

# REVOLUTIONARY RECYCLING

Last time ZincOx Resources spoke to Euroasia Industry, the company was focused on a major new mining project in Yemen, but with drastic changes in the zinc market, the company has found a game-changing technique, giving them a unique position in the industry today. Managing Director, Mr Andrew Woollett, speaks to Nicholas Charity.



**When Euroasia Industry** last spoke to ZincOx Resources PLC, we were told about its project for a new mine taking off at Jabali, in Yemen. "At the time, half of our financing was coming from hedge funds through a special-purpose bond we put together," says Mr Woollett, co-founder and Chairman of ZincOx. But the company's fate was yet to be decided, as he goes on to tell us: "In 2009 we were somewhat delayed in getting contractors on the site, due largely to the deteriorating security situation in the country. It became obvious that we were not going to complete the project on time, even though we were pretty much still on budget, so the hedge funds used that as an excuse to put us into default. They grabbed the money and ran, while we were left with an undeveloped project."

Things in Yemen still haven't changed much for ZincOx, but the company has

now re-focused its efforts into different, more novel platform. For the past six years, it has been pulling back from the mining sector and directing its efforts into a recycling project, that is a more profitable and attractive alternative to traditional zinc ore mining and smelting. Now in the operational stages, the company has developed its recycling plant in Korea and has secured its position in the supply chain for local steel mill wastes.

## **Moving to Korea**

"We first got involved in recycling back in 2005, and we approached the Koreans with a strategy aiming at transforming this hazardous waste into a valuable resource," says Mr Woollett. What was required was a new concept that eliminated the need for any subsidy payments. "So, in Korea, we went to the mills for the first time and said we will







take away this waste material for free, feed it into our plant and sell on a zinc concentrate and an iron product, so we really changed the nature of the material from a waste to a resource."

The electric arc furnace dust (EAFD) from steel mill off-gas cleaning systems contains a higher zinc concentration than primary zinc orebodies, Mr Woollett tells us. "So here is a fantastic opportunity that we have realized. Rather than going out into the bush to try and mine the stuff, the mills are willing to give me material that has a higher grade than most mines," he says, going on to add that Korea produces 380,000 tonnes of EAFD per year, which will rise to 400,000 tonnes within the next few years.

ZincOx initiated its project in Korea around six years ago, putting the project forward to Korean Iron and Steel association, KOSA "Having considered the offer

they decided to put out the deal to international tender. 18 months later, we won that tender and by 2009, 95 per cent of the steel mills in Korea signed up to 10-year exclusive supply agreements for the off-take of their EAF dust."

ZincOx approached Korea Zinc, one of the largest zinc metal producers in the world, with a view to selling them its zinc concentrate product. ZincOx can offer KZ a domestic supply of zinc concentrate, whereas it has always previously relied on imported feeds. As part of a sales and offtake agreement, KZ then provided finance of US\$50 million, which was combined with the US\$60 million of its own capital to develop the project. Mr Woollett elaborates: "The RHF is a piece of equipment that had not, until now, been built on a scale to handle these kinds of capacities, so we decided to build the plant in two stages—the first phase

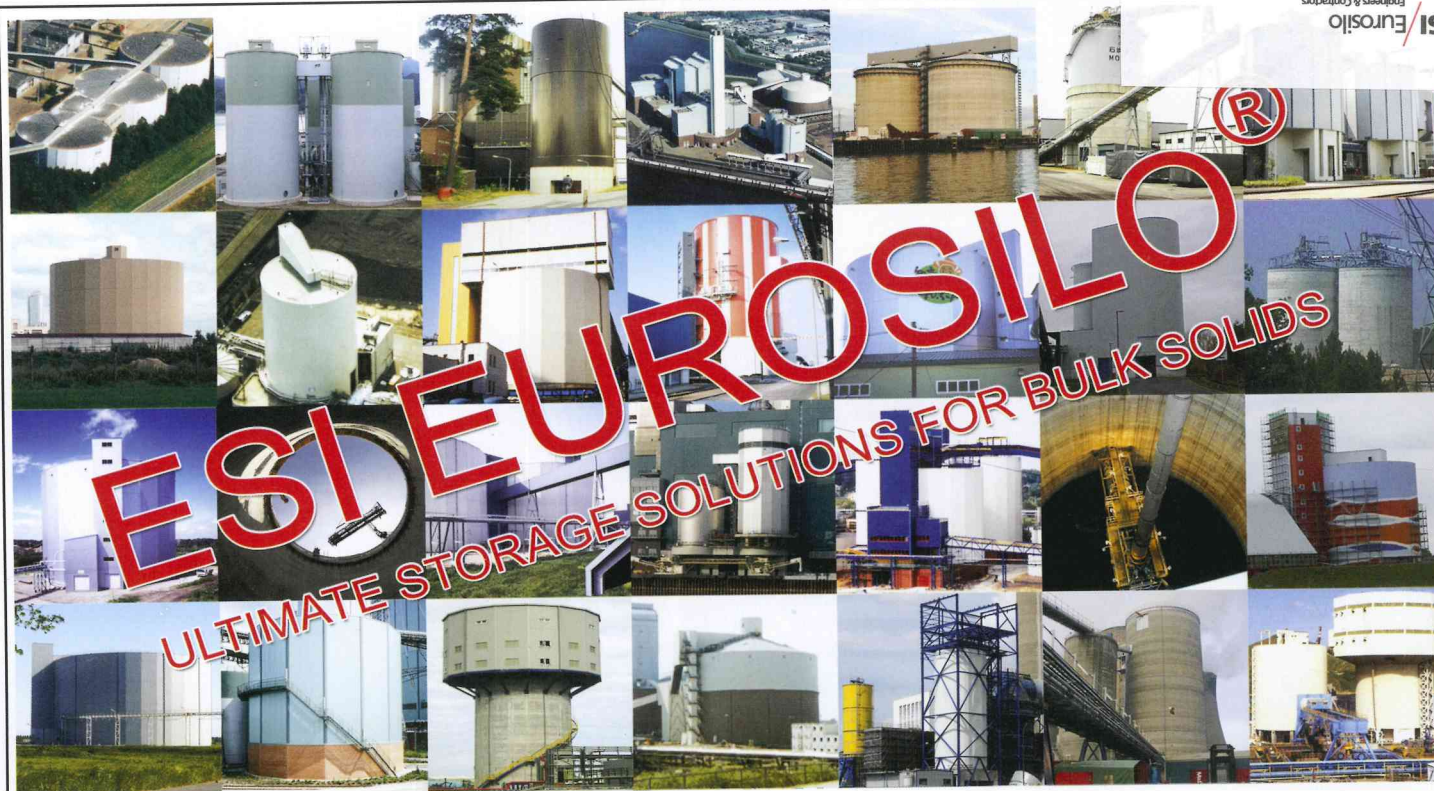
was US\$110 million and then we will double up capacity as soon as we're confident in the technology."

Korea Recycling Plant Phase One (KRP1), based near Pohang in the southeast of the country, will be in production in Q2 of 2012 with a capacity of 200,000 tons of dust every year, and producing approximately 49,000 tons of zinc in oxide concentrate. KRP2, which will follow on after the appropriate production and performance demonstration is complete, is forecast to be operational in 2013, and will produce a further 42,000 tons of zinc.

#### **Rotary hearth furnace**

"When we were looking at traditional processes, we rejected them because they were not the quantum leap forward that we were looking for," outlines Mr Woollett. "They are typically inefficient, with the gen-





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eration of a good deal of hazardous waste. When we realised in 2006 that the rotary hearth furnace (RHF), had been proven to be a reliable technology for iron waste recycling, we looked at how we could convert the equipment for zinc making. It was this realisation that shifted our focus and we've been concentrating on it ever since."

The RHF is a very large, circular tunnel, 30 m in diameter. The sides and roof of the tunnel are fixed but the annular shaped floor or hearth rotates. It is essentially a circular conveyor belt designed to work at

very high temperatures. The RHF is supplied by only a few manufacturers around the world. The original equipment has been modified to increase heat efficiency and optimise zinc recovery. "We start with hazardous waste, and we end up with no waste at all. We also use no material subsidies, so the benefits are not only environmental but also economic," says Mr Woollett. Working at higher temperatures, the customised technology reduces iron oxide in the EAFD so that the residual material contains about 50% metallic iron, turning it into a valuable

by-product. Hazardous elements like lead and cadmium behave like zinc in the process and end up with the zinc concentrate, but zinc smelters are often equipped to recover these metals, and indeed Korea zinc will generate significant additional revenue by producing both these metals. "ZincOx, has secured the exclusive use of the technology with the one of the best established suppliers of RHF's" states Mr Woollett. With a well demonstrated, game-changing technology base, ZincOx has safeguarded its future growth by entering

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the market with something entirely new. "We're not simply doing it more efficiently with the same equipment and we're not trying to rely on a steel mill subsidy. We're literally going into the market with something that works better," he adds.

As well as being a more economical platform, the effectiveness of the RHF to produce reliable output materials and no solid or liquid waste follows current trends towards environmental sustainability, adding to the company's attractiveness to new business. As for gas emissions, Mr Woollett outlines: "We are very conscious of energy requirements and CO2 emissions, so the way that we manage our furnace atmosphere allows the use of less energy than would be the case with the existing technology. We are also able to recover a lot of heat from the off-gases, further reducing the energy requirements of the overall process."

Production is set for Q2 2012. "By the end of Q2 we will have learned a huge amount about the plant's performance, recovery rates and usage of consumables," Mr Woollett tells us. "We will then be able to demonstrate the value of the project and then push the button for Phase Two in Q3. Phase Two will move pretty fast and we will see full capacity by the end of 2013."

### Market trends

"Being aware of what's happening in the zinc industry is incredibly important," says Mr Woollett, "and because it is widely distributed, with many small mines and a lot of different owners, zinc has always had very poor producer discipline leading to low prices in periods of slack demand, as a consequence zinc is perceived as 'the poor relation' for base metal miners. As a

result of this perception, there has been relatively little dedicated zinc exploration over the past 10 years. What we are looking at, over the next couple of years, are some very major mine closures, and not a similar capacity of new mine capacity coming on stream."

There have been some significant shortfalls in zinc in the past, which has given rise to some spectacular boosts in its prices. However, the expectation of a surplus of one million tonnes in the course of this year, is likely to hold down zinc prices for the next three to four years. Mr Woollett advises: "Zinc will always be mined and there are some large, but it will require higher longer term prices to make it viable,"

Today, China – not only the world's largest consumer of the metal but the largest miner – takes up approximately 35 per cent of the global market. Between 2008 and 2009, its zinc imports increased by almost 300 per cent and the domestic industry has exhibited good price sensitivity. When KRP2 is fully developed it will be the largest EAFD recycling operation in the world, and the largest zinc recycling plant in Asia. In terms of its full output, Mr Woollett states that if the plant were in fact a zinc mine, it would be the fifth largest mine in China.

After Korea, ZincOx's next steps will be to roll out the technology globally. As well as its corporate staff in the UK and R&D technicians in Belgium, the company already has team members working up projects in the US, Turkey and Thailand, but it is now taking a far wider picture of the global market. "We've done a survey of all the steel recycling plants in the world – what we are looking for is clusters of plants. To produce an iron by-product we need high temperatures and this in turn

requires economies of scale that are larger than for other less profitable recycling technologies." Future projects will be at around the same scale as KRP, therefore, aiming to process 200,000 tonnes of waste dust per year. "We would be disappointed if we do not have four plants being developed over the next two years," he states.

"Our challenge at the moment is to convince steel mills that although using our product will change the way they operate their furnace, the benefits will be huge. So what we've done is set up various trials in Korea and China, which will be undertaken on our first production output," he tells us.

"Right now, everybody in the company is focused in Korea," says Mr Woollett, "but at the end of last year we raised US\$10 million to be directed mainly towards the next generation of projects and after the completion of KRP1, we will be in a good position to roll out KRP2 and at least another two projects before the end of 2014" If ZincOx can achieve that it will have become the largest zinc recycler in the world. □

