

Euro Manganese Inc.

(ASX: EMN; TSX-V:EMN)



EMN Developing Battery Grade Manganese Supply

Overview: Euro Manganese Inc's (ASX: EMN; TSX-V: EMN) principal focus is the development of the Chvaletice Manganese Project (CMP). The company's plan involves the re-processing of Europe's largest manganese deposit, hosted in historic mine tailings in the Czech Republic. EMN aims to produce high-purity manganese products (HPM) in an economically, socially and environmentally-sound manner. It will be recycling waste to produce highly refined manganese metal and salts. The project is surrounded by a large and growing cluster of electric vehicle, battery and battery metal plants, most of which are located within hours of driving/rail distance, and most of which consume directly or indirectly HPM. These are the finished products that producers of lithium-ion battery cathodes require. Through its subsidiary Mangan Chvaletice, EMN owns 100% of the rights to the Chvaletice deposit. The company has also assembled an industrial land package located immediately south of the highway and rail line that bounds the Chvaletice tailings deposit, where it plans to build the Chvaletice HPM process plant. This strategic land parcel, which is connected to a major rail line, is adjacent to an 820 megawatt power plant and will be the site of its proposed state-of-the-art HPM processing plant.

Catalysts: There are multiple catalysts that should support the development of CMP and in turn provide ready markets for its HPM products.

The significant environmental benefits that accompany the development of CMP are at the forefront of the company's compelling merits. Not only will CMP be viewed as environmentally beneficial in terms of recycling waste, but the primary market for the end product is electric vehicles, arguably the most prominent generational green theme with regard to mass-market distribution.

CMP's location is ideal given its proximity to major European motor vehicle manufacturers, and the burgeoning battery manufacturing industry.

EMN noted that 30 battery and battery precursor and cathode factories, with no fewer than 25 electric car factories are already operating, under construction, or have been announced in Europe recently. Recent data indicated that nine of the top 10 countries surveyed for electric vehicle penetration were located in mainland Europe.

Further to this, Tesla is building a Gigafactory in Germany and recently announced it will be using 33% high purity manganese in its new EV batteries.

2021 could also provide several catalysts including:

- Permitting progress and approvals: 2021?
- Completion of Feasibility Study: 2021.
- Ongoing strategic and commercial discussions with customers?
- Development of a Demonstration Plant in 2021?
- Potential support from the European Union and its agencies?

7 October 2020

INITIATING COVERAGE

Price: \$0.205

DISCLOSURES

REPORT COMMISSIONED BY	EMN
COMPANY OWNS THIS SECURITY	Yes

CORPORATE SUMMARY

TICKERS	EMN.ASX
INDUSTRY	Metals & Mining
SHARES ON ISSUE (PRO FORMA)	258,162,887
OTHER SECURITIES	
	19,725,000 Options
	5,756,750 Warrants
MARKET CAP (PRO FORMA)	\$48..5m
CASH ON HAND (PRO FORMA)	Circa \$3m
DEBT	\$0.0m

ASSET OVERVIEW

NAME	Chvaletice Manganese Project
LOCATION	Czech Republic
STATUS	Preliminary Economic Assessment. Feasibility & Permitting Initiated.
RESOURCE	27Mt Measured and Indicated

BOARD OF DIRECTORS/MANAGEMENT

PRESIDENT & CEO	Marco. A Romero
INTERIM CHAIRMAN	John Webster
CFO	Martina Blahova
MANAGING DIRECTOR CZ.R	Jan Votava
VP OPERATIONS	Andrea Zaradic
VP CORPORATE DEVELOPMENT	Fausto Taddei
CHIEF TECHNOLOGY OFFICER	Thomas Glück

SHAREHOLDERS

DIRECTORS & MANAGEMENT	11.3%
OTHERS	53.3%

2 July 2020

COMPANY OVERVIEW

Hurdles: In the near term, there are likely to be COVID-related disruptions and delays in the electric vehicle sector. While environmental studies, planning and project permitting procedures are at an advanced stage, these boxes need to be ticked in the lead up to construction. EMN has completed all planning and design for the construction and commissioning of a demonstration plant (DP) in the Czech Republic in order to provide bulk, multi-tonne finished product samples for customer evaluation and supply-chain qualification. While the company successfully built and operated a pilot plant that confirmed it can achieve the highest quality and specifications that will be required by customers, the production of a commercial scale HPM that meets the needs of manufacturers is yet to be proven, and this will in turn provide the platform for the company to negotiate offtake agreements that will be crucial in terms of gaining project financing.

Investment View: A Preliminary Economic Assessment (PEA) of CMP reflects some compelling metrics in terms of the net present value of the project, its mine life, internal rate of return and payback period. Over a 25 year mine life the PEA estimates that the project can deliver after-tax undiscounted cumulative cash flow of nearly \$3.3 billion. Based on these metrics the project is valued at \$593.2 million on an after-tax basis with an implied discount of 10%. While the initial capital requirements of \$404 million are substantial for a smaller company, EMN has already been granted investment incentives from the Czech government, in the form of tax credits, and one would expect that some of the heavy hitters in the battery and motor vehicle manufacturing industries may see significant supply and pricing benefits in taking a financial stake in the project. On this note, EMN has already signed five memorandums of understanding to conduct product supply chain qualification that are intended to form the basis for long-term offtake agreements.

ASSET OVERVIEW - Chvaletice Manganese Project (CMP)

Through its subsidiary Mangan Chvaletice, EMN owns 100% of the rights to the Chvaletice deposit and has entered into an option agreement to acquire several parcels of industrial land located immediately south of the highway and rail line that bound the Chvaletice tailings deposit.



EMN owns 100% of the Chvaletice deposit in the Czech Republic, close to all the EV action.

The Czech Republic is a stable, modern democracy with a free market economy and a favourable investment, fiscal and legal regime. Human and property rights are valued and respected. While it is a member of the European Union, the country preserves its monetary independence, boasting one of Europe's highest levels of economic growth.

**EURO
MANGANESE
INC.**

"We are committed to advancing the Chvaletice Tailings Project while adhering to best practices for corporate governance, environmental excellence and social responsibility."



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ASSET OVERVIEW

THE RESOURCE

The company's plan involves the re-processing of Europe's largest manganese deposit, which is hosted in historic mine tailings in the Czech Republic, with the aim being to produce high-purity manganese products (HPM) in an economically, socially and environmentally-sound manner. It will be recycling waste to produce highly refined manganese metal and salts.

The manganese in the Chvaletice tailings deposit principally occurs as manganese carbonate minerals, unlike the vast majority of manganese deposits in the world, which are made up of manganese oxides. Manganese oxides are refractory to acid leaching and require roasting or chemical reduction pre-processing in order to become soluble and amenable to processing into high-purity manganese products. This can create substantial environmental challenges, while manganese carbonates are readily leachable, without prior processing.



EMN plans to re-process Europe's largest manganese deposit.

In 2019, EMN filed a Technical Report prepared by Tetra Tech Canada Inc., which reported an updated Mineral Resource Estimate and the results of a Preliminary Economic Assessment (PEA) for the Chvaletice Manganese Project. This found that 98.3% of the resource is now classified as Measured under JORC and NI 43:101 codes.

Tailings Cell #	Classification	Dry In-situ Bulk Density (t/m ³)	Volume (m ³)	Tonnage (metric tonnes)	Total Mn (%)	Soluble Mn (%)
#1	Measured	1.52	6,577,000	10,029,000	7.95	6.49
	Indicated	1.47	160,000	236,000	8.35	6.67
#2	Measured	1.53	7,990,000	12,201,000	6.79	5.42
	Indicated	1.55	123,000	189,000	7.22	5.30
#3	Measured	1.45	2,942,000	4,265,000	7.35	5.63
	Indicated	1.45	27,000	39,000	7.9	5.89
Total	Measured	1.51	17,509,000	26,496,000	7.32	5.86
	Indicated	1.50	309,000	464,000	7.85	6.05
Combined	Measured and Indicated	1.51	17,818,000	26,960,000	7.33	5.86

Note ⁽¹⁾: Numbers may not add exactly due to rounding.

Note ⁽²⁾: Mineral Resources do not have demonstrated economic viability but have reasonable prospects for eventual economic extraction. Indicated Resources have lower confidence than Measured Resources. The estimate of Mineral Resources may be materially affected by environmental, permitting, legal, title, taxation, sociopolitical, marketing, or other relevant issues.

THE STRATEGY

Having 98.3% in the measured category is exceptionally high for the mining industry and attests to the homogeneity of the deposit and to the attention to detail that has gone into the evaluation and planning of this project.

The CMP is targeting production of ultra-high-purity electrolytic manganese metal (HPEMM) with specifications exceeding 99.9% manganese and ultra-high-purity manganese sulphate monohydrate (HPMSM) with a minimum manganese content of 32.34%, both of which exceed typical industry standards.

The CMP production process will be selenium, fluorine and chromium-free, and its products are designed to contain very low levels of deleterious impurities.

ASSET OVERVIEW

EMN's focus on producing very high purity product is another key differentiator. The purity of raw materials is critically important in the new generation of lithium ion batteries. It greatly influences battery performance and safety.

Table 1: Economic and Operations Summary (M = Millions, K = Thousands)

Product Price Assumptions	Life of Project/Average
High-purity electrolytic manganese metal ("HPEMM") ⁽¹⁾	\$4,617 per tonne
High purity manganese sulphate monohydrate ("HPMSM") ⁽²⁾	\$2,666 per tonne
Capital Requirements	
Initial Capital requirements	\$403.9 M
Life of Project Sustaining Capital (excludes \$255 M in maintenance costs which are included in operating costs)	\$24.8 M
Working Capital	\$30.5 M
Operating Costs (per tonne plant feed)	
Tailings extraction	\$2.02/t
Magnetic separation, HPEMM & HPMSM processing	\$90.21/t
Tailings stacking/storage, site services, and water treatment	\$5.76/t
General and administrative	\$5.04/t
Contingency on operating costs	\$8.24/t
Total Site Costs	\$111.28/t
Freight and Insurance, Selling costs and Royalties (per t plant feed)	
Freight and insurance, and selling costs	\$14.94/t
Czech Government royalty ⁽³⁾	\$4.53/t
Net smelter returns ("NSR") royalty, on sales less allowable costs ⁽³⁾	\$3.40/t
Total cost per tonne plant feed	\$134.14/t
Production Summary	
Life of project operations	25 years
Chvaltice tailings extracted & processed	26,828 K tonnes
Total manganese grade	7.33%
Contained Manganese (Mn)	1,967 K tonnes
HPEMM produced	1,186.4 K tonnes
HPEMM further processed into HPMSM	782.3 tonnes
HPEMM sold	404.1 k tonnes
HPMSM produced/sold	2,345.0 K tonnes
Total Mn contained in HPEMM & HPMSM	1,165 K tonnes
Overall Mn recovery	59.2%

The company has demonstrated the suitability of the Chvaltice tailings for the production of very high quality HPEMM and HPMSM in extensive bench and pilot scale metallurgical tests, during an intensive two-year process design program.



Purity of raw materials is critically important in the new generation of Lithium-ion batteries.

The technology used in the CMP process is commercially-proven and is being adapted through innovative approaches to meet or exceed demanding customer and European Union environmental standards.

The CMP process entails concentrating the manganese in the tailings using simple, clean and low-cost magnetic separation, followed by dissolution of the manganese and production of highly refined manganese metal, using electrolysis, which can then be converted into high-purity manganese sulphate powder. The plant is designed to be flexible and to deliver HPEMM to some customers and HPMSM to others.

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THE MARKET

High grade, high purity manganese is used as a primary cathode material in lithium-ion nickel-manganese-cobalt batteries or NCM batteries, and research has indicated that it increases performance and recharging capabilities.

High-performance NMC Li-ion batteries are being increasingly used in electric vehicles and other energy storage applications.



High performance Li-ion batteries are being used more in EVs.

The manufacturing processes and formulations for Li-ion batteries require reliable, high-purity sources of manganese and other battery raw materials to ensure that the batteries meet increasingly demanding performance, safety and durability standards.

The high-purity manganese materials for the precursor cathode materials of NMC batteries can be supplied in the form of CMP's HPEMM and HPMSM products.



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OUTLOOK

With demand for high purity manganese growing rapidly due to the burgeoning electric vehicle and Li-ion battery industries there is little doubt that the demand side of the equation will remain robust for many years.

Demand will also be supported by government initiatives. The increased focus on the renewable energy industry was recently highlighted when the European Union unveiled a €750 billion (\$A1.2 trillion) plan for a climate-led economic recovery from COVID-19 that prioritises investment in renewable energy, clean transport, smart energy and emissions reduction.

Tesla is one of a number of big names flocking to Europe with a planned Gigafactory in Germany which will be situated near Berlin.

Europe is expected to become the second most important centre (after China) of the global electric car and battery industries.

At least six large battery factories that will consume manganese inputs are located between 200 kilometres and 500 kilometres of the Chvaletice Manganese Project. Others are being built across Europe.

Several prospective customers have expressed interest in procuring high-purity manganese products from the Chvaletice Manganese Project, and in conducting supply-chain qualification of the products of the proposed Chvaletice demonstration plant.

**EMN has already signed five MoUs with major customers.**

Euro Manganese has already signed five memorandums of understanding with major customers, which are intended to evolve into long-term offtake agreements.

EMN has reported that these customers are attracted by the strategic European position of Chvaletice, the incomparable environmental footprint of the project (no mining or new solid waste generation) and by the exceptional purity of the products that Euro Manganese has produced in previous pilot plant trials.

These parties have included manufacturers of electric vehicle batteries and related chemicals who aim to design precursor and cathode formulations, in combination with available nickel, cobalt and lithium products, as well as chemical, aluminium and steel companies that require ultra-high purity manganese products for high-technology applications.

EMN sees the Chvaletice Manganese Project as becoming an important and environmentally sustainable part of the international and European lithium-ion battery supply chain.

Management expects that EMN will become the only primary producer of high-purity manganese in the European Union, where 100% of manganese requirements are currently imported. EMN sits on the largest manganese resource in Europe.

This is significant as Tesla plans to use 33% high purity manganese to power its next generation of electric vehicles. Tesla CEO Elon Musk said he was seeking high purity manganese as a primary raw material for battery manufacture. Tesla's new EV batteries will contain 1/3 manganese, 2/3 nickel and no cobalt. Production is to begin immediately.

Given the large scale of the project, one would normally expect long development times for EMN.

However, EMN has completed five years of work on CMP and, in late June 2020, filed an environmental impact assessment notification with the Czech Ministry of Environment, triggering the project permitting process.

It has initiated a definitive feasibility study and expects construction of the full-scale facility would take between 18 months and 24 months. The company is targeting commercial production by late 2023 or early 2024.

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THE BULLS AND THE BEARS



THE BULLS SAY

- Tesla announced that it will now be sourcing 33% high purity manganese for its electric vehicle batteries.
- Tesla will incorporate this manganese in a series of new battery plants that it proposes to build.
- Tesla plans to build a battery cathode plant in the USA, that will incorporate a simpler process that will use high-purity manganese and nickel metal as a feedstock. This stands to be a game changer for the HPM industry.
- The CMP project could be the subject of corporate interest from companies looking to establish a vertically integrated battery manufacturing business, particularly given the advantages of securing a long-term supply of a key sustainably-produced, made-in-Europe battery material, essentially controlling costs, and reducing supply interruption and reputational risks.
- There are few metals or metal products that have the predictability of HPM local demand and at the same time huge barriers to entry for new entrants in the industry. These are important factors supportive of a strong pricing environment.
- The project enjoys exceptional infrastructure and is logistically sound. The CMP already has all the infrastructure required to manufacture the product and transport it to end markets, including rail, highways, gas, water and electrical power.
- Financial metrics stack up well with the long mine life being particularly attractive, and this should assist in attracting investors to the project.
- The CMP shines from a sustainability point of view. It will recycle waste. It will not require any hard rock mining, crushing or milling, and generate no new piles of waste. It will also clean up a polluted site, leaving it in far better condition than it is today.
- Timing is everything and the CMP is expected to come to market at a time when the green theme is stronger than ever, and demand for green HPM is growing rapidly. A great deal new HPM production capacity needs to come on-stream soon, and nobody wants to be caught using dirty HPM. Securing a high-quality supply of a key battery metal from a sustainable supplier is very valuable to many cathode, battery and automobile manufacturers. There is no other known major manganese deposit like this in Europe. It stands to become Europe's first and only primary producer of HPM.



THE BEARS SAY

- In December 2019, EMN entered into a fixed-price, turnkey contract with CRIMM for the supply and commissioning of a technology, equipment package for the demonstration plant – EMN's ability to move to production is contingent on success of this plant, which is a 7x scale-up of its earlier pilot plant. It then needs to scale that up again into a large commercial plant.
- Potential buyers of HPM will have to be satisfied with the demonstration plant product, before making binding offtake agreements.
- While memorandums of understanding are in place, EMN is yet to secure a bankable offtake agreement.
- EMN is a start-up. With initial capital requirements of US\$404 million, obtaining required financing on reasonable terms could be a challenge unless the company manages to secure European Union, customer financial support or a major partner.

GLOSSARY

Buy	Increasing value of established business operations is likely to yield share price appreciation
Speculative Buy	Increasing value of a new or developing business operation is likely to yield share price appreciation.
Hold	There exists an even balance of risks.
Sell	There is elevated risk of share price depreciation.
Stop	A recommended, pre determined sell price, to be executed if the share price fails to appreciate

ARCHIVES

EuroManganese (EMN)

Oct - 8 **INITATING COVERAGE**

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CONTACT

Wise-owl
Level 4,
152 Elizabeth St
Melbourne, VIC 3000

www.wise-owl.com