

# Giant leaps in thermo-fluid technology

Bronswerk's proven breakthrough with Whizz-Wheel Fan technology and the upcoming Technology-shift with RADIAX® Turbo-Machinery

**H**OW does one re-define and jump performance levels on a staple piece of engineering technology? That was the ambitious goal

Bronswerk set itself with when it embarked upon the creation of the Whizz-Wheel fan technology in 2005. The company, based in Nijkerk, The Netherlands, has its roots in providing air- and fluid based heat transfer solutions, but found its customers needed better-performing, more compact and very much more efficient solutions for their fan performance requirements. The result is, in Senior Engineer Guus Bertels' words, to "re-write the book on fans, fan technology and ventilation."

The Whizz-Wheel -system based design produces the same –or better – output as conventional fan-based cooling units, requiring 50% or less driving power, a doubling of efficiency and where possible, in much reduced space. Not only this, but the fan system's noise level is 6dB lower than its quietest rival. This technology is scalable, and is now employed in everything from small fan systems necessary for computer cooling, to 20-m fans used in cooling for turbo machinery across manufacturing, industry and of course, oil and gas and power.

Its latest innovative technology field aspires to score a subsequent success, in another area Bronswerk has found to be demanding a Technology-Shift.

## The problem

A staggering 50% of all electricity in the world is consumed by compressors, pumps and fans. Building on its success with the



novel fan technology, Bronswerk foresees it can bring about the same technology-uplift, again "re-writing the book", with its RADIAX® compressor technology, for use in compressors, turbines, torque converters and combinations.

The possible applications for this technology are extensive. Compressors are used in everything from refrigeration, chemical and food processes, to industry, manufacturing and oil and gas. The implications of the technology for onshore and offshore gas and FPSOs, for example, are far reaching. Savings in weight, space and logistics and the increased performance flexibility of the unit, could change the way in which large scale oil and gas production, transport and storage operate.

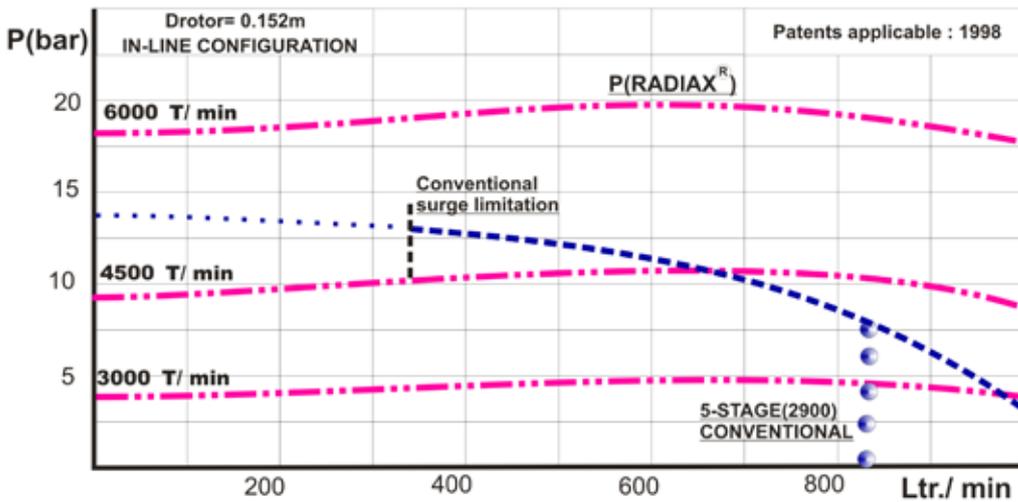
With liquefied natural gas (LNG) playing an increased role in gas markets and in power production, the impact of smaller, more efficient gasification and liquefaction facilities represent massive economic benefits to the industry. Bronswerk is keen to impress that such savings on energy, fuel and costs are enough to convince many operators of the importance of new, game-changing technology to their business.

Bronswerk is particularly bullish concerning the application of more efficient compressors in managing flared gas. In

Saudi Arabia, for example, variable seasonal demand for natural gas for power –mostly used for desalination – results in significant well pressure ups and downs, according to what the supply is requiring. To maintain adequate pressure for pipelines, gas is either compressed or expanded at various stages following its extraction. Reducing excess pressure in the winter, from around 40 bar to 20 bar for example, means a large amount of wasted pressure energy and addition of (costly) pre-expansion reheating of the gas.

The application of RADIAX® could change this: "[Bronswerk] makes one machine that can do any compression in the summertime, and the same machine is used for the gas expansion [in the winter] including the thermal gas conditioning that is needed. We can then convert the power from this expansion, while supplying electricity at the same time, and gas at the right pressure." This more efficient system would save around half of the applications' current yearly gas demand, "and saving a hell of a lot economically," he argues.

One of the most extreme examples of where this could be applied, is in industrial chimneys, where high temperature flue gases are emitted, such as in power stations. Bertels explains: "We could feed the static gas from chimneys into our machines, pump up the



RADIAX® Pump Performance



energy – and pressure – to levels where we can achieve very high efficiencies, to generate steam and generate more power.” As a bonus for example 200 bar flue gases remain that can be used in new fields of application.

Again, the implications of RADIAX® in terms of efficiency increases would be astounding. “We’ve looked at a lot of situations, for instance power stations,” Bertels says, “[Where] we could increase electricity production from the fuel by 10 percentage points. This takes plant efficiency from 30% to 40% – now they’ve been fighting for the last 30 years to improve efficiency by 2%.”

**Radiax® Technology**

The RADIAX® is a new, patented approach, a compressor re-thought and re-designed from a clean slate – and the results are impressive. Based on new work in fluid dynamics, the unit is a compressor with an operating range rather than a single operating point. The single-stage unit provides continuously variable speed, flow and pressure, from a very compact size, many times lighter and smaller than conventional machinery.

RADIAX® combines high flow with an incredible increase in pressure, offering a 20-bar-per-stage pumping pressure rise. This is, according to Bertels, ten times higher than most conventional pumps. Additionally, it can simultaneously handle two phases – liquid and gas – while volume and pressure can be varied independently. This is maximised flexibility with minimised complexity – and the potential effects of such a step change are staggering.

**Integration**

The key to this breakthrough in size and performance has been 100% integration of drive and rotary machinery with a new geometry. This has yielded a compact unit of comparable or better performance, something, Bertels says, Bronswerk’s competition has never been able to achieve. He compares the functionality of the traditional set-up to that of the RADIAX®: “We have integrated all functions into a single-cell. Normally [in a compressor], there is a compressor section, like you’d find in a jet engine. This is sealed at high pressure, a shaft protruding from the section, and then there is a huge, low-speed electromotor-gearbox driving the unit.”

“Typically such machines become huge – something like 20 metres and weighing 20 tonnes – sitting on huge concrete bed,” Bertels says. “Our machine would be 3 metres high by 1 metre diameter, standing upright.” By eliminating the separate motor section – or on a larger scale, whole engine rooms – the cost of installation and maintenance is dramatically reduced, as is the space necessary to house the compressor. He summarises: “There are comparable machines possible, but [RADIAX®] could reduce the size by a factor of 10 and they

could work better.” He likens RADIAX® to a “David and Goliath” scenario – a smaller, smarter piece of equipment against an established, larger foe.

In terms of operational costs, RADIAX® can half the price-per-kWh of machinery over the period of its use. The offer Bronswerk makes then, is less a matter of cost-per-unit, but an economic saving over a lifetime of operation.

RADIAX® compressors and pumps are marketed now, and will be rolled out in a number of projects with a number of Bronswerk’s partners, from the beginning of 2015. The next step for the company will be to take RADIAX® to market proper – a process which both Bertels and Bronswerk Marketing Manager, Femke Schaefer acknowledge, may upset the apple cart. However, this remains part of the appeal – re-writing the book was never easy. But they know this innovation has the potential to change so much, and so dramatically, that it is worth the battle. ■

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