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History in the making

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BY NUALA GALLAGHER

ERNIE WALPOLE, THE BRAIN BEHIND EARS IN ITS EARLY DAYS

It has been a whirlwind year a long time coming for Australian minerals technology company Austpac Resources NL (ASX: APG). Its technology, which looks to be revolutionary in terms of steel industry waste recycling (and turning a profit in the process) will be proved to commercial scale within six months. And by the second quarter of 2012, the company will be inviting all and sundry to stop by its US$12.5 million iron recovery plant on Australia's Kooragang Island, built with majority shareholder and U.S. titanium dioxide pigment major KRONOS Worldwide, so that we can all see for ourselves just what the team has been plotting since the 1990s.

"At this stage a steel plant anywhere in the world that has pickling lines and mill scale is, theoretically, somewhere that can use our process—of course that's hundreds. There's no telling quite how big the market is, and while we've had enquiries from some steelmakers we haven't really pursued them," co-founder and managing director Mike Turbott says.

"When the plant is operating early next year, they can keep an eye out, come and see the plant and then we'll talk business."

The technology in question is Austpac's EARS process, and who better to introduce its massive cost implications for the steel industry worldwide, than one of the men behind its idea, development and imminent arrival?

Success in the making

Austpac started life as a gold exploration company, founded in 1986, and working with a Japanese company on an ilmenite deposit in New Zealand around 1988. The team recognised that the then-current technologies couldn't separate the ilmenite from some other materials in the deposit in question very efficiently, and elected to sponsor some research at the University of Newcastle. This involved roasting ilmenite to make it more magnetic so that it could be separated from the other minerals more easily.


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MIKE TURBOTT, AUSTPAC RESOURCES NL CO-FOUNDER AND MANAGING DIRECTOR

"That work was successful, and our first patent in 1990 for that was the ERMS patent for the ilmenite magnetising roast. Since that time we have continued to fund research, and in 1992 we patented the EARS process," Turbott says.

Roasting ilmenite turned into leaching and upgrading it, before Austpac decided it needed to look at finding the best way to regenerate the spent liquors and came up with the EARS process. The brain behind EARS, a Mr Ernie Walpole, has since sadly departed. But he was able to train, "a series of very bright chemical engineering students, one of whom is with us now managing the project," Turbott says in reference to colleague John Winter; the man to whom he attributes the later ideas and EARS developments.

"At that stage it was a more efficient process but it didn't have the end step of taking the iron oxide through to iron metal, or metallization," Turbott says. During the 1990's and concurrent to looking at project options with the Indian government's mineral sands arm on beneficiating ilmenite, which unfortunately never materialised, the team itself continued to fund the research and improve the process all the way along.

"We'd done a lot of pilot-scale work but we'd never run the whole process put together, and hence came up with the idea of the ERMS SR synrutile demonstration plant. That concept was conceived around 2004, but we couldn't fund it," Turbott says.

"Risk capital in Australia is tough to find; the venture capitalists will lend you the money, but only if they can double it in six months, which is a bit hard when you're in technologies with a two-year-plus development timeline."

The team then met with BHP Billiton who, armed with a huge ilmenite deposit in Mozambique, was searching for a process to not only make the highest grade synrutile in the world but also recover iron. Austpac was the only company in possession of such a process, and following

test work in 2006 BHP agreed to inject $8 million into the company. Austpac sourced another $2.5 million and went about building the ERMS SR demonstration plant, which included completing the ilmenite roasting and leaching sections to make high grade synrutile, as well as the EARS section to recycle the chloride-rich leach liquors. By November 2008 the demo plant was complete—well-timed as BHP's failed takeover of peer mining major Rio Tinto caused it to lose interest in titanium and disband its entire division.

"We recognised that we needed to beef up the EARS section and run it for long enough to get data to be able to design a commercial synrutile plant. Again, capital's hard to find and it was just little Austpac by itself," Turbott recalls.

"In mid-2009 we were lucky enough to be asked by KRONOS about treating some of the iron chloride waste that comes from their chlorinators."

KRONOS agreed to supply a large test sample from one of their plants in the USA, and by the time it had been shipped over it was early-2010.

"We tested it very successfully, then we met their top engineers who reviewed the whole process and felt that it could be very applicable for their purposes, and by November 2010 we agreed to form a venture to rebuild the EARS plant to recycle industrial wastes," Turbott says.

"The full agreements were signed in April. KRONOS agreed to purchase $6.5 million of Austpac shares and became our largest shareholder, and also to provide a further $6 million for a technology licence for their pigment plants."

The plant kicked off on May 2, 2011. It has since progressed very well, reaching 45 per cent completion as of the end of August.

The work underway

An entirely new endeavour, the project has literally been built from scratch. Detailed design work has been carried out for each bit of kit, which has been reviewed by structural engineers and

quotes are obtained before orders are placed.

"We are a little behind time, although still on schedule to start commissioning in the fourth quarter 2011, which will continue for three months. Production will start towards the end of the first quarter or early in the second quarter next year," Turbott says.

"The plant will start at a lower level—processing up to 14,000 tonnes of mill scale and 1,000 tonnes of pickle. That's because of the permits we currently have and because all plants are subject to emissions review, and while we may technically know what the emissions will be, we have to run the plant to prove to the environmental authorities that it's clean and green."

General consensus from the environmental camps is one of joy that this company has the enthusiasm to develop waste recycling. Visits from the CSIRO, from European researchers and from industry have warranted equally positive impressions—not least from Australia's steel industry when it comes to the all-important metallisation step.

"That was the result of my nagging Newcastle-based John Winter back in 2003 that there must be something we can do with the iron oxide. There was a hiatus of around nine months, then one day John called and said, 'come up, I want to show you something'," Turbott says.

"I went up to the plant and he showed me the iron he'd made. It's a unique way of doing it, that's why it's patentable, and it could have much wider applications in the steel industry.

"At full capacity we'll make just less than 19,000 tonnes of iron at Newcastle, and that's nothing to the steel industry. Goodness, Australia produces over a million-and-a-half tonnes of steel a year so that's a drop in the ocean, but it is a recycling technology."

Austpac iron is highly pure because the company (so far) is taking iron oxide only into the process. However it has proved at pilot scale (but not plant level) that it can reduce iron ore to make direct reduced iron. Of course, Turbott says, the team wants to walk before it can run.

"We recognised that while our dream for a long time had been synthetic rutile, by gee, the world's steel industry is a lot bigger than the titanium industry. It was fortuitous that KRONOS came along when we needed the funds, they needed the technology and it was a meeting of minds," Turbott says.

"The next step for Austpac is two-fold: Getting the recycling technology for the steel industry proven. We'll have an operating plant for people to see in Newcastle as a reference site. We'll look at technology licensing or owner-operator options depending on what the steel industry chooses to do."

JOHN WINTER AFFECTIONATELY CALLS THE PROCESS “THE GARBAGE DUMP”

Additionally, the team will weigh up options presented by the various plants producing ilmenite in Eastern Australia. Owing to other minerals in the respective concentrate produced by these plants, Turbott explains, their ilmenite is virtually un-saleable and the facilities are operated for the zircon and rutile. The ERMS SR process isn’t encumbered by deleterious concentrate; it takes those materials out and Austpac can put them back in the mines where they come from.

“Titanium manufacturers pay a premium for a premium product, and that’s the market we want to be in. Our dream will be realised once the EARS plant is operating at Newcastle,” Turbott says.

“We’ll go back and re-design and re-engineer the concept to look at the East Australian ERMS SR commercial plant, perhaps in the range of 60,000 tonnes of synrutile product.”

Secondly, because the ERMS SR plant (making 60,000 tonnes of synthetic rutile) will have

an EARS plant to regenerate the chloride liquors, Austpac can put any mill scale and pickle liquor directly into it, thus augmenting the iron production and potentially producing perhaps four or five tonnes of iron for every tonne of synrutile. This alone could dramatically reshape the project's economics attractively, Turbott explains, while noting that Winter affectionately refers to the process as "the garbage dump" with good reason.

Tonnes of potential

Anywhere in the world that processes or rolls steel is a source of mill scale, and even in process where oily mill scale is created—which is far more environmentally difficult to dispose of—Austpac's unique technology is the clear answer to steel industry recycling, and potentially plenty of other economic add-on benefits to existing processes too. Within a few months the world will see proven application of the team's efforts; the summation of more than a decade's hard graft.

Turbott's emphasis on remaining conservative, well-founded by research and straight talking about the pitfalls navigated along the way to commercially realising the EARS process is not just refreshing; it is downright exciting. Contemplating quite how large a feat "little Austpac" is about to accomplish, and what its implications are for the world's steel industry, are nothing less than astounding. **IRJ**

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