



Python Group — Q2 2010 Scales Newsletter

History of Nickel Mining in Sudbury

Nickel has been the main source of mining in Sudbury since the city was established. The first recording of ore however was in 1856, and only included copper. Mining took time to commence in the area, as it was vastly unpopulated in the mid 1800's. To learn more see the article on pg.2 of this newsletter for details from the discovery of initial ore to current day for the two major nickel miners in Sudbury.

Biodiesel — The Future of Alternative Fuels

Cost effectiveness and environmental awareness are both key issues in the mining industry. The heavy dependency on diesel fuel for haulage equipment has led to high environmental rehabilitation costs for mining companies. The problem is that alternatives are currently unavailable or not feasible due to price or operating conditions. Biodiesel may be the answer; similar operation to current diesel engines but with less pollution. To learn more about the creation, uses and advantages of biodiesel see the article

Volume 1, Issue 2



Early settlement in Sudbury circa 1888

Charlie Page Interview



Python Mining Consultants had an opportunity to speak with Charlie Page on February 1st 2010. Jordan Young spoke with Charlie about Queenston's direction and some of Charlie's personal goals and aspirations. See page 9 for

Trolley Assisted Mine Trucks



Open Pit Haulage Truck on Trolley Line

Ore haulage for open pit mines can be a significant expense. Large diesel trucks are needed to move the ore from pit bottom to surface. The efficiency of these trucks is limited to the efficiency of their diesel motors. Electric powered trucks have been proven faster and more efficient, but battery powered units are not practi-

cal in most mining situations. The answer may be with trolley assist power lines. Providing the benefits of both diesel powered units and electric efficiency, trolley research may lead to the future of mine haulage trucks. For more information see the article on pg.7 of this newsletter.

Discovery of Ore in Sudbury



Sudbury's Big Nickel Monu-

Salter noticed a deflection in his compass readings in an area about 200 yards west of the cur-

The first recording of possible ore in Sudbury was in 1856. This discovery was made by the land surveyor A.P. Salter and geologist Alexander Murray. Salter noticed a deflection in his compass readings in an area about 200 yards west of the current Creighton mine site.

Murray took samples and wrote a report, but there was not much interest in mining that area at the time. More geological studies were done in 1886 which lead to the start of production in 1901. Creighton mine was owned and operated by the Canadian

Copper Company, which upon discovery of nickel in Sudbury spurred the creation of the International Nickel Company. These two divisions became known under the trade name INCO in 1919, and continued under than name until the company's

INCO

INCO began production with the Creighton and Murray mines in the early 1900's, but quickly began to expand its operations in the Sudbury area. The Frood-Stobie mine began production in the 1920's. Originally believed to be two orebodies, Frood owned by INCO and Stobie owned

by Mond Nickel, the companies amalgamated under the INCO name once it was discovered they were actually combined. During the 1930's the copper cliff smelter was completed. This eliminated the need for heap roasting, a process where heaps of

lumber are burned to smelt the ore. The heap roasting left its mark on Sudbury, killing most of the plant life and charring the rocks a smoky black colour. The 1940's was a time of frantic production for INCO with the war effort requiring more nickel than ever. During



Inco's 1234 ft Superstack

In the 1960's INCO completed the sinking of the world's deep-

...deposits were discovered in Thompson, Manitoba and INCO expanded its production out of Sudbury. In the 1960's INCO completed the sinking of the world's deepest shaft, 7138 feet No.9 Shaft at Creighton mine. The Clarabelle mill was constructed in 1971 and was capable of handling

35,000 tonnes per day of ore. This allowed multiple mines in Sudbury to produce ore and truck it to one central location. By this time Sudbury has many mining operations and the city is filled with various companies involved in the mining field from equipment suppliers to engineering consultants.

The 1980's was a time of growth for INCO with expansions into the cobalt market as well as the aerospace industry. 1989 was a record high profit year for INCO, bringing in over \$750 million. Mining in Sudbury has continued to the present with the expansion of current mines and new development projects.



**Sudbury Nickel Cuivre
Circa 1930**

By 2006 the entire company was taken over by Xstrata near the same time Inco was taken over by Vale...

Falconbridge began its life in 1928 as an independent company, incorporated by Thayer Lindsley. Falconbridge then purchased mining claims in the town of Falconbridge, Ontario (within the borders of Greater Sudbury). In 1929 Falconbridge purchases a refinery in Norway. By 1930 Falconbridge mine is in operation and is shipping ore overseas for refining. The smelter begins to operate in Sudbury at the same time, processing the 250 tonnes per day of ore from the Falconbridge mine. In 1932 Falconbridge added a 200 tonne per day mill to their operations. Mining is steady but not expanding for Falconbridge until 1949. Falconbridge adds 12 mines to the Sudbury operations over the next 20 years. In 1962 Falconbridge merges with Venture Limited to expand its worldwide mining presence. In 1978 the new smelter and sulphuric acid plant begin operations in Sudbury. The main goal of the new facilities is to reduce SO₂ emissions into the environment. The Falconbridge mine closes in 1984 once its ore reserves have been exhausted. Many other mines keep Falconbridge running in the Sudbury area. By 1990 the East mine closes, leaving the small town of Falconbridge with no operating mines. Mining at other sites continues in Sudbury up to today. In 2005 Noranda and Falconbridge complete the merger to become Falconbridge Limited. By 2006 the entire company was taken over by Xstrata near the same time Inco was taken over by Vale. Current day Xstrata Falconbridge has only one mine in operation, the nickel rim mine. It is expected that a rise in demand may warrant reopening of some recently shut down mines in the near future.

Falconbridge

References:

- The Discovery of Sudbury Nickel was Accidental, Gary Peck. "<http://www.republicofmining.com/>"
 - INCO history "www.inco.com"
 - Falconbridge history "<http://archive.xstrata.com/falconbridge/www.falconbridge.com>"
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Biodiesel car being refueled by vegetable oil

Current gasification methods also release a lot of carbon monox-

Alternative fuels are becoming more popular as the prices of oil rise and the environment becomes of greater concern. Biodiesel is one of these fuels, and is a becoming a popular alternative to using conventional diesel from petroleum. Biodiesel offers an environmentally friendly solution that does not rely on foreign oil sources for import, but can be created here using our own resources. There have been many advances in diesel motors, and they have changed from the loud and violent engines of the past to become smooth, quiet, and clean. People associate diesel motors with transport trucks that roar away slowly while spewing clouds of black smoke. The new diesel technology allows consumer vehicles to run cleanly, without the black exhaust, and more smoothly. Even the smell of diesel fumes has been greatly reduced through new filtering methods. These advances only further support the use of biodiesel as the best option for a future alternative fuel.

Biodiesel is currently fairly inefficient in its creation. It requires specific biomaterial as a source, such as corn, and that goes through a gasification process that requires large quantities of this biomaterial. Current gasification methods also release a lot of

Gasification

Gasification is the process used to turn biomaterial as well as coal or petroleum into carbon monoxide and hydrogen. For the purposes of this study the focus will be set on converting biomaterial as it produces the least pollution and is the most environmentally friendly solution to our future fuel needs. Conventional gasification is done by reacting the material at very high temperatures with a controlled amount of oxygen and steam to separate the carbon monoxide and hydrogen. The biomaterial added can be anything from trees, bushes, wood chips, even garbage. The result of this basic

gasification is something called synthesis gas, or Syngas.

Syngas

Syngas is the product of gasification which is useful. Syngas is primarily carbon monoxide and hydrogen but can include some other gasses. Syngas can be used in many different ways, one of which is the production of synthetic natural gas, which is where the name comes from. Syngas is also used in producing [synthetic petroleum](#) for use as a [fuel](#) or [lubricant](#) via "[Fischer-Tropsch](#)"



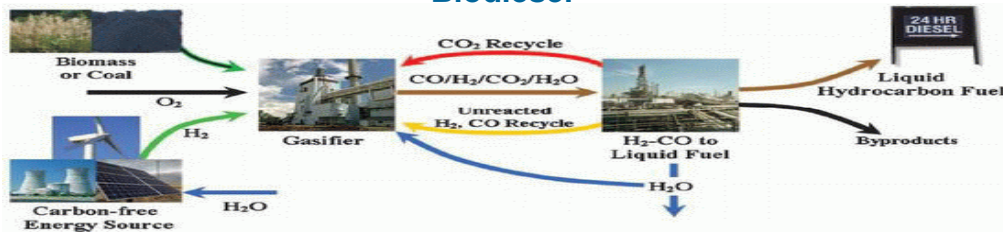
Updraft Gasifier:
 1. Fuel Source
 2. Roasting Cham-ber
 3. Ash Bins



Updraft Gasifier

There are many different types of gasifiers but the primary type used for biomaterial is the counter-current fixed bed gasifier, also known as an “updraft” gasifier. This type is a large cylinder as seen on the left that contains the fuel (biomaterial) on the bottom. Once the biomaterial is properly heated (initial heating) then oxygen and steam are shot through the material under pressure. The resulting reaction creates the high temperature fuel that rises and is collected

Biodiesel



Currently a large problem with other alternative fuels is that there are no vehicles available to run them. Hydrogen fuel cell vehicles require completely new vehicle designs, but car

manufacturers are not mass producing them. Electric vehicles are available for some industries, but not widely available as commercial vehicles. By using biodiesel we can avoid some of

these problems. Biodiesel is a direct replacement for diesel fuel, and often requires little or no modification to existing diesel engines. Biodiesel is a clean burning alternative

fuel that has been seeing increased use worldwide.

Biodiesel is currently created using the gasification process, but is not yet efficient enough to compete with petro-



1941 Adler Diplomat built to run

The modifications needed for biodiesel are fairly cheap and minor. In old vehicles the major problem is that regular diesel use has caused the buildup of hydrocarbons in the fuel tank and fuel delivery system, and biodiesel is a natural solvent that

removes and releases these buildups. For the initial period after converting to biodiesel a couple of quick filter changes may be required to remove the buildup that has been released. It is also possible to put a new fuel system in and

One question that is often raised by anyone considering biodiesel is “Will I lose power or fuel economy?”. Unfortunately the second

statement is true; biodiesel has been shown to provide approximately 10% less fuel efficiency. This extra spending on fuel could be offset if

the price of biodiesel was 10% lower than regular diesel. When available power is a concern, biodiesel may actually provide more power



Legal Issues With Biofuels

The United States currently portrays a public image of trying to reduce automobile emissions and use cleaner vehicles and fuels. Unfortunately this image does not reflect on their current laws. According to Henderson (June 11th 2007), one man in Charlotte spent \$1,200 to convert his 1981 diesel Mercedes to run on vegetable oil. He bought soybean oil in 5-gallon jugs at Costco, spending about 30 percent more than diesel would cost. His reward from the government that promotes use of alternative fuels; a \$1000 fine for not paying motor fuel taxes. He was also told

to expect another \$1000 fine from the federal government.

United States law states that all vehicles burning fuel on public roads must pay a motor fuel tax. This tax is included in the price at the gasoline pumps. For anyone who uses fuel they purchased elsewhere, at Costco for example, they must pay the government extra taxes on the fuel. This tax was explained as a way to limit the amount of pollution created, and to help restore the damage already done. The problem is that biofuels do not create pollution, but are still

His reward for use of alternative fuels, a \$1000 fine for not pay-

Future of Biodiesel



City Buses equipped to run on biodiesel to promote the

Biodiesel may be the future of transportation and even energy production in Canada and worldwide. To achieve this goal the process must be refined to make it efficient and economical enough to compete with fossil fuels. With the prices of oil rising and the potential to continue their rise, the case for biodiesel become much stronger. It may be difficult for citizens

to accept new technology simply on the merits of the people creating them. Real world testing and proof of these new fuels capabilities will need to be done and reported accurately to the public. The key to a new fuel succeeding is proving that it is economical, practical and does not require a major change from the public in terms of how their vehicles operate. Accord-

References:

- Agrawal R., Singh N., Ribeiro N., and Delgass N., Mar 14, 2007. [Sustainable fuel for the transportation sector](#), School of Chemical Engineering and Energy Center at Discovery Park, Purdue University, PNAS
-

Trolley's are overhead power cables that can be used by mobile equipment to supply energy for their electric motors. You have likely seen similar setups for streetcars in cities which run on tracks and have overhead power. For open pit mines tracks would not be feasible due to the steep grades, sharp corners, and constantly changing haulage ramp. This is why most operations today utilize rubber tired, diesel, haulage trucks. Electric motors have been proven more efficient than their diesel counterparts, and for the mining industry efficiency is key. The only thing stopping widely used electric power for trucks is the lack of a supply. Batteries can drain quickly, are heavy and expensive, and take a long time to charge. The solution to this problem is overhead trolley power lines. These will supply constant power, with no weight gain and no downtime for charging.

It is not possible to have overhead trolley cables installed everywhere, that is why a diesel motor is still necessary. The trucks use the trolley power when moving up and down the main ramp, but switch to diesel on the level and



Open Pit Haul Truck with Trolley Power Cantilever

propelling the trucks uphill, and can increase haulage speeds significantly. The faster speed of these trolley trucks also increases overall efficiency (fewer trucks needed).

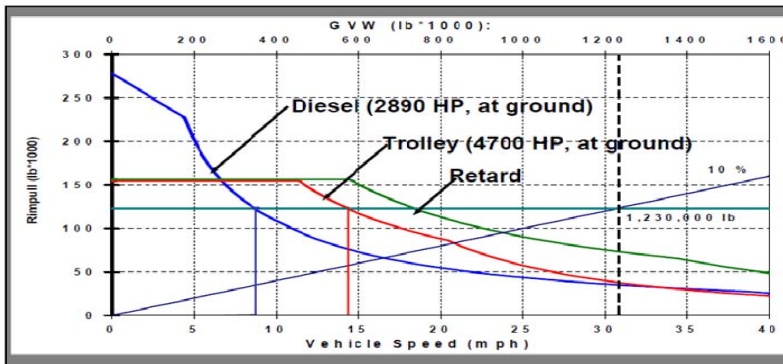
Some of the other benefits of using trolley assisted trucks are with the noise and maintenance. Noise is significantly reduced when on electric power which can make the workplace safer and more enjoyable. Maintenance costs

are normally lower due to the reduced use of the diesel motors. The air quality in and around the mine site is much better with the lack of constant diesel emissions.

Trolley assisted trucks have been used and tested at the Grootegeluk Coal mine in South Africa. Trolleys have been proven to be faster and more efficient by comparing pure diesel to trolley on the same trucks. See the table

| <u>Komatsu 730E - 190 Tonne</u> | <u>Non-trolley</u> | <u>Trolley</u> |
|-----------------------------------|--------------------|----------------|
| <u>Speed (Km/H)</u> | 12.2 | 23.7 |
| <u>Fuel Use (Litres/Hour)</u> | 367 | 37.4 |
| <u>Electricity Use (kW)</u> | 0 | 1930 |
| <u>Cost of Fuel (\$1.05/L)</u> | \$ 385.35 | \$ 39.27 |
| <u>Cost of Power (\$0.07/KwH)</u> | \$ - | \$ 135.10 |
| <u>Total Cost (\$/Hour)</u> | \$ 385.35 | \$ 174.37 |

Another study done with a 360 ton truck showed an obvious advantage with regards to power and speed capabilities when attached to the trolley line.



360 ton AC Hauler on Trolley Assist:

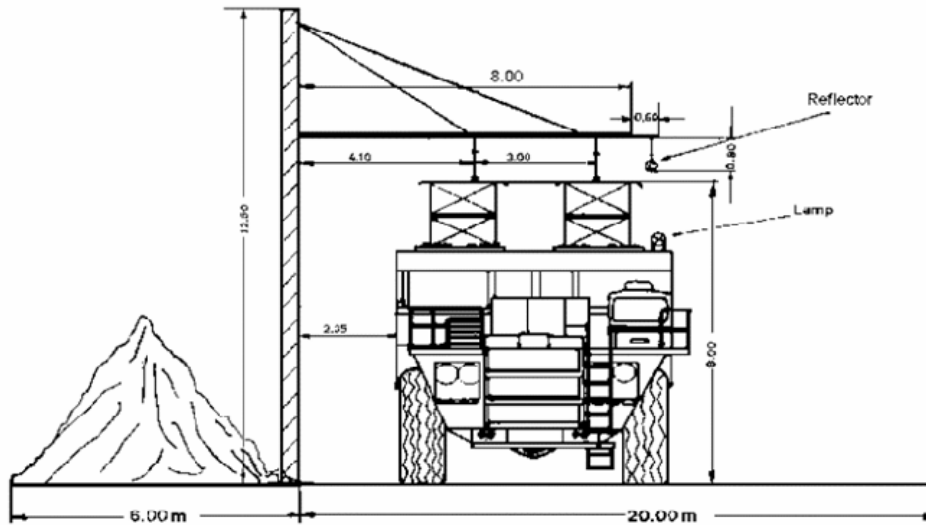
62% faster than with 3500 HP Diesel

The mechanics of trolley assist appear simple at first, a power line with a cable attached. Quick attach and detach is necessary for mine trucks to maintain their speed advantage and effi-

ciency. A system has been designed which uses a magnetic field electrical connection to power the trolleys. This gives the advantage that the trucks cantilever does not need to be constantly

touching the power line, and can instantly attach or detach simply by drilling away from the trolley line. There is an onboard sensor that tells the driver how close or far away they are from the

power cables so that they can maintain the best electrical connection. See the figure below with the overhead trolley lines and the truck equipped with cantilever.



The obvious question now is why are all mines not using this system? There are some downfalls and costs which make it uneconomic or too risky for some planners. There is a higher capital cost attached with the special attachments for the truck and the construction of the trolley system.

Electrical substations and large steel masts are required for the

trolley lines which also add to the cost. There have been some issues with stringing and tensioning the power lines so that they do not droop down and catch on other vehicles.

There have also been concerns with the damage caused to the system from rockfalls, land slips, and nearby blasting.

Currently larger and higher production mines can more



easily justify the capital costs of the trolley system for the gains in operating costs.

More studies will need to be done to prove the overall efficiency of trolleys as well

as to minimize the disadvantages.

Thank you for taking time out of your day to speak with me and thank you for this opportunity to interview with you on behalf of the Python Newsletter.

I know our readership would enjoy hearing & learning about a mining professional such as yourself.

Jordan: How long have you been involved with Queenston Mining?

Charlie: I have been with Queenston since 1987. Queenston was two companies at one point, HSK Minerals and Joutel. It was used as learning material while I was in school.

The Kinross acquisition led to the Kirkland Lake Gold formation of Queenston. Queenston bought Inco Gold's Kirkland Lake properties in 1995 and in 2002 finally arrived at current position. Recent announcement of a merger between Vault and Queenston may dramatically change the companies portfolio.

Jordan: What did you find most enjoyable, challenging within your work/time with Queenston?

Charlie: I enjoyed working on exploration projects the most in the early 1990's when gold prices were very low. We had very aggressive targets. I now particularly enjoy working with the large exploration budget (10 million to exploration in 2009). I also feel lucky to have such a cooperative board of directors who I find very easy to work with.

Jordan: Which key parts of your own personal educational or experience background do you believe served you the best working with Queenston?

Charlie: I have a passion for geology and determining economic geological reserves. I had opportunities to work in the gold mining field during summers at school and realized my interest in gold.

Jordan: If someone gave you complete control in all aspects of the company, what projects would you focus your attention on within the next 18 months?

Charlie: I would focus on East-Gauthier and its four gold deposits. I would focus on bringing it from a pre-feasibility level to full feasibility. Secondly I would focus on the Teck Township Joint Venture in Kirkland Lake the early stage exploration of this project provides the highest grades to the mill and has huge potential.

Jordan: What do you consider your greatest strength and weaknesses as a mining professional?

Charlie: I find developing organizational strategy, organizational development and perseverance are a few of my strengths. I sometimes find it difficult to delegate tasks as I enjoy being directly involved in most aspects of the projects.

Jordan: Is there a particular person/company within the past or present mining world that you would enjoy being involved with.

Charlie: I have always admired Thayer Lindsey from Falconbridge his early discoveries and the pioneering aspects of what he accomplished were very impressive.

Jordan: What do you consider your proudest accomplishment as



a mining professional?

Charlie: I am proud of the work I have done with Queenston. We have been recognized as a significant player in the Canadian mining industry. I believe Queenston has developed a reputation within the industry of having the ability to identify, develop and capitalize on projects which has made it a very attractive partner for other companies within the mining industry.

Jordan: What do you hope people take away from this interview and from your work and involvement in the mining industry?

Charlie: I hope people are able to get a sense of Queenston's perseverance, dedication and accomplishments. On a personal front I hope my work, enthusiasm and participation is remembered within the mining industry.

Jordan: Fast forward to your retirement from the mining industry. How would you like to be remembered by your colleagues, your competitors and the general public?

Charlie: I hope Queenston is remembered as a clean, well-kept company, free of scandals, that spends money wisely and adds shareholder value. I hope our projects continue to bring value and global admiration to the Canadian mining industry

Jordan: Which key thing would you like to see changed about the mining industry in Canada as a whole and more specifically in Queenston's mining areas?

Charlie: I would like to see more education and public support for the mining industry in Canada. I would like the general public to see and understand how positive mining is for employment and how the mining industry has built and sustained many of the communities in the northern areas of Canada. I would like people to see how mining has grown to become a greener industry than it once was. Canadians should be proud of Canada's standing as a leader in the global mining industry, pioneering environmental concerns, and setting an example for health and safety in developing countries.

Jordan: Thank you for participating with us today in this interview. I know our readership will enjoy your input. Thank you for your time.



The Python Group

Mine Design, Planning, Scheduling

Python Mining Consultants Inc is a flexible and innovative consulting firm. We are capable of performing a variety of different projects, and we have access to a large pool of specialized professionals. We are an innovative consulting firm, with a keen eye for detail, and we are currently looking to expand our existing client base. Python Mining Consultants Inc (PMC) has over 8 years of mine consulting experience. The company was officially incorporated in 2000, and since commencement has grown to include two offices as well as six full time employees.

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