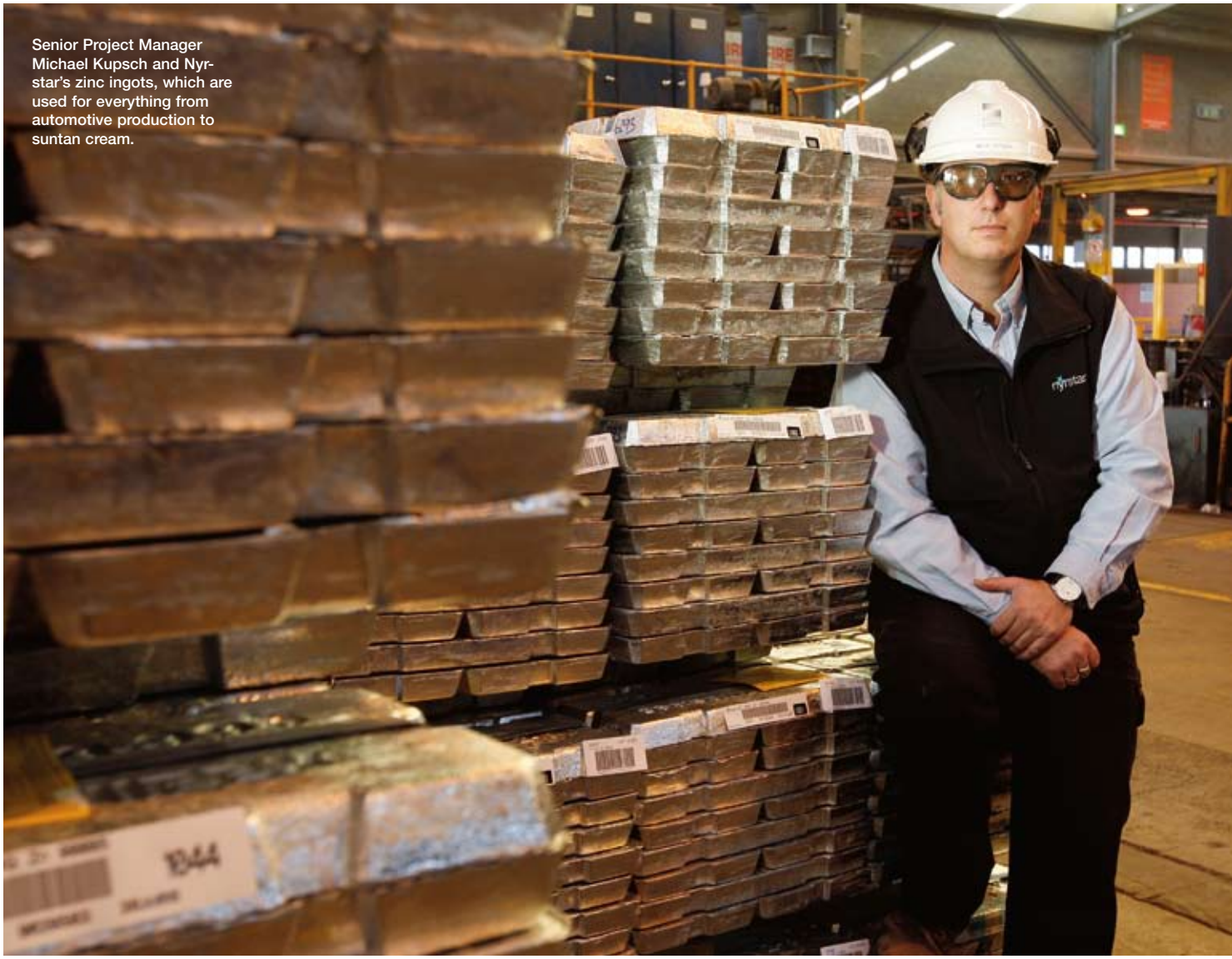


Senior Project Manager Michael Kupsch and Nyrstar's zinc ingots, which are used for everything from automotive production to suntan cream.

Zinc in synch

Zinc smelting began in 1917 on the site of Nyrstar's Hobart plant in Tasmania, Australia. For generations it has involved hard, dirty and risky jobs.

By Peter Woods
Photos David Callow

> One of the toughest - skimming the waste dross off molten zinc just poured into ingot moulds - was done by hand, with a rake, until four ABB industrial robots took it over in 2008.

Now the work of 16 men, who sat beside the 600° C molten metal around-the-clock in 30-minute spells, over four shifts, is automated - and Nyrstar is producing cleaner, smoother, correct weight ingots with unprecedented consistency.

Nyrstar Senior Project Manager Michael Kupsch led the 40-strong team, from Nyrstar and systems integrator Lewis Australia, who installed the robotic cells on four lines producing 25 kilogram zinc and 9 kilogram zinc alloy ingots.

"We make special high grade, 99.995 percent pure zinc and EZDA, a zinc alloy," says Kupsch. "It's used in galvanizing, alloying and die-casting, in battery casings, car panels - even zinc cream," to keep sunburn at bay. "Most now goes to China and India."

In Australia, Nyrstar also operates a smelter at

>FACTS

Nyrstar at a glance

- World's biggest zinc producer, smelting more than a million tonnes, worth USD 1.8 billion, annually – and third largest lead producer
- Created in September 2007, when Australian-based Zinifex's and Belgium-based Umicore's smelting operations merged
- Operations in Australia, Belgium, China, France, Netherlands, Thailand and USA, employing 4000 people
- Hobart smelter employs 500 people and produces 250,000 tonnes of zinc and zinc alloy, worth USD 450 million, plus sulphuric acid, copper sulphate and cadmium metal annually.

Port Pirie, South Australia, and is by far the biggest zinc producer – with only one, smaller, competitor.

Molten metal from the furnace is first pumped into pouring bowls on the four casting lines.

Until robotization, a pneumatically controlled system then poured just enough metal into each mould on a conveyor, and operators raked off the waste dross, for re-processing.

Pouring speed could be changed, manually, to improve consistency, but the process was complex.

"Four fulltime operators each shift just sat beside the conveyor, for 30 minutes at a time, in cocoons of safety clothing, with hard hats, face visors, hoods, gloves, coveralls and with a rake," says Kupsch. "We got quite a bit of reject-weight zinc. Imagine, pouring a 10-liter bucket of water into a mould in six seconds, repeatedly, without splashing. That's quite difficult."

Robotizing the process was "like putting an SL500 Mercedes engine into a Model T Ford," he says.

> "Typically, in the robotics industry you don't have a moving target.."
>
> **Michael Kupsch, Senior Project Manager, Nyrstar**

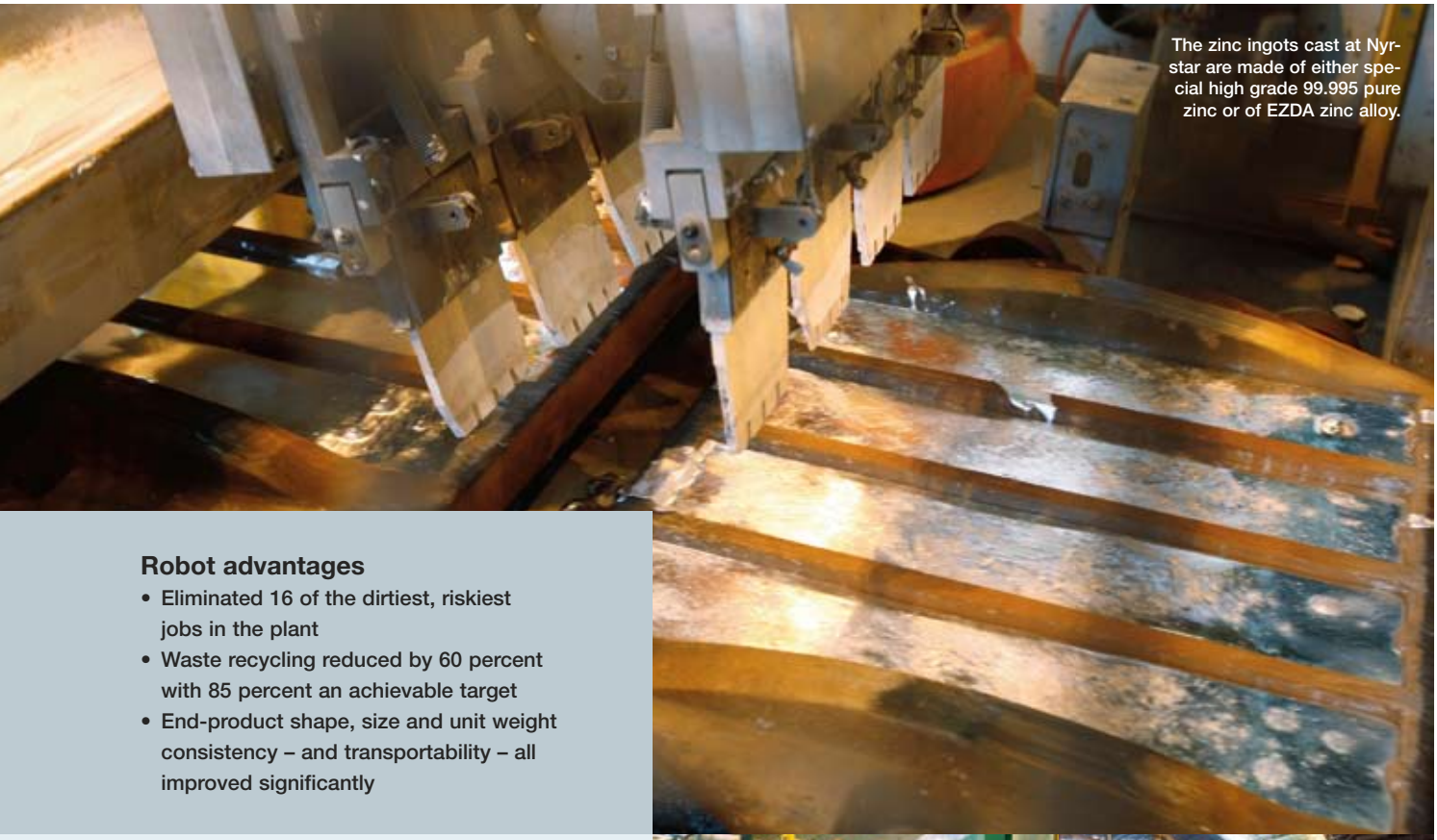
Each robotic cell comprises: an automated servo-control system for the pouring bowl; an ABB IRB 4400 robot, with 1.95 meter reach and 60 kilogram payload; a vibratory conveyor for the dross; and lasers which check the zinc level in the moulds and adjust the pouring system.

The project cost AUD 3 million, the robotic component about AUD 1 million, says Kupsch – and an awful lot of development and testing.

"The new and existing equipment in the plant communicate seamlessly, through Devicenet" says Lewis Australia's Senior Project Engineer Graeme Little.

"The existing Allen Bradley PLCs (Programmable Logic Controllers) and touch screens have been upgraded to run Contrologix Version 16," says Little.

"Each casting conveyor has a robot tracking system matched to the robot via an ABB IRC5 robot >



The zinc ingots cast at Nyrstar are made of either special high grade 99.995 pure zinc or of EZDA zinc alloy.

Robot advantages

- Eliminated 16 of the dirtiest, riskiest jobs in the plant
- Waste recycling reduced by 60 percent with 85 percent an achievable target
- End-product shape, size and unit weight consistency – and transportability – all improved significantly

Lewis Australia Pty Ltd at a glance

- Founded 1968 in Victoria, Australia
- Industrial automation system and robotic cell specialist
- Employs 26 and has annual turnover around AUD 10 million
- Projects in Australia, Asia and North America

A die-casting cell at Nyrstar with its IRB 4400 robot.

controller. This was a particularly complex robotics application," says Kupsch. "Typically, in the robotics industry you don't have a moving target."

Two IRB 6600 6-axis robots, with 200 kilogram payloads and 2.75 meter reach, were commissioned in Hobart in 2007, for stacking ingots. So familiarity was one driver for choosing ABB equipment, says Kupsch.

"Also, we are a partner with ABB," says Little. "We tend to use a lot of their robots, they provide good service and our guys are familiar with them. We completed full workshop set up and testing at our base in Melbourne, before we started bringing over the cells. The only thing we couldn't test in our workshop was molten zinc."

The first new cell went in at Nyrstar in February, 2008, the last in mid July.

"It was a staggered process," said Kupsch. "You can't just walk into a hot zinc area whenever we like - there's permits, risk assessments, job safety analysis, a lot to get through. In fact, the installation window was only four days for each robot."

Nyrstar will do most ongoing work on the robotic cells itself, says Kupsch.

"But for specific warranty on software and components, Lewis or ABB will be coming back in to do the work on those – depending on the component."

Eliminating manual skimming was a key benefit in itself - but Nyrstar also was looking for quality gains, says Kupsch. "Overall, we're seeing a 60 percent decline in reject-weight ingots and we're aiming for the project deliverable target of 85 percent," he says.

"People who mind the stacking end now look after the pouring end as well," Kupsch continues. "The new pouring bowl system prevents 'flash' – splashed metal which cools on the sides of molds and interferes with the shape of the slabs. Now we have a clean, smooth consistent-size product."

The robots will pay for themselves within two years, says Kupsch. "We've considered having the robots perform other functions, such as mould spraying and wire buffing, for example. We'll discuss that in the second half of next year."