



# European Nickel

12 May 2009

## Heap leaching of laterites – have European Nickel found the Holy Grail?

Nickel laterites are a problem. Whilst they hold approximately 70% of the world's current nickel resources, and by their very nature are a surface-exploitable mineral ore, they are difficult and expensive to process. Even now, after many years of differing developments in laterite process technology, there is still not a well understood, industry standard route to extracting nickel cheaply from laterite ore, and there have been many failures, particularly during periods of low nickel prices.

Enter European Nickel.

The company came to market in 2004, focused on a nickel-cobalt laterite project in Turkey at Caldag, which contains a JORC proven reserve of 33.2Mt at 1.13% Ni, for a nickel content of 375,000 tonnes. Here European Nickel have developed and demonstrated a new process for the extraction of nickel and cobalt from European "dry" laterite ores: heap leaching, to produce a mixed hydroxide product (MHP) for further refining into its component metals. From Day One, European Nickel has had the financial support and technical input of BHP Billiton (LSE: BLT), and the two companies have worked together to develop the technology. Key advantages of this proprietary process are low capex and operating costs, engineering and operational simplicity and a low carbon footprint.

The "dry" nickel laterite ores of the Balkan region are different to the clay-rich "wet" ores found in the tropics. All are weathered and oxidised surface outcrops of ultra-mafic rocks, where the leaching action of groundwater has resulted in concentrations of valuable metals such as nickel and cobalt. In the Balkan region, the weathered laterites have, at an earlier point in their geological history, been overlain by younger sediments, and have been "relithified" – i.e. their loose friable texture has returned to rock. These deposits are often described as "rock" laterites, as opposed to the "soil" laterites of the tropics. The result is a low-clay laterite ore that is stable enough to be stacked and is easily permeable by the leaching liquor – in this case, dilute sulphuric acid.

The process is simple. Ore is mined from a series of open pits, and transported to the process site, where it is crushed, before being stacked on the leach pad. The ore is then irrigated with dilute sulphuric acid, which leaches out the contained metals. The leach solution is collected and returned to the pad. Once the optimum metals recovery (approx 75%) has been achieved the solution is pumped to the process plant, where, first, the iron is precipitated out of the solution by raising the pH with limestone. Further raisings of the pH with soda ash precipitate out the nickel and cobalt in a two stage process, producing primary and secondary saleable MHPs. The entire process is run on electricity generated by the on-site sulphuric acid plant.

Three years of continuous operation at Caldag using a large-scale demonstration plant have shown the process is effective, generating 75% recoveries of both metals over a 20 month leach cycle. The company, having finally received its long-awaited forestry permit, is now ready to progress project finance and put Caldag into full-scale operation. The majority of the mine infrastructure is already in place and long lead time items have been acquired and are

Price: 8.02p

Market Cap: £37.75m

### 1 Year Share Price Graph



### Share Information

Code: ENK

Listing: AIM

52 week High Low

39.75p 2.00p

Sector: General Mining - Nickel

Website: www.enickel.co.uk

### Company Synopsis:

*European Nickel is an emerging mid-tier nickel laterite producer with a simple, low cost heap leach process which offers a competitive edge over conventional nickel laterite HPAL processing. The Company's assets span Turkey, the Philippines and Albania, with an identified pipeline of growth targeting 70,000tpa of nickel production. The Caldag project in Turkey is the Company's flagship asset for which has just been given the green light for development, following approval of a forestry permit approval and a signed a financing framework agreement with Chinese partners for a guaranteed US\$350 million debt facility. This will be the world's first commercial nickel laterite heap leach operation and represents the largest foreign direct investment in Turkey's mining industry.*

### Author:

Ian Mclelland 44(0)1202 770386  
action@proactiveinvestors.com



warehoused on site, following expenditure of some US\$70 million. Engineering design work is 80% complete, and life of mine offtake agreements for the MHP are in place.

A bankable feasibility study was concluded in 2006, based on an operation producing 20,400 tonnes of nickel in concentrate per annum and 1,200 tonnes of cobalt. Recent estimates calculate a total capex of US\$428 million with operating costs of US\$1.99 per lb. At a nickel price of US\$6 per lb, the project will generate US\$50 million pa in free cash flow when at target production, allowing capex payback in less than 6 years. Capital intensity cost – i.e. the capital cost per annual pound of production – is just over US\$6, substantially lower than the industry average of US\$20-30, demonstrating the low cost nature of the European Nickel leaching technology. NPV is estimated at US\$207 million, with an internal rate of return of over 20%.

Project finance is currently being sourced, and agreements have been entered into with two Chinese partners, Jiangxi Rare Earth & Rare Metals Tungsten Group Corp (JXTC) and China Tianchen Engineering Corporation (TCC). JXTC are a large state-owned enterprise based in Jiangxi province, and are building the world's first dedicated MHP nickel refinery, due to come on-stream in 2010. They will take a 20% stake in European Nickel by contributing US\$20 million, and also wish to take 50% of Caldag's output, already verbally agreed by BHP Billiton, to whom all output is currently committed. TCC, a global EPC provider, are to arrange for the provision of US\$350 million of financing, predominantly from Chinese banks. They will receive a 2% stake in European Nickel for performing this role, and will also become European Nickel's preferred EPC contractor for the next five years. Provided all the necessary conditions are satisfied, financing should conclude mid-year, and project construction can commence during the second half of 2009.

European Nickel estimate that from completion of financing it will take nine months to reach the point where the leach pad is initially stacked with ore and ready for irrigation, and first metals production should begin four months later. Initially, the project will buy in sulphuric acid, but anticipates that within 15 months, its own acid plant will be online. The acid plant will generate not only enough electricity to run the entire Caldag project, but will also have a substantial surplus to sell to the national grid, thus attracting carbon credits. The inherently slow nature of leaching as opposed to more immediate metal extraction techniques means that the ramp up to full production will take approximately 28 months in total, but once that level is reached, uninterrupted production of MHP should continue.

With the forestry permit finally in hand, a US\$16 million social and environmental works programme agreed with local government, and financing in course of arrangement, Caldag – after almost 6 years of preparation – is finally about to enter production and will be the world's very first commercial nickel laterite heap leach operation.

But what of the world's second commercial nickel laterite heap leach operation? And the third? Although the heap leach process was developed for the rock laterites of the Balkans region, European Nickel are now adapting the same process to exploit two large tropical laterite deposits in the Philippines. European Nickel is determined to maintain control of their technology, and rather than simply licence it to third parties, they are using it to obtain an economic interest in other projects.

At Rusina Mining's (LSE:RMLA) Acoje project on Luzon island, European Nickel are spending US\$10 million to earn 40% project share by conducting trials and studies on the Acoje laterites, where a recently published prefeasibility study has confirmed a JORC indicated resource of 30.8 million tonnes at 1.12% nickel and 0.05% cobalt.

At Acoje, both limonite and saprolite will be mined, and will be blended and agglomerated before stacking on the heaps. The agglomeration of the soft, wet limonite with the harder saprolite produces a mixed ore which is stable enough to be stacked and allows good percolation of the leaching agent. The saprolite also leaches very quickly, with some 80-90% metals recovery within only 10 days, and offsets the slow leaching characteristics of the limonite. Further modifications to deal with the "wet" ores involve covering the heaps to protect them from rain, and the use of "dynamic" heaps - rather than a single multistack heap as at Caldag. As each heap is exhausted of metals, the spent ore will be neutralised and removed for eventual use as back-fill in mined-out areas, and fresh ore will be loaded on to the vacant heap.

The PFS envisages a 10 year mine life from the existing indicated resource – mining the inferred resources could add another 13 years – with an output of 24,500 tonnes of nickel and 932 tonnes of cobalt pa. Cash costs are estimated at US\$3.10 per lb of nickel (at a nickel price of US\$6.00 per lb), net of by-products and including a refining charge of 25% of the nickel price and a cobalt price of US\$10.00 per lb. Capex is estimated at US\$498 million, including infrastructure and working capital, giving a

capital intensity cost of US\$7.76 per lb - highly competitive when compared to HPAL projects. The project has a post-tax 10% NPV of US\$375 million and a three year payback period after commissioning. A demonstration plant will be constructed shortly as part of the full feasibility study, which is due for completion in 2010.

And the third project? Last May, European Nickel expended US\$50.5 million to purchase a 19.3% strategic stake in Toledo Mining (LSE: TMC), and at the same time acquired a direct interest of 18.7% in the Berong Nickel project being developed by Toledo and its partners on Palawan Island in the Philippines. This move gave European Nickel access to a total resource of 375 million tonnes of laterites at around 1.3% nickel, for 4.9 million tonnes of contained metal. European Nickel has already conducted a concept study on the Berong deposit, which confirmed the economic viability of applying heap leach technology and a PFS is due to commence during 2009. European Nickel's Caldag partner JXTC is also involved in the Palawan developments, having signed an MoU with Toledo under which it will fund the construction of a commercial scale processing plant at Iplan, the second of Toledo's projects on the island, receiving an equity interest in the plant and a longterm MHP offtake agreement in return.

So has the breakthrough at last arrived for nickel laterites? Is European Nickel's low-tech, low-cost, easily deployable, environmentally friendly process the answer –the holy grail - that laterite developers worldwide have been seeking for so long? The proof of the pudding will be in the eating, but it's looking good....

**By Wendy Durham**

---

Proactive Investors facilitate the largest global investor network across 4 continents in 4 languages. With a team of analysts, journalists, & professional investors Proactive produce independent coverage on 1000's of companies across every sector for private investors, private client brokers, fund managers and international investor communities.

Contact us ■ +44 (0)1202 770386 ■ [action@proactiveinvestors.com](mailto:action@proactiveinvestors.com) ■

### No investment advice

Proactive Investors is a publisher and is not registered with or authorised by the Financial Services Authority (FSA). You understand and agree that no content published constitutes a recommendation that any particular security, portfolio of securities, transaction, or investment strategy is suitable or advisable for any specific person. You further understand that none of the information providers or their affiliates will advise you personally concerning the nature, potential, advisability, value or suitability of any particular security, portfolio of securities, transaction, investment strategy, or other matter.

You understand that the Site may contain opinions from time to time with regard to securities mentioned in other products, including company related products, and that those opinions may be different from those obtained by using another product related to the Company. You understand and agree that contributors may write about securities in which they or their firms have a position, and that they may trade such securities for their own account. In cases where the position is held at the time of publication and such position is known to the Company, appropriate disclosure is made. However, you understand and agree that at the time of any transaction that you make, one or more contributors may have a position in the securities written about. You understand that price and other data is supplied by sources believed to be reliable, that the calculations herein are made using such data, and that neither such data nor such calculations are guaranteed by these sources, the Company, the information providers or any other person or entity, and may not be complete or accurate.

From time to time, reference may be made in our marketing materials to prior articles and opinions we have published. These references may be selective, may reference only a portion of an article or recommendation, and are likely not to be current. As markets change continuously, previously published information and data may not be current and should not be relied upon.