount of €403.20 (consumption per year 2016kW x costs per kWh €0.20), this results in cost savings of €1,809.60 per year. In addition, fresh water is a limited resource with periodic rationing in various locations. If water restrictions activate in your plant area, what do you do? As corporate ‘green’ policies and scrutiny become publicly transparent the unnecessary waste of fresh water exudes environmental irresponsibility. Dedicated recirculating chillers eliminate the waste of fresh water, reduce operating costs and deliver reliable process control. Large capacity chillers (up to 20kW) can control dedicated cooling processes such as condensers, packaging systems, reaction vessels and semiconductor applications. Circulators with a large pumping capacity (80 l/min, 6 bar) can even control multiple systems when meeting the cooling requirements. Depending on the process, circulators accommodate the use of a variety of fluids for temperature control, including; water, glycols, alcohols, and silicones. Some of these fluids have a lower heat capacity than water allowing the chiller to cool or heat the process faster than water. More importantly chillers offer precise

temperature control through a PID controller. Temperature stabilities <math>\pm 1^\circ\text{C}</math> deliver peace of mind that the process temperature conditions remain constant and reproducible.

### ARE YOU GETTING THE MOST FROM YOUR CHILLER?

The proper installation, proximity and connection of the recirculating chiller to the application is paramount in affecting the overall process performance. Cooling efficiency is affected greatly by sufficient insulation and an unhindered flow of coolant through the tubing or piping. Follow these six points to achieve the best conditions: minimise tubing length – keep the tubing as short as possible and well secured; maximise thermal exchange – utilise tubing and connectors with the proper diameter; avoid bath fluid flow path restrictions; insulate – install insulation on all tubing, connections and vessels to maximise thermal efficiency; choose the proper bath fluid – select a compatible fluid for the temperature range and chiller; change fluids as needed or on a yearly basis (at a maximum interval); keep it thin – choose a fluid with a low viscosity in the temperature operating range; and validate integration – test all external control systems prior to integration into the production process, if applicable; external temperature probes, computer control system.



*Recirculating chillers pay to replace tap water in a process.*

### DO YOU NEED MORE?

More demanding applications requiring low temperatures <math>< -20^\circ\text{C}</math> can be addressed in two ways. Well known and stable processes can be cooled by chillers that have a large internal bath volume (>40 l). The large reservoir serves as a cold ballast reservoir resisting any temperature fluctuations but hinders fast temperature changes. Exposure to atmospheric conditions must be avoided when used <math>< -20^\circ\text{C}</math>. At low temperatures humidity can accumulate in the open bath and form ice crystals. This will degrade the recirculator performance and can shorten the bath fluid lifetime. A second approach utilises highly dynamic temperature control systems that supply a broad temperature range (-91 to +250°C) using a small internal fluid volume. The bath fluid never contacts atmospheric conditions thus eliminating the possibility of ice formation. The combination of a small internal bath volume, strong cooling capacity and a powerful pump enable quick responses to external events (exotherms) and fast pre-programmed temperature profiles.

**“At low temperatures humidity can accumulate in the open bath and form ice crystals.”**

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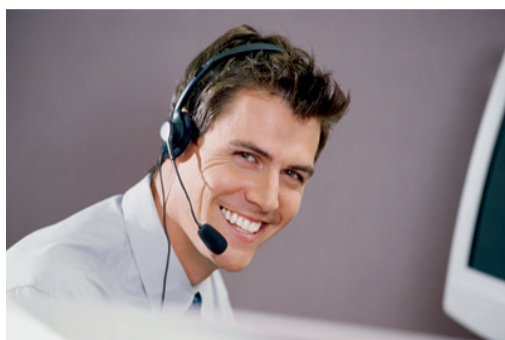
Demanding applications require powerful highly dynamic control systems providing a wide temperature range with quick response times.

### CAN WE COMMUNICATE?

Chillers can also be integrated with a computer for remote programming and data capture. Communication from the chiller via a built-in RS232 port facilitates hard-wired or wireless computer control. The controlling software supports chiller temperature profile programming, data capture of

internal/external temperature, cooling power and interfacing to external data-loggers. Use of the software increases peace of mind, frees operators from performing manual data logging, reduces foot-traffic in the production area and provides a definitive performance log. In large production areas up to 24 chillers can be controlled and monitored from one PC.

Another option supports communication between the chiller and a handheld wireless remote control. This remote control communicates with up to eight chillers monitoring actual and set temperatures and displays the start/stop and alarm status. This frees operators from constantly walking up to the chiller to monitor settings and allows for adjustment of the set point and start/stop of the chiller while 'on-the-go'.



Proper maintenance and service contracts provide insurance to keep your process running and give you peace of mind.

### WHAT'S IT WORTH?

Scenario: A production process incorporates a chiller as a critical component. This line fabricates product worth >€20,000/day. What would you do if the chiller goes down? How much will the down-time cost?

In the overall scheme of capital expenditures the integration of a recirculating chiller into a corporate-



Corporate environmental policies and practices go hand in hand with natural resource preservation and a positive corporate image.

critical production process might be financially insignificant (<€7,000). The insignificance of this cost is quickly forgotten if the recirculating chiller breaks down and the entire production process ceases. The necessity of a maintenance contract and service for the recirculator is vital. Contingencies such as a spare cooling unit and/or a comprehensive planned maintenance /service contract from the manufacturer can quickly realise their value.

### GET TO KNOW YOUR WALLFLOWER

Ignoring the environmental impact of wasting fresh water in processes is no longer a responsible corporate option. A process chiller supplies consistent cooling performance while saving precious tap water and promotes the significance of global natural resource conservation.

Chillers are key components in process operations. Remember to treat them as such and with proper use and maintenance they will provide reliable cooling and cost-savings for many years.

## Saving OEMs Time and Money in Developing Custom Software



Initially developed for OEM use in embedded system applications, **Ocean Optics** has introduced the new SeaBreeze OEM Driver Software. This compact, fast and flexible software saves OEMs time and money with a basic starting platform that can be customised, by developers, for their own unique applications and instruments.

Without the typical Java run time load of other platforms, SeaBreeze delivers faster processing and is compact enough to be built directly into spectral libraries smaller than 500k. Its superior speed is achieved by minimal overhead between requesting and reading out data. SeaBreeze communicates with devices using different protocols and buses and easily accommodates the addition of support for new features within existing devices. The portable software design enables SeaBreeze to be adapted to new platforms simply by providing a native implementation of the bus interfaces for the target.

Intended for use by experienced C/C++ programmers, SeaBreeze provides a starting point for developers that would otherwise have to create an equivalent device interface because existing options are too large or complex for their application. It supports most Ocean Optics' USB spectrometers for Linux and Windows operating systems, and is extensible so developers can add required enhancements to increase functionality and device compatibility.

Ocean Optics' dedicated OEM engineering team provides expert integration support to assist OEMs with their development challenges. As the result of specifying and delivering over 100,000 custom-system spectrometers since 1992, the OEM team is able to address any mechanical, software, optical, or electronic integration need.

IT SOLUTIONS Circle no. 597

## Better Crystals for Diffraction Studies

Specially engineered **Asynt** DrySyn™ heating blocks are being used by Glasgow University Chemistry Department's Research Group in Structural Chemistry to prepare high quality crystals for study by X-ray and neutron diffraction techniques. This group, part of the WestCHEM Research School led by Professor Chick Wilson, carries out structural chemistry research into the structure and properties of a wide range of molecular materials, with particular focus on hydrogen bonding.

Good quality crystals of the type required for many of the studies carried out in the Wilson Group have to be grown slowly under carefully controlled conditions, requiring close temperature control over periods sometimes extending to several weeks. This can be difficult using conventional water baths, not least because of evaporation. Because of the time factor, it is also more efficient to grow many crystals simultaneously, in parallel.

Asynt's DrySyn heating blocks have been popular in chemistry laboratories worldwide as a safer, more convenient alternative to oil and water baths ever since their introduction in 2004. In the Glasgow laboratory several units, some custom-made for the research group's applications to hold up to 24 vessels each, are used in parallel at different temperatures.

DrySyn systems are available for single or multiple reaction vessels with volumes from 1ml to 5000ml. They all combine a small footprint with excellent reaction visibility. All models are fully compatible with magnetic stirring, or the novel Vortex Overhead Stirrer System can provide powerful directly driven stirring for up to three flasks, improving performance with viscous mixtures and largely eliminating the grinding effects that can occur with magnetic stirrers on solids, especially crystals.



LAB PRODUCTS Circle no. 598

## Safety Enclosures Internationally Recognised

**Solotec** (UK) have been awarded the internationally recognised ISO 9001 certificate for quality for their Safety enclosures. Solotec manufacture a range of safety enclosures suitable for various types of laboratory, large or small.

Their cost effective solutions do not compromise quality with products including: Waysafe 110, for use with Analytical or top pan balances. It is a low air flow system, so not to disturb fine balances and it uses simple low cost filters and puts the mask on the balance not the operator.

Waysafe 2, another enclosure is more suited for use with microscopes and has already been accepted as the first choice by technicians checking asbestos samples. It has a 2 speed fan – better than 0.5m/s or about 0.3m/s with a HEPA filter and pre filter. All enclosures can be modified to users own specification to suit individual applications.

LAB PRODUCTS Circle no. 603

