



*Sustainable production of
EMD and EMM
from MnO₂ ores*

In today's world, electrolytic manganese dioxide (EMD) and electrolytic manganese metal (EMM) are made from high grade manganese oxide ores or low grade manganese carbonate ores.

The former route, which involves roasting high grade MnO₂ ore fines, is inefficient in both an economic and a technical sense creating gases, particulates and metal ions that can all pollute the environment. It also requires long term unsightly impoundment of tailings materials.

The latter route, which involves the dissolution of MnCO₃ ores in acid is also inefficient. It creates gases and metal ions that can pollute the environment, requires long term impoundment of unsightly tailings materials on 4+ times the scale of the MnO₂ current route and it has inherent product quality constraints.

This presentation describes an alternative process for the sustainable production of EMD and EMM **from low or high grade of MnO₂ ores** that is economically efficient, eliminates all potential pollutants, eliminates unsightly tailings impoundments and, as a bonus, can allow higher purity products to be produced.

This HiTec process comprises a number of patented novel steps, combined with world's best practices, which taken together provide a far superior production route for both EMD and EMM.



HiTec Energy

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Can the HiTec process truly be described as sustainable?

Electrofuel™ for Portable Energy

Sustainability is one of the most overworked and misused words we hear in today's environmentally sensitive world.

One could argue that nothing is ever sustainable indefinitely and, certainly in the case of a mineral resource such as an MnO_2 deposit, there will be a finite life despite the fact that changes in economic and technical factors can often prolong that life for significant periods.

However, if we accept the common usage of the word "sustainable", which embodies the concept of maximising the utilisation of a given resource without causing detrimental effects for the environment, then the HiTec process for producing high value electrolytic manganese products, with a high value micronutrient fertiliser as a byproduct, can truly be described as "sustainable".

HiTec would argue strongly that hydrometallurgical solutions such as this are the way of the future in minerals production for a variety of environmental and economic reasons that this presentation will address.



Yes it is truly sustainable because ...

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- 1. Today's waste becomes tomorrow's ore*
- 2. Metals efficiently extracted from ores*
- 3. Zero pollution created*
- 4. Regulations & product demands met*
- 5. Lowest decile capex and opex profile*
- 6. Environmentally friendly products*

Electrofuel™ for Portable Energy

The HiTec process achieves long term sustainable **economic** and **environmental** value that is derived from the combination of all of the following attributes:

1. The process can efficiently unlock the latent value in any grade of MnO₂ ore, or high tenor MnO₂ waste, making the decision on what feedstock to use purely an economic one;
2. The process promotes the maximization of a given resource resulting in higher economic benefits for the community and smaller waste dumps containing lower metal concentrations in more stable forms;
3. The process ensures that a plant is a 'good neighbour' in its local community, in an environmental sense, as no gas, particulate or metal ion emissions result and unsightly tailings impoundments are avoided;
4. The process will allow a plant to conform fully with all government policies for the environment and the economy whilst meeting increased and varied product demand;
5. The process will allow lowest decile capex and opex cost profiles to be achieved and maintained providing superior returns over many decades; and
6. The process results in 'green' products that each in their subsequent usage can result in an improved environment for the wider community.



Sustainability Attribute 1

The process can efficiently unlock the latent value in any grade of MnO₂ ore, or high tenor Mn waste, making the decision on what feedstock to use purely an economic one.

The present process for making manganese electrolytic products from oxide ores involves the roasting of high grade fines resulting from the mining of lump ores for manganese alloy production. Premium grade fines, bought by the electrolytic industry in competition with steel and chemical industry buyers, usually command a high price. Furthermore, in times of high demand they can become difficult to acquire at any price.

The fines are then roasted in a rotary kiln or batch oven to turn the MnO₂ into its soluble oxide form MnO. The lower the grade of the fines, the more the other metal oxides that are present are also solubilised in this roasting process with these metals ending up in the electrolyte. Removal is operationally difficult, even when high grade fines are used, resulting in detrimental impacts on both product quality and production volumes.

Quite to the contrary, the patented HiTec sulfur dioxide leach process is very selective for manganese meaning that the grade of an ore, and its location relative to the processing plant, can be viewed in purely economic terms. For example, a plant operator might compare the delivered price of a remote high grade ore with a local low grade ore, examining the relative delivered prices of the two materials versus their relative impact on capex.



HiTec Energy

The HiTec processes also provide bonus environmental outcomes

- Improved Resource Utilisation: *"Waste becomes Ore!"*
- Reduced Fossil Fuel Consumption: *"40%+ reduction!"*
- High Purity EMD for Li-ion batteries: *"Clean vehicles!"*
- Tailings become micronutrient fertilizer: *"No waste"*



EV'S & HEV'S



Electrofuel™ for Portable Energy

Because of its high selectivity for manganese the HiTec process can be economically viable when low grade ores or even wastes are included in the feedstock regime. Ores that were previously sold for low value can now have their true value unlocked, and mining or industrial wastes which are currently a cost of doing business, can now be transformed into assets. Adopting the HiTec process provides an MnO₂ resource holder with a unique opportunity to maximise the value of its manganese mineral resources.

The HiTec process consumes 40% less fossil fuels per tonne of EMD produced through the elimination of the reduction-roast plant used in the conventional process. In future it will also have a secondary, but very favourable impact, on fossil fuel consumption if the EMD produced is used in the production of li-ion batteries for use in electric or hybrid electric vehicles.

EMD produced using the HiTec process is particularly suitable as a feedstock for li-ion battery production due to the fact that the relatively high purity of the electrolyte produced in the initial leach process allows the latter leach purification sub-processes to be more efficient in stripping out the remaining impurities.

EMD produced using the HiTec process contains very low iron (up to 5 times less than the conventional process) and is therefore ideal for li-ion battery production!



Sustainability Attribute 2

The process promotes the maximisation of a given resource resulting in higher economic benefits for the community and smaller waste dumps containing lower metal concentrations.

Mining inevitably results in the production of products of various size and grade. Where mined products result that are unsuitable for manganese alloy production, because they are too low grade or too fine, and where they cannot be beneficiated for technical or economic reasons, then these products and the metals they contain inevitably end up on mine waste dumps.

For the community as a whole there is a resulting economic loss from consigning mined metals to waste dumps and potentially an environmental cost as well if natural forces subsequently cause those metals to transit from the waste dumps into the general environment in an uncontrolled or insidious manner.

The HiTec process can provide a mine owner with valuable options as any remaining low grade ore and or fines not sold to the steel or chemical industries can then be sold into the manganese electrolytic products industry.

The options can also eliminate costly and inefficient beneficiation processes or, in some instances can complement them, increasing the overall metal recovery from an ore body. Inevitably, smaller dumps, with proportionately less and more stable 'lost metal' in them, will likely be the result of wider usage of HiTec's process!



HiTec Energy

A world class plant, using HiTec processes, is the future direction for EMD & EMM ...

- The value in low grade ores is unlocked
- Operating and capital costs are reduced
- All wastes dealt with on site in a sustainable way
- No contaminated outflows or emissions
- Water usage is significantly reduced
- The environment is protected
- 'Green products' as output



Electrofuel™ for Portable Energy

EMD and EMM production plants that use HiTec's patented processes, plus 'best practice' throughout the plant, can meet the most demanding environmental standards and thus be good local neighbours to the communities in which they reside.

Plants which do this will also create long term sustainable value as they will exhibit **all** of the following attributes:

1. The production technologies used have unlocked the latent value in an area's low grade MnO_2 ores;
2. The plants are 'good neighbours' in their communities, from an economic as well as an environmental standpoint;
3. The plants conform fully with all government policies for the environment and the economy; and
4. They have lowest decile capital and operation cost profiles.

Increasingly over coming years the products they produce such as EMD or EMM will be sought after, both for their inherent value and the fact that they are environmentally 'green'.

Importantly, a plant incorporating these processes could be sited in any rural or even semi-urban setting without concern that its presence would despoil the local environment.



Sustainability Attribute 3

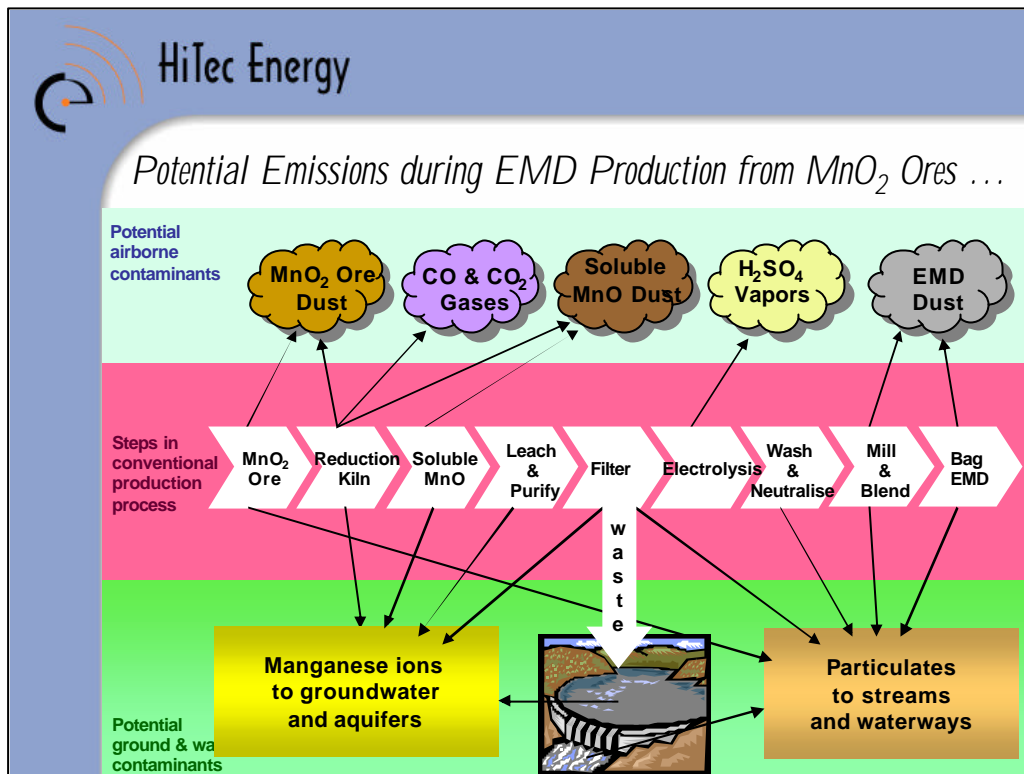
The process ensures that a plant is a 'good neighbour' in its local community, in an environmental sense, as no gas, particulate or metal ion emissions result and unsightly tailings impoundments are avoided.

The following four slides depict how the HiTec process differs from the conventional MnO_2 route. The differences are very substantive with the potential to transform what is today a production process that can pollute its environment and is regularly the source of community aggravation to one that can co-coexist happily in any rural or metropolitan industrial zone, anywhere in the world!

Importantly, the fact that the critical elements of the HiTec process, a sulfur dioxide leach front end and a micronutrient fertiliser back end, can be retrofitted to an existing plant means that an existing plant with pollution or economic problems may be able to have its economic life significantly extended.

The importance of community acceptance cannot be underestimated. In our travels we have noted that communities in both developed and undeveloped countries are now taking very active interest in what industries are established in their area and how these industries perform relative their claims.

We have also observed that in countries where industries are imposed on local communities, without their blessing, again whether this be in developed countries or undeveloped countries, those communities actively fight against the imposed plants and inevitably see them closed down.

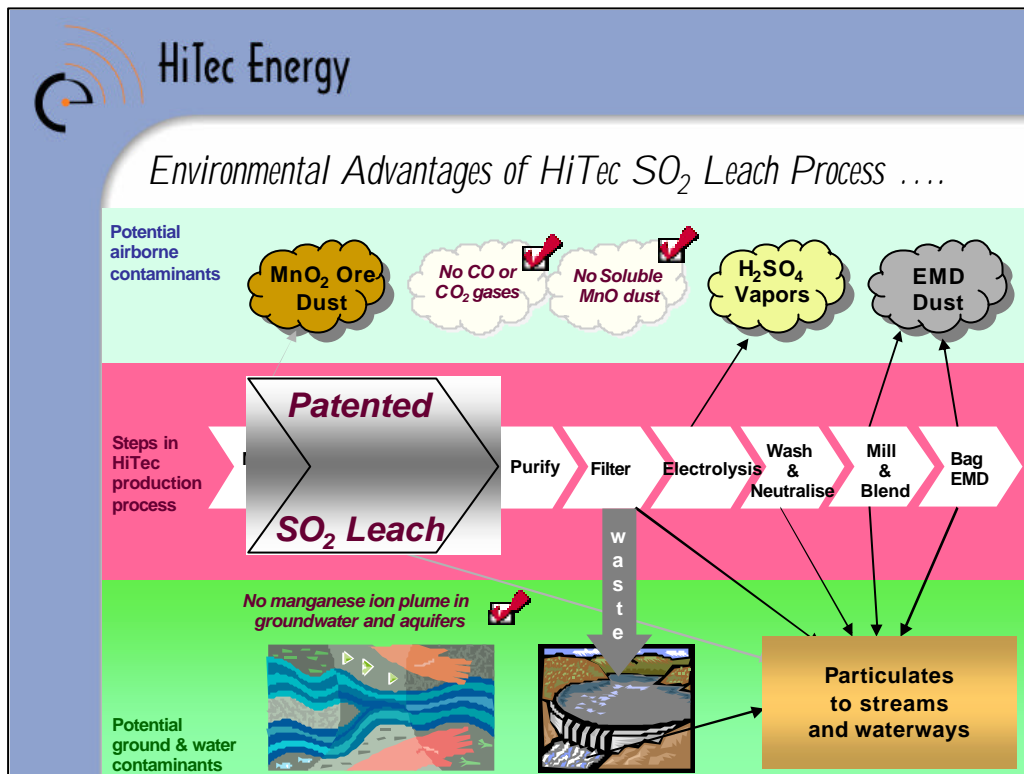


EMD production from MnO_2 ores currently involves a roasting step whereby the insoluble MnO_2 ore is converted to a soluble MnO form. Roast-reduction is inherently a 'dirty' process that requires high capital and very stringent management practices to minimise or capture and treat the emissions that will occur.

In the West, this process is invariably only used with high grade MnO_2 ores (ie, 45%+ Mn) as emission and production problems increase exponentially as the grade of ore drops. Plants can make EMD from local lower grade sources of MnO_2 ores using conventional methods, i.e. incorporating a roast-reduction step, but it is quite dubious as to whether these process would be at all viable with MnO_2 ores of the grade we generally find is available around the world.

Whatever the grade of MnO_2 oxide that is used, all of the airborne and groundwater borne pollutants depicted in this slide will be present to some degree and will need to be captured if the plant is to have a secure future. History tells us that even in the best managed plants, gas emissions, particulate pollution and metal ion pollution will be present to some degree!

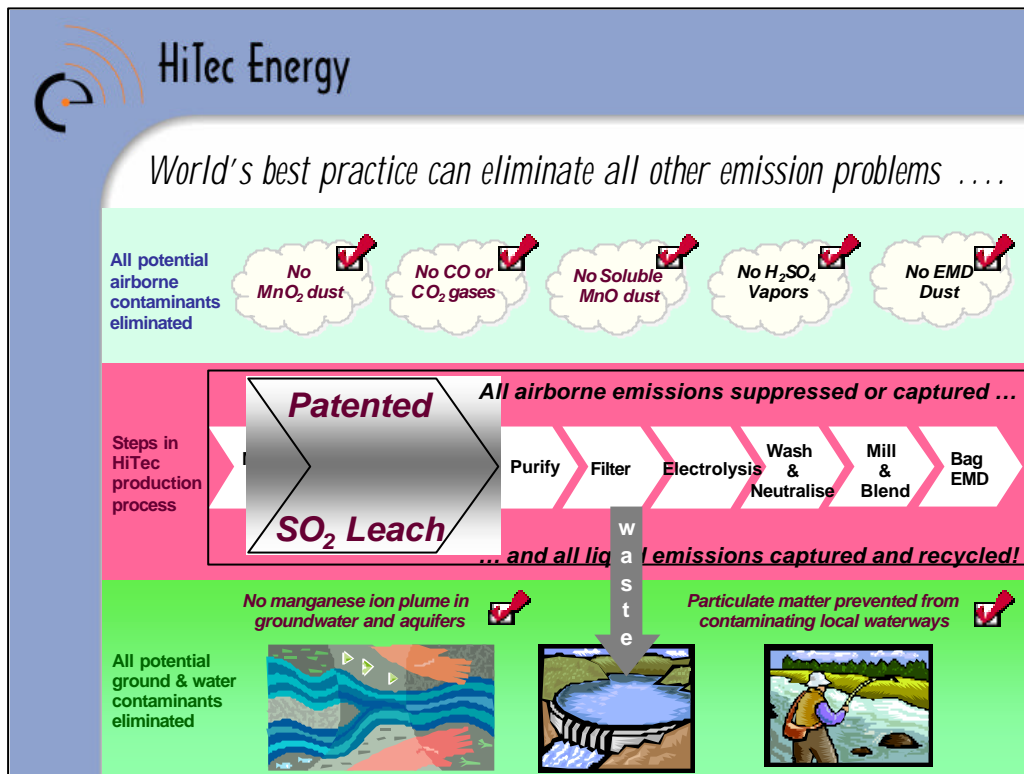
Add to this the need for unsightly tailings dams, which alone can antagonise a local community and it is no wonder that today's EMD and EMM plants experience local community resistance.



First, the HiTec SO₂ leach process has important advantages:

- It is highly selective for Mn ions, unlike the conventional roasting process that solubilises all metal oxides in thus creating environmental and production problems;
- This high selectivity for Mn ions also allows lower grade ores and wastes to be used as the manganese feed source, unlocking the value in otherwise worthless materials;
- The leach converts the MnO₂ ore directly to MnSO₄ thus avoiding the soluble MnO compound that is the source of the Mn ions that can enter the community water supplies;
- The SO₂ gas produced for use in the leach is readily controlled in a closed circuit with any gas not consumed in the leach neutralised in a gas scrubber; and
- As a predominantly hydrometallurgical process there is far greater ability to contain all materials on site and within designated containers thus minimising both airborne and groundwater emissions.

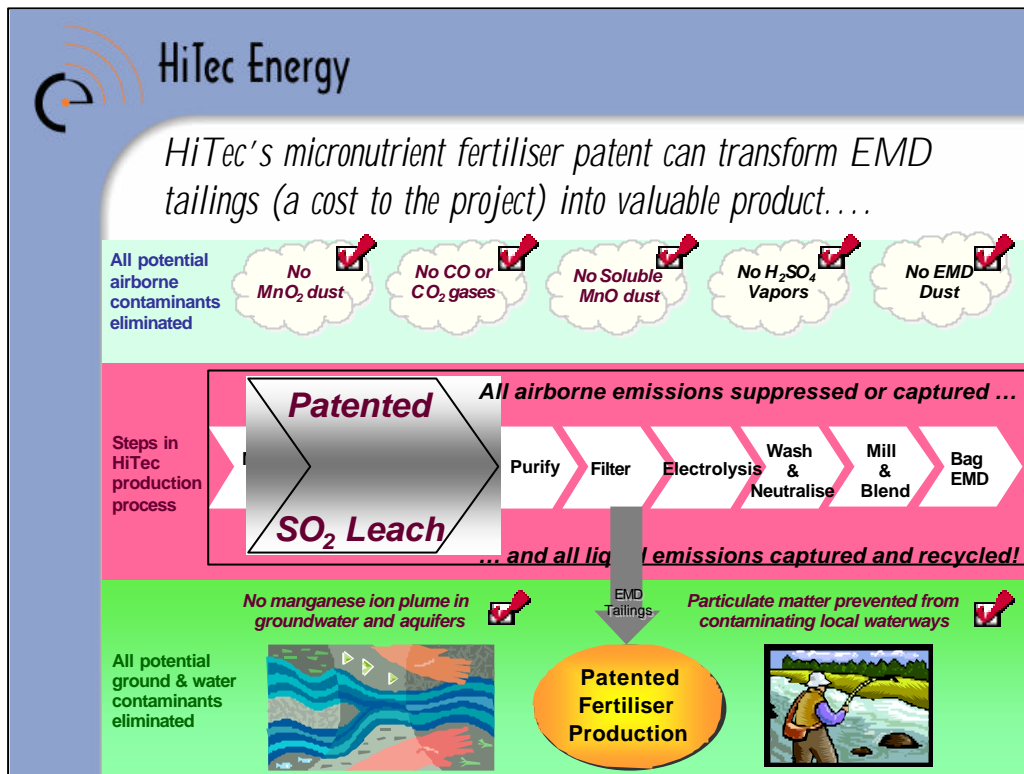
The use of the HiTec SO₂ leach will eliminate all CO or CO₂ emissions and all emissions of soluble metal ions ensuring that no metal ion pollution of ground waters can occur!



Second, having substituted the very dirty pyrometallurgical roast-reduction process with the hydrometallurgical HiTec sulfur dioxide leach process, it is then relatively easy to suppress or contain all other dusts, vapors or liquid emissions. For example:

- Water sprays on MnO₂ ore piles and good stockpile management techniques to prevent dusting;
- Polypropylene balls on surface of cell house tanks to suppress H₂SO₄ vapors, with any vapors escaping the cell tanks captured and recycled within the cell house;
- Closed circuit EMD preparation plant ensures all EMD, whether in wet or dry form, is contained within the plant;
- All liquid wastes from ore preparation, purification, filtration and electrolysis are recycled to prevent metal ion or particulate emissions to the local environment;
- Waste dam water management practices ensure that the relatively benign tailings produced in the HiTec process do not escape the waste emplacement facility creating particulate pollution in local waterways.

In summary, all emissions are captured in the EMD or in a secure tailings impoundment where they can be controlled.



Third, even though the use of the patented HiTec SO_2 leach process and world's best operating practices would control all plant emissions and resulted in a benign tailings material, relative to the conventional production process for EMD, a tailings impoundment still requires considerable land, has a long term management costs associated with it and is generally unsightly.

HiTec's micronutrient fertiliser patent is designed to eliminate the need for a tailings dam by conversion of all tailings into a high value product ideally suited to Mn, Fe, Ca and K deficient soils.

This could be done on site by EMD or EMM producer, as part of its own plant, or by a fertiliser company who would build their plant on site and pay a royalty for the tailings delivered to them. Either way, considerable economic value can be added to a project at the same time it is earning very substantial environmental kudos by the elimination of unsightly tailings dams.

The process can involve the production of granules for machine or hand dispersion or a suspension concentrate for spray dispersion. It can also involve the addition of further minerals if these are desired and, in most cases, these potential additives are readily available at prices that make their addition economically viable.

A plant incorporating all of our technologies and knowledge would sit comfortably in any rural or semi-urban location!



Sustainability Attribute 4

The process will allow a plant to conform fully with all government policies for the environment and the economy whilst meeting increased and varied product demand.

Electrofuel™ for Portable Energy

HiTec has struggled for a number of years to commercialise its original SO₂ patent. The reasons for this were various, but not the least of which included:

- The adverse affect on battery sales of the year 2000 debacle;
- The disruption of the alkaline EMD market upon the entry of Chinese producers;
- The blow out in capital costs caused by the mining boom; and
- The failure of our Kalgoorlie project to proceed given the withdrawal of a key partner.

Fortunately the planets all seem to be aligning now for HiTec and successful commercialisation is now seen as very achievable. In this regard, the factors that have changed in our favour include:

- Formal national restrictions on CO and CO₂ emissions;
- The high price and unavailability of premium Mn fines;
- Rapidly increasing prices for EMD and EMM, based upon both increased and varied demand, plus a recognition of the higher cost of inputs;
- Widespread government backed opposition to particulate and metal ion pollution of the environment; and
- Wider community appreciation of the need to maximise the use of local resources.

*Increases in demand for alkaline grade EMD
and hi-purity EMM continue unabated . . .*



EMD still growing at 7% per annum and EMM growth matching steel industry growth

I would like to diverge for a moment to talk about EMD and EMM demand. We have long focused on the alkaline battery market as the main end user of high purity, high battery active EMD and have previously forecast that this market would grow at around 7% per annum this decade as this battery technology supplants the zinc/carbon battery technology as the main source of disposable portable batteries.

In the first half of this decade this has proved to be the case and we see no reason why it should not be the case in the latter half of the decade. The key point to make on this today is that we believe that this market alone can justify new investment in EMD production, provided of course that this new production utilises our patented processes to ensure that adequate manganese ore fines will continue to be available at reasonable prices.

Although we have not really focused upon producing EMM using our processes to gain cost, quality and environmental advantages, we have had discussions with parties who do have this focus. In this regard, it is pleasing to note that with rising demand for high manganese steels and for ferrites in electronics, and the shortages of premium grade ore fine required to make these products conventionally, then this is an area that could become increasingly of interest to HiTec.

Energizer® LITHIUM
“the battery of the future”



Does this mean the end for the alkaline battery and for EMD?

If you surf the net doing research, or even just watch your TV's occasionally, you could be forgiven for believing that the world is about to be blessed with a 1001 new battery types, all with seemingly miraculous capabilities.

The truth is that the world is crying out for better performing batteries and a few will come forward to meet the demand. However, the time taken from discovery to production will remain relatively long, and those few that make it first will tend to kill off other technologies that may otherwise have been produced.

As an example of a new battery which has reached production and is proving a success, you may have seen this little fellow racing around on your TV screens proclaiming “Energizer Lithium” as the battery of the future.

Does this battery, and a small number like it, give us cause for concern about the future for high purity EMD? Well no, because it actually uses 93% of the EMD that would go into a similar sized alkaline battery and it is predominately scavenging sales from the rechargeable sector of the market rather than the disposable sector. Whilst not all new successful batteries will contain EMD, many do, and we believe that this trait will continue due to the inherently favourable electrical characteristics of manganese.

Milwaukie 28V Power Tool Range

"Its success has changed the power tool industry"



Power tools that can match the performance of plug-ins!

An example of early success driving out competing technologies can be seen in the power tool market and this is again very positive for the future high purity EMD market.

In 2007, annual sales for power tool li-ion MnO_2 spinel battery cells will reach 1.35 million units. These units will go into both amateur and professional ranges of construction, gardening and air-pressure tools. In addition, high-end cells will be increasingly used in military radio, computing and lighting systems. In short, the low cost, the high power to weight ratio, the low heat output and the wide operating temperature range makes the use of the manganese variant of the li-ion battery a 'no-brainer'.

For example, the Milwaukie V28™ power tool battery now provides 28 volts of power at a weight that is slightly less than an 18 volt Ni-Cd battery. The V28™ battery delivers significantly more power, up to twice the run time, plus 'fade-free' consistent power throughout each usage cycle. Unlike Ni-Cd and NiMH battery platforms, the V28™ battery performs significantly better in extreme hot or cold temperatures. A very important factor!

As new portable devices call for higher and higher current rate, the manganese variant of the li-ion battery has now moved to the frontline. Demand is in fact so great that manufacturers don't even bother to promote the product. E-One Moli Energy, Milwaukie's supplier, is a leading manufacturer of manganese lithium-ion technology, as are also Sanyo, Panasonic and Sony.



Vehicle batteries may add to high purity EMD demand ...

- The EV's and HEV's that are the road transport mode of the future are already with us today



2007 Toyota Prius

These vehicles have great potential to reduce pollution and lower to conserve oil!



- Will the batteries that will power them in future will contain high purity EMD?



Mn forms of Li-ion Battery

This is still unclear, but Li-ion battery variants containing manganese derived from EMD have become a front running technology!



Electrofuel™ for Portable Energy

The number of EV and HEV offerings is increasing rapidly as the technical, economic and political hurdles faced have been overcome and as the demands for lower green house gas emissions has strengthened. All major world car makers and many small niche players are rapidly moving in this direction.

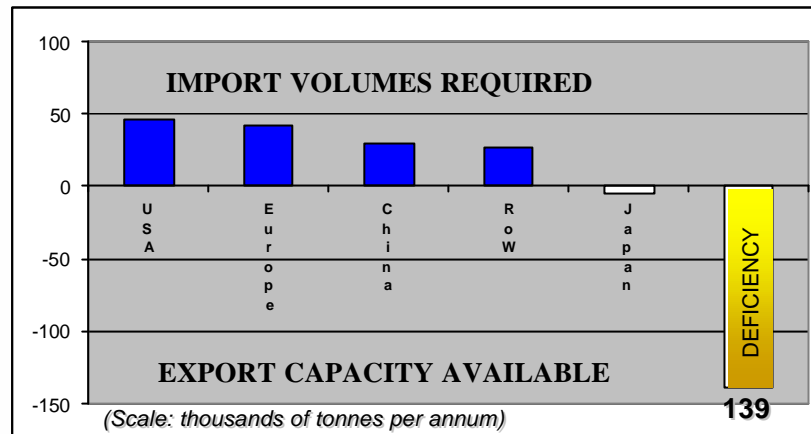
Li-ion batteries, containing manganese derived from high purity EMD, are now a front-running technology to power vehicles and this could mean a very big surge in future demand for EMD.

The battle for the next generation vehicle battery has been won by the li-ion battery format, but that the battle between li-ion variants to be the sole winner in the EV and HEV markets, or at least to share this prize, is far from won at this point.

We previously touted “LMO” as being the ‘blue-sky’ for a high purity EMD producer. It truly was then ‘blue-sky’ as historically new battery technologies took upwards of 20 years to move from invention to first production use. The rapid progress of the LMO battery, or as it is now called “the manganese variant of the li-ion battery” has surprised many observers, but the reason for its rapid progress is obvious. Its competitors; the lead/acid battery, the nickel metal hydride battery and most of the other variants of the li-ion battery all have very significant problems!



Estimated deficiency of high purity EMD by region for 2009, given no new plants. . . .



Electrofuel™ for Portable Energy

Taking into account all these new uses, we estimate that there will be a net deficiency of some 139,000tpa of high purity EMD by 2009 unless new plants are built. It is our strong view that no new plants will be built in USA, Japan or Europe so the shortfall will need to be filled by new Chinese and Rest of World plants.

As has been the case in recent years, some of the shortage will also be filled by low purity EMD production, but the ever increasing need for better battery performance, and to some extent public awareness of the negative impacts of low grade substitution, is to a degree putting a real limit on this practice.

Please note that this estimate was prepared before the recent announcement of the imminent closure of the Delta plc Australian plant which had a capacity of 27,000tpa. This plant was caught between rising costs (which without a change in technology it could not correct) plus the adverse effect of the appreciating dollar on sales on one side and successful US and European EMD producer efforts to encourage politicians to prevent lower cost imports on the other.

With this plant closed, and cost structures of the European and US producers making expansion very unlikely (again without technology change), the true deficit of high purity EMD by 2009 is likely to be closer to 166,000tpa than it is to 139,000tpa!



Sustainability Attribute 5

They process will allow lowest decile capex and opex cost profiles to be achieved and maintained and will provide superior returns over many decades.


Over the past twelve months HiTec has completed what in effect was a prefeasibility study for a 12,500tpa EMD plant in India. This work has confirmed the technical and economic viability of a production module of this size; about half the size our previous feasibilities have validated.

The plant's location in a generally lower cost regime such as India has been a significant factor in driving down the plant's size and thus its capital cost. However, other factors such as HiTec's new fertiliser patent, the quality of local technical services and the finessing of process bottlenecks have also contributed.


As regards operating costs EMD or EMM are comprised of electricity, manganese and other feedstocks, labour and services. With a few rare hydro based exceptions, which do not apply in the Indian example studied, electricity is now charged at world prices so locational differences tend to relate to the quality and security of long term power supply only.

Manganese and other plant feedstocks do tend to be at the very low cost end of the spectrum as the grade of ore fines targeted will generally be below that which is usable for other purposes. In India we have validated grades down to 28% manganese.

Indian labour and services are significantly cheaper, even after accounting for certain inefficiencies, which provides a very cost competitive capex and opex profile for a small plant module.

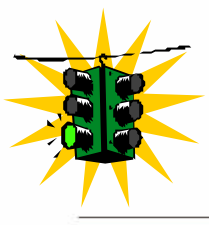


HiTec Energy



Would a new investment today in EMD or EMM be profitable?

Producing 'best in class' value added products only makes sense if they can be sold at prices that will provide superior long term returns to the investors.



HiTec believes they can be!

Electrofuel™ for Portable Energy

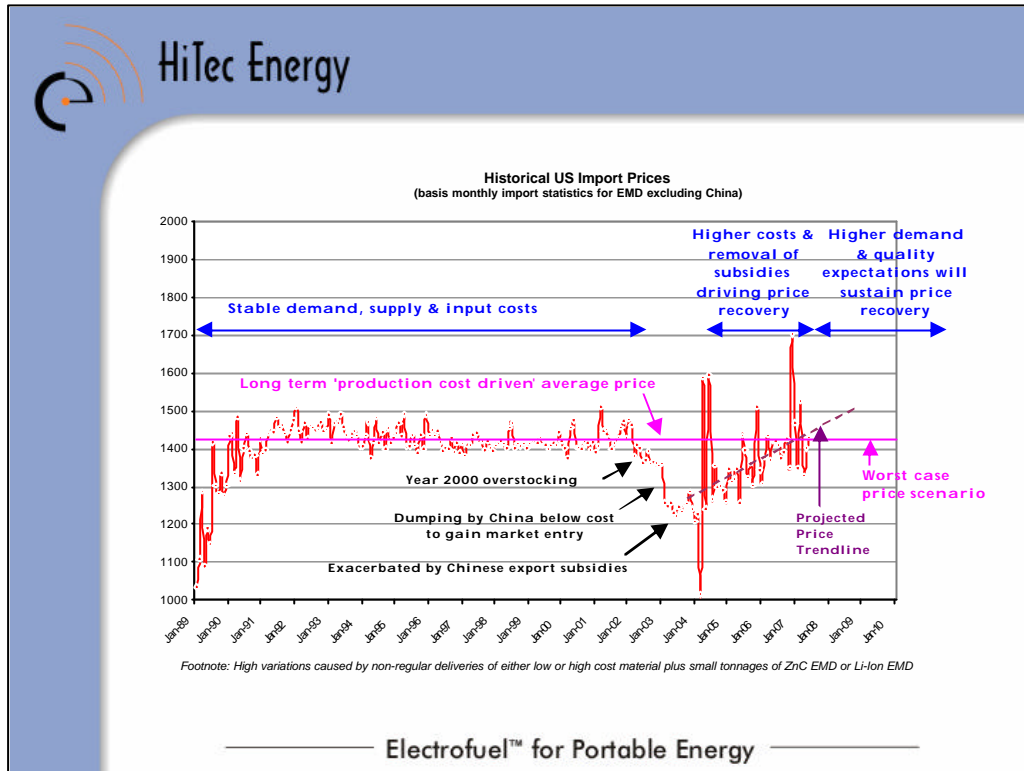
HiTec believes that the timing is now right for an investment in either high purity EMD or EMM or both.

Over the last five years the EMD industry has been in turmoil due to a succession of adverse events culminating in the entry of China into the market. The Chinese entry has destabilised the existing producers leaving them unable to react to changes in their input costs and demands on their environmental performance without a change in technology. Some plants will inevitably close over the next five years. (Eg, The Delta plc announcement that their Australian plant will now close in 2008.)

However, having effectively seized EMD and EMM production leadership, the Chinese will struggle to maintain it as their own production capacity is limited without significant rises in the product selling values above the levels that they have forced prices down to over the past five years.

Similar factors have also caused significant disruption in the EMM market but these also now seem to be behind us.

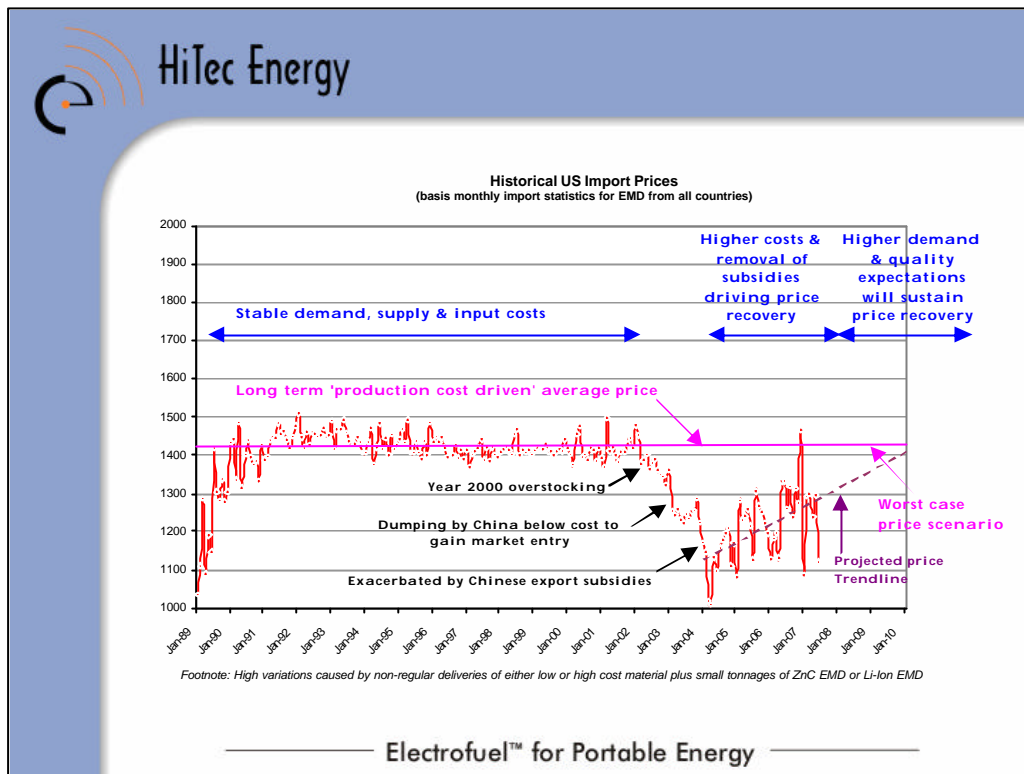
We believe that there is a window of opportunity now open for new producers to enter the market with quality product, produced consistently for relatively low cost, **provided that they adopt the processes that only HiTec can offer.**



As a proxy for the pricing of alkaline grade EMD we always use the declared US import prices as these have more rigour than other data sets that we can access. The trend picture we can see is also very clear despite large monthly variations around the trend line caused by irregular importer monthly consignments. NB: This particular chart shows the trend for all imports other than for China so, it while you can see the impact of the Chinese entry on other suppliers, it is not affected by the actual prices paid to the Chinese shippers.

Market price forecasters are universally predicting a continuation of the upwards trend in prices for at least the next two to three years due to strong and very solid demand for all manganese products. We at HiTec have no doubt about this as we see this as it is now clear that the market has now broken free and is responding to real demand and supply factors.

In this belief we are not naïve enough to believe that parties won't try to warp this market to their advantage in future. However, we believe the demand factors are so strong, and the constraints on increased production so great, that there is a huge opportunity here to be exploited by any party that can consistently produce high quality product at a reasonable cost.



For the record, here is the same graph with the Chinese prices included. You can clearly see that the upward surging trend line started at a much lower point (ie, around US\$1,000 per tonne FOB), but you can also see clearly that the trend is heading in exactly the same direction.

Said another way, having sold cheaply to buy market share (driving competitors to the wall in the process) the Chinese are now demanding higher and higher prices for their product and higher prices are being achieved despite continued grumblings from US battery makers about Chinese product quality.

Up until recently, our view was that the trend shown on this chart would continue through the long term price average of US\$1,440, to at least US\$1,700, at which point it should have stabilised for some time. However, this view was based upon an assumption that all large western plants will survive at these higher prices.

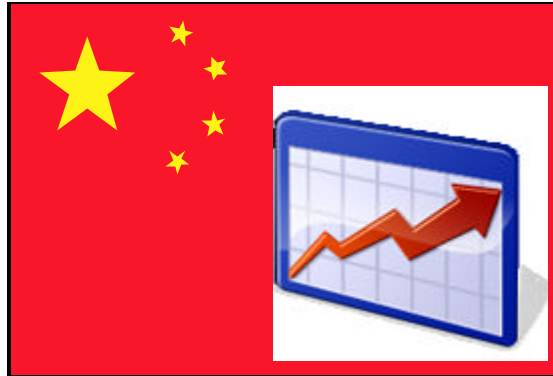
Since then, Delta plc has announced the closure of its Australian plant and this could see even higher prices for EMD for a year or so, until a new even higher price plateau is eventually found.

Anyway you look at the supply/demand picture there would seem to be inadequate future supply of high purity EMD, whether that be required for primary or secondary battery production.



HiTec Energy

Over the last five years, China has become a major producer and user of all grades of EMD!



Electrofuel™ for Portable Energy

Until the rise of China in the mid 1990's the alkaline EMD world was relatively tightly held by only eight companies. Tosoh, Mitsui, JMC, Tronox, Eramet, Panasonic, Delta and a small Brazilian company. All told they held eleven geographically spread production facilities.

Today those non-Chinese market participants have reduced to six companies with eight production facilities and most of these are under real threat of closure. Recently Delta plc has announced that its Newcastle plant, which has high costs and is facing anti-dumping action in the USA, will close in 2008 further tightening the supply demand balance.

In the same time Chinese alkaline capacity has risen from only one "true" alkaline capacity plant to at most six plants, albeit that the jury is still out on their quality performance and consistency.

The industry has done a complete turnaround with 94% of 1996 total production of 140,000 tonnes coming from countries other than China but by 2007, 47% of total production of 290,000 tonnes coming from China.

(NB: Again we stress that our numbers deal exclusively with EMD production for use in alkaline primary batteries and for manganese based rechargeable cells.)



HiTec Energy

Can China become the dominant player in the next five years and dictate market prices?



Very unlikely without a change of technology!

Electrofuel™ for Portable Energy

The answer to this question would appear to be “Very unlikely without a change of technology” :

- To reach its present position Chinese producers have sacrificed profit margin in a rising cost of materials context;
- They have also passed on government export subsidies which have now been withdrawn or substantially reduced;
- Their power cost subsidies, also in effect passed on to EMD buyers, have also now been reduced or eliminated;
- They rely heavily on low grade MnCO_3 ore, with all its inherent problems that inevitably impact on EMD quality and the local environment;
- They also lack domestic supplies of high grade MnO_2 ores so must import these at full market price where required;
- Their environmental standards have been variable, creating in some instances backlash from both local communities and government agencies; and
- **They do not have the technology to use efficiently the abundance supplies of low grade MnO_2 ore that they do possess. (NB: It is here that we believe that HiTec’s patents will eventually come into play!)**



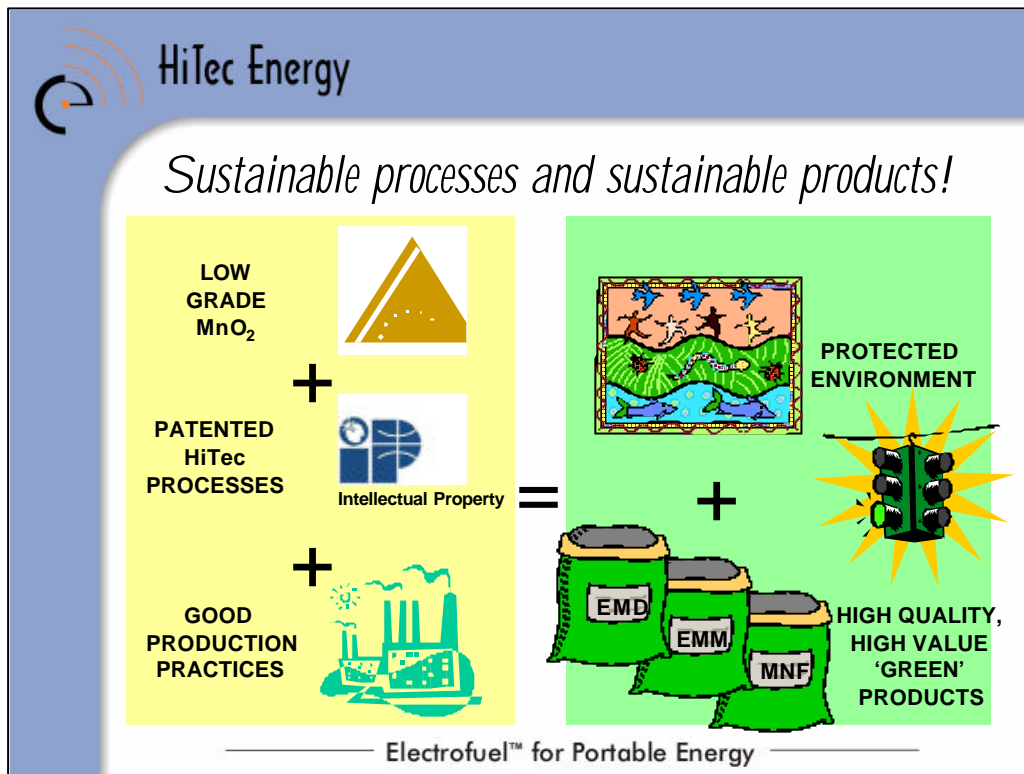
Sustainability Attribute 6

The process results in 'green' products that each in their subsequent usage result in an improved environment for the wider community.

Having a green production process as I have explained in this presentation is fundamentally important if a business is going to survive and prosper long term. Whether it be the reduction in energy consumption, the elimination of carbon output or the elimination of particulate or metal ion pollution, manganese electrolytic plants built today must aspire to meet and beat all current standards so that they have a chance to continue operating for decades rather than years.

However, having achieved all this, making products that are themselves used to reduce adverse environmental impacts, is the next most important business goal that can be aspired to if one wants to be around for the long haul. In alkaline and li-ion grade EMD's, for use in alkaline and li-ion batteries respectively, a very positive environmental story can be told. Likewise, the story for micronutrient fertiliser produced from plant tailings is also very positive.

Whether it be in terms of smaller more efficient batteries permitting downsizing and thus reduced materials usage, or in less problematic chemicals to deal with when those batteries are ultimately disposed of, our processes will provide a plant operator with a second good story to tell and very real environmental credits that should ensure long term survival of a plant despite community encroachment on industrial areas which always occurs despite the various authorities' best endeavours.



The key to a sustainable EMD or EMM industry is to make high quality product using an environmentally superior and long-term viable process. Unless this is the basis for an industry, the present and future environmental costs for a given community may well outweigh the short term economic benefits gained.

If low grade MnO_2 can be used, such as those found in many countries, but not used to their full potential, then an EMD or EMM industry will not only have an environmental advantage, but will also be able to make the highest quality electrolytic manganese product whilst enjoying a production cost advantage, to the extent of its feedstock costs, over the other production facilities worldwide that must use high grade Mn ores.

The unique combination of low grade MnO_2 ores, HiTec's patented processes and first class production practices, can result in both superior, environmentally friendly, products as their output and the best standards of environmental protection and cost efficiency achieved in their production.

When the added benefits derived from the conversion of unsightly tailings dams into a valuable and environmentally friendly micronutrient fertiliser product are understood, then the overall story becomes one worthy of great environmental kudos.