Mantra Venture Group Ltd.

Mantra Energy Alternatives Ltd. is a Nevada company, incorporated in May, 2007 as a subsidiary of Mantra Venture Group Ltd. (OTCBB: MVTG FSE: 5MV).

Investor Relations: Terry Johnston
Email: tjohnston@mantraenergy.com

Authorized Capital:
100,000,000 common shares
Par Value: $0.00001

Issued and Outstanding
(As at October 10, 2008): 25,840,161

Public Float
(As at October 10, 2008): 4,597,233

Management Team:
Larry Kristof
Director, President, CEO
Dennis Petke
CFO
John Russell
VP, Technology Evaluation

Mission:

Mantra Energy Alternatives Ltd. ("Mantra") seeks to be a world-leader in the development of commercially viable sustainable technologies that will minimize the impact of human activity on our climate, environment and health. Mantra's aggressive growth strategy will see the company create a significant return on investment for investors by becoming a key contributor to the global effort for environmental sustainability and, in particular, carbon dioxide management and reduction.

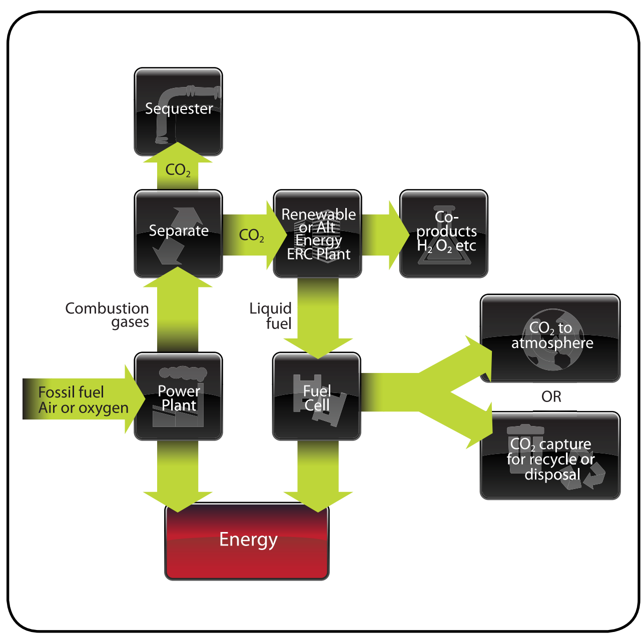
Mantra's competitive advantage lies in its ability to flexibly pair together investment and scientific expertise to guide promising new technologies through development and into market. Based in the Pacific Northwest, a hotbed of innovation in sustainability, Mantra is uniquely positioned to locate, incubate and capitalize upon revolutionary technologies.

ERC: Electroreduction of Carbon Dioxide

In November 2007, Mantra acquired its flagship technology, a chemical process developed at the University of British Columbia's Clean Energy Research Center. The reactor at the heart of the process, referred to as the electrochemical reduction of carbon dioxide, or ERC, has been successfully proven through small scale prototype trials. ERC offers an innovative solution to reduce the impact of carbon dioxide (CO_2) on Earth's environment by converting CO_2 into materials with a broad range of commercial applications, including a fuel for a next generation of fuel cells.

Powered by electricity, the ERC process combines captured carbon dioxide with water to produce high value materials, such as formic acid, formate salts, ammonium formate, oxalic acid and methanol, that are conventionally obtained from the thermochemical processing of fossil fuels. However, ERC has an advantage over the established thermochemical methods for converting carbon dioxide to liquid fuels. While thermochemical reactions must be driven at relatively high temperatures that are normally obtained by burning fossil fuels, ERC operates at near ambient conditions and is driven by electric energy that can be taken from an electric power grid supplied by hydro, wind, solar or nuclear energy.

In fuel cells liquid fuels are indirectly combined with oxygen to form carbon dioxide and water, while generating electricity. This process is known as electro-oxidation. The complimentary nature of ERC and electro-oxidation makes it possible to use ERC in a regenerative fuel cell cycle, where carbon dioxide is converted to a fuel that is consumed in a fuel cell to regenerate carbon dioxide. As shown in the figure, the net energy input required in this cycle could be supplied from a renewable or non-fossil fuel source.



The Need: Carbon Reduction and Fuel Cells

Carbon dioxide is increasingly notorious as a cause of global warming and a burden to industrial producers under increasing regulatory scrutiny. Apart from the obvious solutions of energy conservation and carbon sequestration (recovery and burial of CO_2) ERC offers a safe, viable and solution to mitigate and profit from CO_2 generated from fossil fuel combustion. While the increasing cost and scarcity of fossil fuels renders competing processes for converting CO_2 less and less desirable, and while carbon sequestration does not offer a renewable solution, ERC's compatibility with carbon neutral energy supplies makes it an attractive strategy for industrial producers struggling to meet regulatory caps on CO_2 emissions.

The international market for carbon dioxide management is currently in the US$ billions annually and carbon emissions credits are traded at values of up to US$40 per ton of CO_2. In addition to the numerous existing applications of ERC produced formic acid (feedstock preservatives, de-icing solutions, baking soda to name a few) the rapid development of direct formic acid fuel cells (DFAFCs) is likely to be a significant commercially valuable use of formic acid. DFAFCs are gaining popularity over hydrogen and methanol based fuel cells because of their ease of refueling, efficiency, and safety. An emerging technology, DFAFCs are currently being tested by major producers of portable electronics in phones, laptops and computers. With continued development there is potential for DFAFCs to challenge traditional batteries as power sources for mobile electronic devices. Large scale applications of DFAFC technology are expected to follow. Sodium formate and formic acid are the primary products of the ERC process and both will fuel DFAFCs.

Yet another new application is the use of ammonium formate as an additive to diesel fuel (it reduces the NO_x emissions). Truck and car manufacturers in Europe and Japan are testing it now – it could be a future large market. The ERC process can be adapted to produce ammonium formate.

Application - Steel

Existing applications of primary ERC products include feedstock preservatives, de-icing solutions, and baking soda, to name a few. Sodium formate and formic acid currently have a market value of $2,200 per ton. More than 600,000 tp/year of formic acid is produced: BASF is the largest producer and world marketer. Formic acid has uses including the following: cleaning purposes, de-icing of planes and runways, as a precursor chemical in making agricultural and other finished chemicals. Sodium bicarbonate has a market value of $500 per ton.

Application - Fuel Additive

Diesel manufacturers in Europe and Japan are concerned with NO_x emissions from diesel trucks and cars. A new fuel additive – ammonium formate – shows great promise and is being tested. It is likely to be adopted and would be a large market worldwide. The ERC process can be adapted to produce ammonium formate.

ERC Development

Experimentation on the electroreduction of carbon dioxide has been carried out in several laboratories over many years, but in circumstances not appropriate for industrial application. The recent focus on carbon dioxide and climate change has motivated work at the University of British Columbia to develop a continuous reactor with the potential to be the basis of a commercially viable process for ERC, as described in the PCT Patent Application WO2007/041872 "Continuous co-current electrochemical reduction of carbon dioxide". Mantra Energy Alternatives has now acquired this intellectual property with the prospect of developing a commercial ERC process that will help the worldwide efforts to lower carbon dioxide emissions and mitigate global warming.

In May, 2008 in collaboration with Kemetco Research Inc., a private sector integrated science, technology and innovation company, Mantra established a research and development facility for the ERC in Vancouver, British Columbia, staffed by a dedicated research team. To date Mantra has financed and commenced a development program that will see the construction of a scaled down industrial grade ERC test reactor by September, 2008, to be followed by 6 to 12 months of testing to prepare the ERC for pilot scale (1 ton of CO_2 per day) commercial trials. We are also establishing relationships with major industrial partners to pair the ERC with complimentary technologies and applications. Within a 4 to 5 year period, we expect to progress from pilot scale trials to the implementation of full scale commercial ERC reactors capable of processing 100 tons of CO_2 per day.

Market for formic acid in steel making

ERC's primary purpose is to convert CO_2, a waste product of burning fossil fuels and an environmental problem, into a valuable product, formic acid. But if the ERC process is both economic and successful it is likely to be widely accepted as a way for industry to deal with exhaust gas from power production; there then arises the danger of overproduction of formic acid, that is, in excess of market demand. (The current world market is modest – hundreds of thousands of tonnes annually[1].) This would limit the value of the product and might act as a barrier to the wider spread of an otherwise valuable technology. So it is useful to anticipate the issue and look beyond the current market to ask if there are future applications that can take up a much larger volume of formic acid. This question quickly becomes: can the strongest of the organic acids (formic acid) replace the use of strong acids like hydrochloric (HCl acid) and sulfuric. Formic acid is much more environmental friendly.

The market discovered:

On investigation, there is an application in hot-rolled steel pickling (cleaning the oxidized surface of hot-rolled steel during the manufacturing process in a steel plant), this is one of the largest uses today of HCl acid [2]. Formic acid is potentially more attractive in this application than HCl because:

1. It gives a better surface quality (HCl is an aggressive acid and can pit the steel).
2. Less iron is lost from the steel surface
3. Less rinse water is needed after pickling
4. A caustic rinse is necessary to neutralize the HCl; no neutralizing rinse is required with formic acid
5. Corrosion inhibitors are not required to reduce the amount of steel etching
6. HCl is so aggressive that the surrounding plant equipment gets corroded quickly; use of formic acid will result in a longer plant life
7. Formic acid is bio-degradable
8. Formic acid can be reconcentrated and reused from the aqueous spent solution, not HCl
9. Precipitated iron formate can be recycled back into the blast furnace to recover iron that was etched from the pickling operation
10. Process water can be recycled more easily.

ERC also produces O_2 as a byproduct: the oxygen goes to the blast furnace where it will improve combustion.

There are other large scale industrial applications of formic acid that are being considered and investigated by Mantra, but until we have more information this is not the time to discuss these ideas.

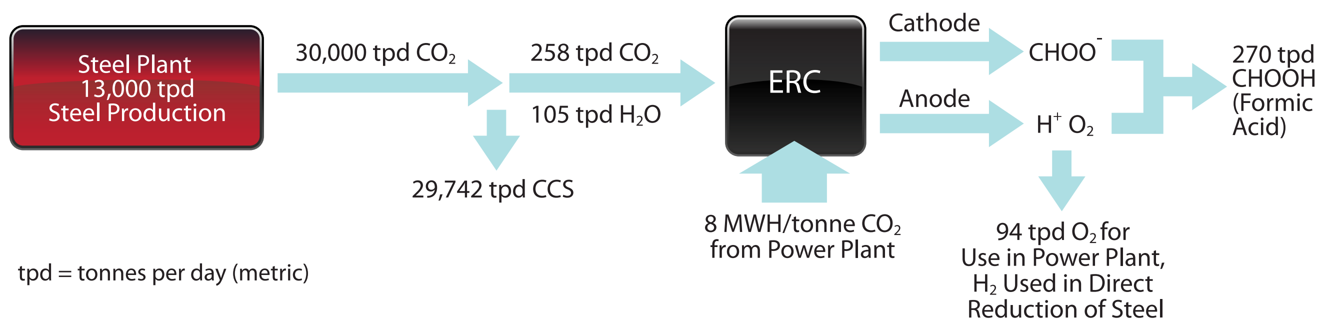
[1] Formic acid world capacity is 620,000 t/a according to the China Chemical Reporter, June 16, 2006, author Yeli Li. The prime production method is by the light oil liquid-phase oxidation method.

[2] HCl production is estimated at 20 Mt/year according to Wikipedia. One of the biggest applications is pickling of steel.

The process described for a 13,000 tpd steel plant

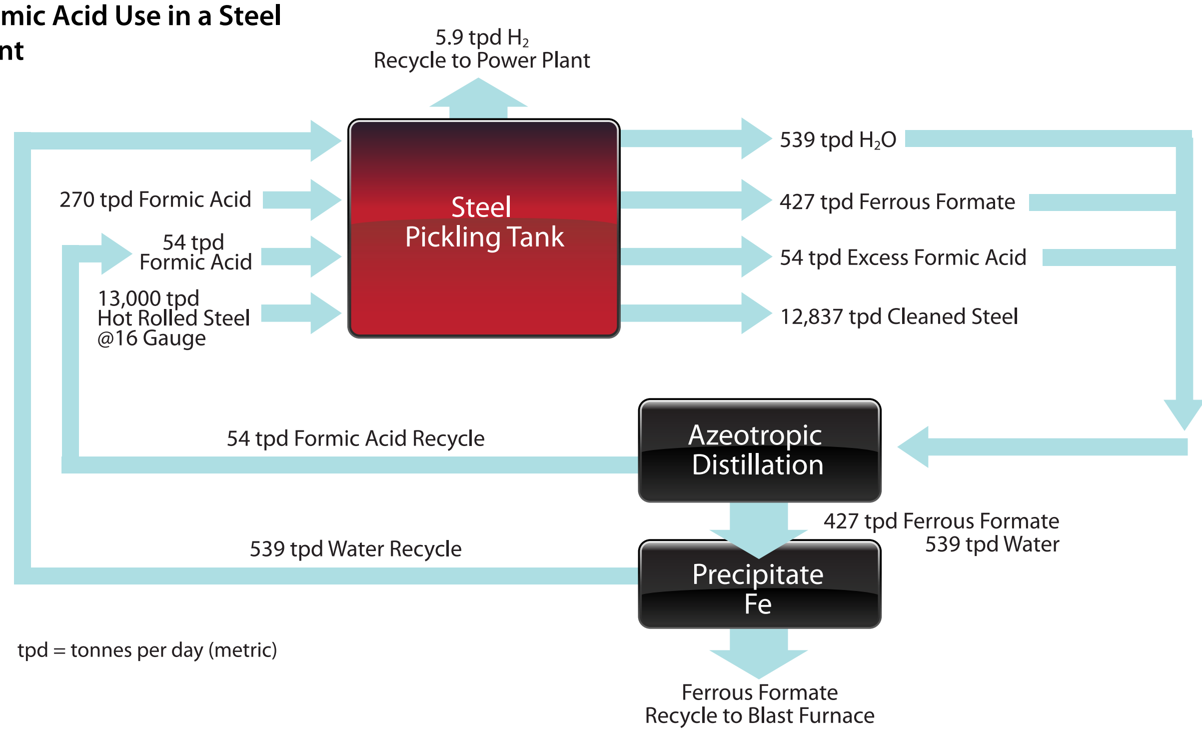
Attached is a conceptual flow sheet which shows the production of formic acid.

Formic Acid Production in a Steel Plant



A second conceptual flow sheet shows the integration of Mantra's ERC system into a steel mill making 13,000 tpd of 16 gauge rolled steel; ERC is designed to take the CO_2 from the steel plant and convert it into formic acid which is then used to replace the use of hydrochloric acid in "pickling" hot-rolled steel[3 4]. This is one of the largest uses of hydrochloric acid in the world. In the manufacturing process iron ore is converted into steel which is poured into billets; these are later reheated and rolled into strip steel; as they are being rolled oxides forms which must be removed to provide a clean surface. The finished steel strip goes on to make refrigerators, car panels or other steel products.

Formic Acid Use in a Steel Plant



[3] "About 1/4 of the HCl produced in the U.S. is used for pickling steel", from americanchemistry.com http://www.americanchemistry.com/s_chlorine/sec_content.asp?CID=1255&DID=4735&CTYPEID=113

[4] The process for the use of formic acid in steel pickling has been researched by the European Steel Research Association. They patented the process which has since lapsed. See reference appendix for more detail.

Steps Described

Note: the numbers below are not exact. In a real world situation there is wastage and spillage: the numbers given are close enough to illustrate the overall idea.

- 13,000 tpd of steel production results in 30,000 tpd of CO_2 from the power plant, coking plant and pellet sintering plant
- 258 tpd of CO_2 is calculated as the requirement to make sufficient formic acid to pickle 13,000 tpd of 16 gauge hot-rolled steel strip. This process requires 105 tpd of water. Each tonne of CO_2 requires 8 MWh of electricity.
- The ERC reactor will generate 270 tpd of formic acid and 94 tpd of pure oxygen gas. The oxygen will be injected into the blast furnace to improve efficiency. Hydrogen is also produced.
- 270 tpd formic acid is diluted with 539 tpd water to give the pickling solution: formic acid at 500 g/L
- After processing 13,000 tpd of 16 gauge hot rolled steel strip, 5.9 tpd of hydrogen gas is available to be recycled to the power plant; 12,837 tpd of cleaned steel is produced; 54 tpd of excess formic acid; 539 tpd of water; and 427 tpd of ferrous formate
- The residual formic acid is separated using azeotropic distillation and reused
- The ferrous formate is recycled back into the blast furnace
- The waste water (pickling solution) is reused in making up the new pickling solution.

Reference Material Appendix

European Steel Research Association, information to be found at:
http://www.eurofer.be/publications/pdf/2002-NetEURes.pdf

Their lapsed pertinent patent is described below:

Abstract: Steel sheet is subjected to a thermal treatment as a result of which an oxide layer is formed. The sheet is pickled by contact with an organic acid solution (formic acid), containing at least 50 mg/l of iron, at a pH of 1.5 to 4 and at a temperature above a minimum value T_m given by T_m =20+(pH-1.5)32.

We claim:

1. A process for the continuous treatment of steel sheet, comprising the sequential steps of:

   - thermally treating the steel sheet to form an oxide layer on its surface;

   - pickling the sheet having the oxide layer by bringing the sheet into contact with a solution of formic acid, the solution having an iron content of at least 50 mg/l, while

   - maintaining the pH of the solution between 1.5 and 4, and maintaining the temperature of the solution both above 40° C. and above a minimum value T_m in C.° given by the equation T_m =20+(pH of solution-1.5)32;

   and

   - adding hydrogen peroxide oxidizing agent to the solution, while maintaining the concentration of the oxidizing agent in the solution between a minimum value equal to the value necessary to oxidize at least 80% of the ferrous ions in solution to ferric ions and a maximum value of up to ten times the minimum value wherein, the formic acid pickling solution is self-regenerating by the sequential steps of,

   - reacting the formic acid with the ferrous oxide coating of the sheet to yield ferrous formiate and water,

   - reacting the ferrous formiate, the hydrogen peroxide oxidizing agent which is added, and the formic acid together to form ferric formiate and water, and

   - producing a hydrolysis reaction between the ferric formiate and the water to regenerate the formic acid and produce a ferric hydroxide precipitate;

   - removing the ferric hydroxide precipitate from the pickling solution, and

   - recycling the regenerated formic acid.

2. A process as claimed in claim 1, in which the rate of weight loss of the sheet during pickling is at least 5 mg/m^2.
3. A process as claimed in claim 1, in which the iron content of the organic acid solution is at least 100 mg/l.
4. A process as claimed in claim 1, in which the formic acid solution has a pH of 2.6 to 3.6.
5. A process as claimed in claim 1, in which pickling is carried out in several successive enclosures by means of separate solutions, of which at least one is the said formic acid solution and has a temperature higher than 40° C.
6. A process as claimed in claim 1, in which the maximum concentration value of the oxidizing agent is twice the minimum.
7. A process as claimed in claim 1, including rinsing the pickled sheet with water, and continuously recycling the rinse water while subjecting it to a treatment for neutralizing or chemically destroying residual acid.
8. A process as claimed in claim 7, in which the formic acid contained in the rinse solution is chemically destroyed by adding to this solution hydrogen peroxide and a catalyst.
9. A process as claimed in claim 8, wherein the catalyst is copper or iron.
10. A process as claimed in claim 1, wherein the iron content is from 60 to 500 mg/l.

Management

Larry Kristof
President and Chief Executive Officer

Prior to founding Mantra Venture Group Ltd., Mr. Kristof served as President and Chief Executive Officer of Lexington Energy Services Inc., a Calgary, Alberta company he co-founded. Under his direction, Lexington designed and commercialized innovative mobile drilling rigs and nitrogen generation technologies. He successfully raised capital for the company on public markets.
Before establishing Lexington, he founded Westec Venture Group Inc., a company which provided business development and venture capital services.

Dennis Petke
Chief Financial Officer

Mr. Petke is qualified as a Chartered Accountant in Canada, and has been a member of the Institute of Chartered Accountants of British Columbia since 1995. Currently serving as a director and/or chief financial officer for a number of private and public companies, his responsibilities include strategic and overall financial management for these companies. Mr. Petke has accumulated extensive experience in the area of corporate finance, including negotiating and implementing private and public company mergers, as well as facilitating private placement, preference share, convertible debenture, special warrant and debt financings.

John P. Russell
Vice President of Technology Evaluation

A founding member of Mantra's management team, Mr. Russell has over 30 years experience in the identification, evaluation and marketing of technological resources. From 1995 to 2007, Mr. Russell was as Vice President of Technology with ARC Sonics Inc., a specialty engineering firm. He has authored several scientific publications and has presented technological innovations at conferences internationally. Mr. Russell holds a Bachelor of Arts from the University of British Columbia.

The ERC development team

Professor Colin Oloman, P.Eng,
Scientific Advisory Board Member and Consulting Scientist

The co-inventor of the ERC, Prof. Oloman has been a member of our Scientific Advisory Board since November 2, 2007. Prof. Oloman is a graduate of the Universities of Sydney and British Columbia and has been engaged in the field of chemical engineering for 40 years, both in academia and industry. As a faculty member in the Department of Chemical and Biological Engineering at the University of British Columbia, from which he retired in 2004, Prof. Oloman has taught a range of undergraduate and graduate courses in the area of chemical and biological engineering. A professor emeritus of the University of British Columbia, professional engineer, member of the Chemical Institute of Canada and the Electrochemical Society, Prof. Oloman has authored or coauthored three books (Ol's Notes on Material and Energy Balances, Electrochemical Processing for the Pulp and Paper Industry, Handbook of Fuel Cell Modeling) plus numerous proprietary reports and publications in technical journals. He is also an inventor or co-inventor of some twenty U.S. and international patents. Prof. Oloman's ongoing research and consulting interests are centered on electrochemical systems, with a focus on the design of electrochemical reactors for electro-synthesis and power generation.

Norman Chow, P.Eng,
President, Director, Industrial Process, Kemetco Research Inc.

Norman Chow earned a B.A.Sc. in Metals and Materials Engineering from the University of British Columbia, graduating top of his class. Continuing his education, he received a Masters of Applied Science Degree and then became a Registered Professional Engineer (P. Eng.) in British Columbia. Mr. Chow has over 10 years of technology development experience and contract research experience. Mr. Chow also co-invented a patented electrochemical metal cleaning process that is used worldwide by multi-national companies. He has a background in technology development, business management, international sales, project management and manufacturing. Mr. Chow has been the winner of several prestigious awards that recognize his skills in engineering and business. In 1996, his patented metal cleaning technology, won the Financial Post Gold Award for being the Top Environmental Technology in Canada, and then in 2004 he was named the winner of the Business in Vancouver Top Forty under 40 Award.

Joey Jung, P.Eng,
Research Engineer, Kemetco Research Inc.

Joey Jung earned his Masters of Applied Science Degree from the University of British Columbia in Chemical Engineering and subsequently became a Registered Professional Engineer (P. Eng.) in British Columbia. He has had a successful career in electrochemical engineering and battery research, formerly serving as Vice President and Chief Technology Officer of a publicly traded battery development company.

Dr. Edward J. Anthony
Scientific Advisory Board Member

Dr. Edward J. Anthony has been a member of our Scientific Advisory Board since January 23, 2008. Currently, Dr. Anthony is a Senior Research Scientist for the National Research Council ("NRC"), Canada, based in Ottawa. Dr. Anthony has had a lifetime of involvement with energy issues and most recently served as the Canadian Representative on the International Energy Agency and as the Session Chair responsible for the September 2007 Greenhouse Climate Change Sessions of the Pittsburgh Coal Conference in Johannesburg, South Africa. He has authored over 100 papers published in refereed journals, and directed several research projects at the NRC on the capture and sequestration of carbon dioxide for greenhouse gas abatement.

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