

11:02 21 Jun 2019

Coffee with Samso: Episode 1, tungsten projects

As I mentioned before, in the tungsten project world the possibility of success is few and far between due to the complexity and geological nature of the deposits.

There are only a handful of good deposits that will be able to carry substance over the life of mine.

Cantung mine and Mactung deposit

The Cantung and Mactung deposits in Canada are extremely high-grade, but they are no longer in operation due to the high OPEX for both mines. When Cantung was in service, it was by far the highest-grade producing mine.



Cantung and Mactung tungsten deposits (Source: NATC).

Mining reserves were grading in the 0.80% range as you can see in the table below. The probable mineral reserves table from the website of the now-bankrupt company, North American Tungsten Corporation Limited is listed below.

Final products include a premium gravity concentrate (G1), containing on average, 65% WO₃; a flotation concentrate containing, on average, 35% WO₃ and a copper concentrate averaging 28% copper.

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Table 1.1 - Probable Mineral Reserves, July 31, 2014

Zone	Probable Mineral Reserve		
	Tons	Grade (WO ₃ %)	STU's
Amber	442,000	0.85	374,000
Below 3700	44,000	0.87	38,000
E Zone	55,000	0.99	55,000
Pit	190,000	0.77	147,000
Pug	886,000	0.80	707,000
West Extension	159,000	0.77	123,000
Stockpile	41,000	0.77	32,000
Grand Total	1,818,000	0.81	1,476,000

The Mactung deposit was never mined, from what I can remember, but I could be very wrong here.

The project had a resource of 33 million tonnes at 0.88% WO₃. The Mactung project was forecast to run at 2,000 tonnes per day from an underground operation using conventional long hole plus cut and fill mining methods. The ore was to be processed into both a premium gravity concentrate (67% WO₃) and a flotation concentrate (55% WO₃).

Resource - Indicated:	33.0 million tonnes @ 0.88% WO ₃
Resource - Inferred:	11.9 million tonnes @ 0.78% WO ₃
Underground Probable Mineral Reserve:	8.5 million tonnes @ 1.082% WO ₃
Annual Throughput:	730,000 tpa
Recovery first 5 years:	81.7%
Average annual production first 5 years:	752,000 MTU's
Operating cash cost first 5 years:	CDN\$104/MTU of WO ₃
Capex including contingency:	CDN\$ 402.1 million
APT pricing:	US\$300/MTU of WO ₃
Exchange Rate \$US/\$CDN:	0.88

Key parameters that form the basis of the economic evaluation of Mactung project (Source: North American Tungsten).

According to the information on the North American Tungsten website, the Mactung deposit fact sheet indicated that the feasibility study came up with the following points:

"Mine life is 11.2 years for the underground mine with the potential to expand by 17 years with an open pit, exploiting near the surface, lower grade indicated and inferred mineral resources.

The capital expenditure estimate is comprised of a project capital cost of

C\$356.5 million plus a contingency of C\$45.6 million.

Based on an 11.2-year mine life and the base case parameters, the project's pre-tax net present value is calculated as follows:

Discount Rate Pre-Tax Net Present Value

8% C\$276.8 million

6% C\$346.4 million."

The development cost for the mine is high, and with the current tungsten price, one would argue that such high risk would not be helping owners of the project to find capital.

Barruecopardo Tungsten Project

The Barruecopardo Tungsten Project in Spain by Ormonde Mining plc (LON:ORM), which appears to be a low-cost tungsten mining project, is now in the advanced stage of construction. When fully operational, Barruecopardo will account for around 13% of the non-Chinese global supply of tungsten concentrates.



Barruecopardo deposit (Source: Saloro.com).

The new mine development is based on an initial open pit mining operation with a 9-year mine life, producing 260,000 metric tonne units (mtu) of tungsten trioxide (WO₃) per year, or 2,060 tonnes of tungsten metal, contained in a high-quality concentrate, following a 1-year ramp-up period.

Ormonde holds a 30% interest in the project company, Saloro SLU, which is funded to develop the mine through a US\$100 million financing package provided by funds managed by 70% joint venture partner Oaktree Capital Management.

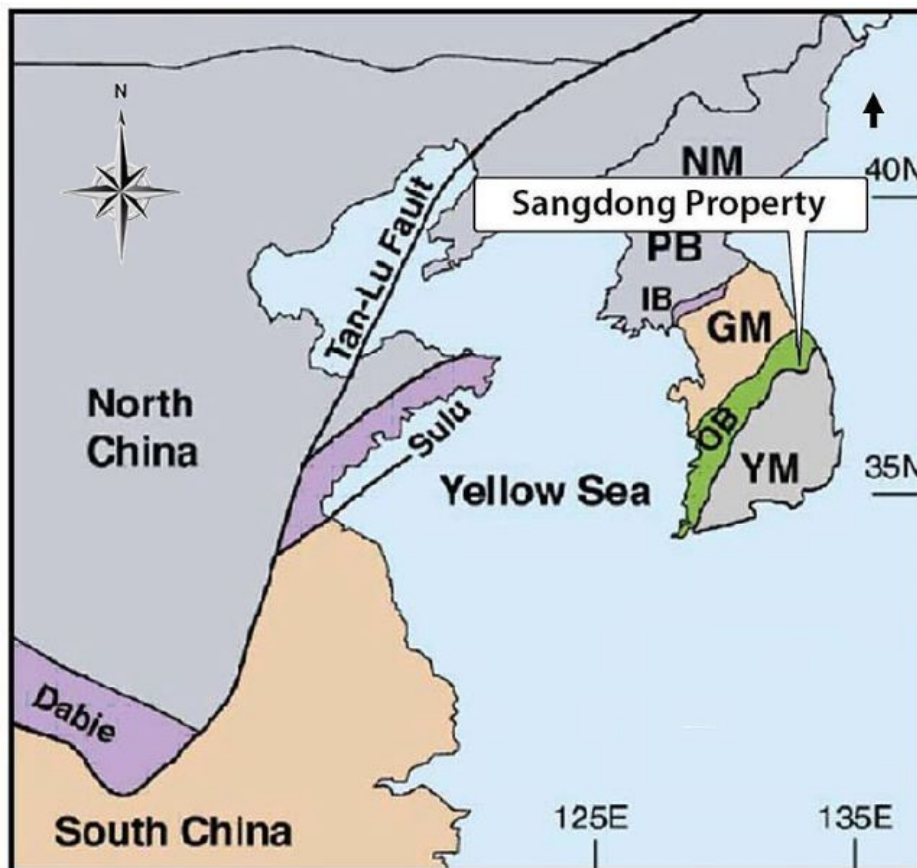
This project has taken a long time to get to this stage. Around 2013, this project was already ready to be mined, but for some reason, it never happened. In my time within the tungsten industry, I have always wondered why several of these "better grade" deposits/projects never happened.

The Sangdong mine

(Source: Wikipedia)

The Sangdong mine in South Korea is one of the largest tungsten mines in the world. The Sangdong tungsten deposit was discovered in 1916. The mine is 187 kilometres southeast of Seoul, approximately three hours' drive via expressways and local sealed highways.

Temperatures rise to a maximum of about 30 during the wet summer months of June to August. The winter period is relatively dry and extends from October to March, with freezing temperatures occurring during the period December to March.



Note: Crustal Blocks and massifs of the Korean Peninsula and adjacent northeast Asia: Nangrim massif (NM); Pyeongnam basin (PB); Imjingang Belt (IB); Gyeonggi massif (GM); Okcheon Belt (OB); Yeongnam massif (YM).

(Source: Wikipedia)

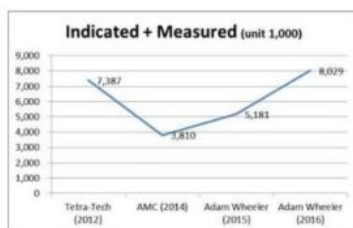
After a decade from mine closure, mining rights of Sangdong mine were acquired by Woulfe Mining Corporation via Sewoo Mining Corporation in 2006 and established its wholly-owned subsidiary, Almonty Korea Tungsten

Corporation (ex-Sangdong Mining Corporation).

Almonty Industries, specialising in tungsten projects with operational mines in Spain, Australia and Portugal, completed the acquisition of Woulfe Mining Corporation in September 2015. All information and data along with many detailed investigation and analysis about Sangdong mine which had been closed for over 15 years, were well organised and summarised in the feasibility study and NI 43-101 Technical Report drawn up by Almonty Industries.

Chronological Development of Sangdong Resource

	Indicated + Measured (unit : 1,000)						Inferred (unit : 1,000)							
	Total	F2	F3	HALO/F4/F5	MAIN	F1	HW	Total	F2	F3	HALO/F4/F5	MAIN	F1	HW
Tetra-Tech (2012)	7,387	1,448	1,458	1,505	2,976		0	53,882	6,777	7,027	12,496	4,467		23,115
AMC (2014)	3,810	1,440	1,310	0	860		190	11,280	930	760	1,310	340		7,930
A. Wheeler (2015)	5,181	1,554	1,578	627	854	295	273	52,765	3,935	4,386	8,456	4,235	467	31,286
A. Wheeler (2016)	8,029	1,554	1,578	627	854	295	3,121	50,687	3,935	4,386	8,456	4,235	467	29,208



AKT Jan 15, 2018				
Tonnes	Avg Grade W03	Contained W03 Tonnes	MTU	
5,822,000	0.41%	23870	2,387,020	
0	0.00%	0	0	
0	0.00%	0	0	
5,822,000	0.41%	23870	2,387,020	
Resources (W03 Cut-off 0.15%)				
Measured	0	0.00%	0	0
Indicated	8,029,000	0.51%	40,948	4,094,790
Total	8,029,000	0.51%	40,948	4,094,790
Inferred	50,686,000	0.43%	217,950	21,784,980

- 12.5 years of Indicated & Measured (at 640K tpa) represents only 2 surface levels out of 21 levels developed by Korea Tungsten
- 0.41~0.51% W03 grade is one of the highest in the world (cf. 0.18% world average and 0.19% China)

Resource information for the Sangdong tungsten deposit (Source: Almonty Industries).

The Sangdong project was the project that sparked a lot of interest due to the link of Warren Buffett. One of his companies was looking at the project and created a lot of attention.

Structurally it has some complexity, but as Mark mentioned, it looked like Almonty has worked out what they need to do.

While we are mentioning Almonty, it is also appropriate to say that they are the only company that has multiple mineable tungsten projects. They also own the Los Santos project in Spain and the Panasqueira Mine in Portugal.

Conclusion

I could go on for a long time talking about all these deposits, but I hope this will give readers a start if more research is your thing. Otherwise, I hope I have given some context to this segment of my conversation with Mark Strizek. I have included the links to the other parts below.

The tungsten industry is a very small unique sector as there are only a handful of players and the opaque nature of the tungsten pricing and the market, in general, makes it hard for investors to find a good company to back. I am guessing that the Australian projects will soon become world players once this uncertainty starts to settle down.

Individual Segments for Episode 001:

Coffee with Samsø Ep 001_01_Introduction

Coffee with Samsø Ep 001_02_Mark Strizek talks about his experience with Chinese Tungsten experts

Coffee with Samsø Ep 001_03_Solution to Low-Grade Tungsten Projects

Coffee with Samsø Ep 001_04_Dealing with impurities in Tungsten projects

Coffee with Samsø Ep 001_05_Tungsten Projects

Coffee with Samsø Ep 001_06_Australian Tungsten Projects and the Tungsten market

Coffee with Samsø Ep 001_07_Tungsten market and Conclusion

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