



# Agrium Reclaims Lost Capacity

*Agricultural chemicals producer improves operational maintenance*

For some time, Canadian-based Agrium, an agricultural chemicals producer with 13 plants across North America, had been wrestling with a number of maintenance and operations issues at its potash production facility in Vanscoy, Saskatchewan. The operation consistently scored unacceptably on the company's maintenance and operations KPIs and there were significant asset availability issues. In addition, according to Richard (Dick) Olver, Agrium's senior reliability specialist, "We were not producing the product we were looking for."

Potash is a primary source of potassium, one of three essential plant nutrients (the other two are nitrogen and phosphorous) and, since there is no substitute for potassium compounds, they are in great demand for food production around the globe. Some 95 percent of potash produced worldwide is used in agriculture. The remaining five percent goes to

such other industrial uses as glass manufacturing, soaps, plastics, and pharmaceuticals. Canada is the largest resource for potash, and Saskatchewan is home to more than 50 percent of the potash reserves in the world.

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According to a June 13, 2008, Reuters article, "Canada's potash industry has suddenly become red hot...." After a decade or more of stagnant prices, potash sales leaped 38 percent in the last year,

"largely due to increased demand from countries such as China and India."

In such a seller's market, Mr. Olver says, "Throughput is extremely important." To increase throughput, and, ultimately, profits, Mr. Olver, along with the Vanscoy mine manager and the maintenance supervisor felt they needed to find a new approach to resolving their issues and decided to seek external help.

"I believe you use a consultant for three reasons," says Mr. Olver. "One of them is that they know some things you don't know. Second, you need some extra hands to make the changes you're trying to make. The third is that having a high-priced consultant on site focusing on the problems keeps you focused on the problems. In my experience, it is very easy for the day-to-day [responsibilities] to take you away from focusing on making more permanent improvements."

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Agrium re-engaged USC Consulting Group, LLC (USCCG), an independent operations management consulting firm with which it had worked successfully on three previous improvement initiatives.

“Several years ago we put together a request-for-quote and sent it to five different firms, including USCCG,” reports Mr. Olver. An Agrium team interviewed the three responding companies and, “based on the proposal and the interview, we felt most comfortable with USCCG.” One of the most positive aspects of the process, Mr. Olver emphasizes, were USCCG’s references. “I contacted five or six different [ones] and got positive feedback that assisted us in making the decision.”

USCCG’s first three efforts at Agrium dealt with improving use of the SAP maintenance process in the underground mine, improving mine operations with overall equipment effectiveness (OEE) reporting for the hoist, and improving mill operator rounds and equipment care. Based on this earlier successful experience, Agrium pulled in USCCG for a fourth engagement.

### A Small Underground City

The Vanscoy operation produces premium granular grade potash, premium coarse grade potash, and standard grade potash. According to Agrium’s web site, North American growers demand the premium grade potash. Standard grade potash is sold primarily overseas, but demand for the premium grade product is increasing there also. “The potash ore is mined from an area one kilometer below the surface. To reach the ore, mine shafts have to be drilled through 80 meters of glacial deposit, 440 meters of shale, 120 meters of water-bearing sandstone, 420 meters of limestone, and 15 meters of salt.”

The mine is described as “a small underground city, with personnel travel-



*The miner is used to bore into the mine wall to break loose raw ore.*

ing the roadways in a fleet of rugged four-by-fours. Ore is mined on four different faces of the ore body, and various mechanical and maintenance shops are situated in the mine to quickly and efficiently deal with equipment repairs and overhauls. The mine now covers about 77 square kilometers. The stratum being mined is 3.3 meters thick and extends for over 300 km in an east-west direction and 150 km in a north-south direction.

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“The ore body has reserves that will sustain current production rates for 100 years. The Vanscoy storage facility can store 180,000 metric tons of dry product.”

In addition to the mine and storage facility, the potash operations include a mill where the ore is processed and a compaction plant that readies the product for market, where it is shipped by rail.

USCCG was charged with improving

process and equipment reliability across the operation, and encouraging a proactive approach to process and equipment care. This was to include clear identification of expectations, operator training, improved communication, equipment rounds, house-keeping standards, and checklists.

The consulting firm began by detailing the maintenance processes, working directly with the Agrium people on the ground, on a six-by-thirty-foot roll of brown paper that hung prominently in the public hallways for the duration of the assignment. “It’s a very good visual mechanism,” Mr. Olver explains, “for understanding the existing [processes], to help identify the problems, and to get feedback from people. It has the added advantage of being up there for people to look at and make comments on.”

John Dias, USCCG’s senior project manager, points out, “It was critical to the success of the reviews that we involve not just management, but that we also engaged the operators on the shop floor in understanding the system and process disconnects and soliciting their input as to how to act on the identified opportunities.”

Another particularly valuable approach designed to encourage participation among all levels was the employee involvement prototyping methodology USCCG uses. They train small groups in new or revamped processes, before rolling them out to broader groups.

“Starting small and not trying to eat the whole elephant,” says Charlie Payne, USCCG operations manager, works to debug processes before they are put into place. For example, regular, short, end-of-shift meetings with miners proved instrumental in improving the processes they worked every day because the problems or solutions to the problems were still fresh in their minds.

“The miners got their voice and the



*Agrium's potash production facility in Vanscoy, Saskatchewan*

maintenance people could interact with them, and that helped improve the maintenance process we were putting in.”

“What surprised and delighted me,” agreed Mr. Olver, “was how engaged some of the people were. It’s something USCCG manages very well.”

Minimizing downtime in turnovers was a prime area where prototyping worked well. Standardizing the miner set up and “kitting” are two good examples of how effective this technique has been for Agrium.

The miner, according to Mr. Olver, is “the biggest drill you’ve ever seen,” and is used to bore into the mine wall to break loose the raw ore. “In view of all the things that affect miner set up,” he explains, “the initial cut is most important. When you’re doing a miner set up, the ground around the miner has to be leveled. There are now certain standards that we’ve put in place around how well the initial entry has to be cut so that the miner can be set up correctly.”

Every three or four weeks, the miner set up entails moving the miner from one ore body to the next. Prior to initiating

the new standards, the set up required seven workers 3.4 shifts to complete. Any reduction will allow more time for maintenance, making the miner more reliable and therefore more available – a very valuable increase in capacity and production time.

“Secondly, the concept of kitting – having all the parts and equipment you need to do a miner set up in a kit that can be brought out so that workers aren’t wandering around the mine looking for those tools – has been very successful. We are in the process of building more kits so that they’re always available for miner set ups,” reports Mr. Olver.

In the mill, USCCG’s analyses helped identify those areas where changes in maintenance procedures would have the most impact in terms of improving set up speed, efficiency, and safety.

By focusing on downtime in these turnover situations, Agrium has been able to track the number of downtime hours and translate the savings into a 70 percent improvement in lost capacity on planned reduction days. Mr. Olver says, “This is

expected to result in \$2.5 million in annualized savings to baseline performance, which means this project has more than paid for itself.”

### **Improving OEE**

Developing OEE charts was critical for putting asset utilization data into a context and format that would allow for easier analysis. “One of the things we wanted to get out of this engagement,” Mr. Olver reports, “was much better information on downtime and lost capacity in the mine, the mill, and the compaction plant. And that we have done, and we’ve done it very well.”

The Agrium/USCCG team focused their first efforts in the mine around the hoist, which, according to Mr. Olver, “...can be a particular bottleneck in any underground operation. Getting our hoist data, downtime, and problems well detailed and putting them into an OEE chart showed exactly where the major losses were occurring.”

By organizing the information using a simple Pareto chart, the big issues that affected hoist capacity quickly became apparent. “We knew we had a number of problem areas on the hoist, but because we didn’t have the information in a good format, they weren’t hitting people in the face,” Mr. Olver explains. “Once we put it together, it showed us that we were losing this many tons every month to cylinder problems, this many tons to some other problem. We finally could prioritize the most important problems to solve, and by and large, they have been.”

Ultimately the OEE charts covered the hoist, the mill, the mill feed, and the compaction plant. “After that, we had a series of measures that we could use corporately for measuring maintenance performance,” reports Mr. Olver. “USCCG assisted us in getting a number of those

*Agrium continued*

tallied to a weekly measure and into a weekly report that shows where underground and surface operations are in relationship to their internal target, as well as the corporate target.”

Another important area that required attention was the crushing facility, where raw ore is broken down to the appropriate size for processing in the mill. The area had become rundown for a number of reasons and clearly needed attention in the form of housekeeping and proactive maintenance.

“We have developed a detailed Agrium housekeeping standard that we expect to be maintained and monitored on each site,” says Mr. Olver. “We were looking for a part of the plant where we could pilot our housekeeping standards and we happened to pick the worst possible area in the crushing facility. Imagine your teenaged son’s room!”

To re-establish the rigorous housekeeping standards that lead to greater efficiency and safety, USCCG helped Agrium institute a 5S program (for sort, set in order, shine, standardize and sustain).

### **Better Communications Build Better Relationships**

Communication plays an amazingly big role in any improvement effort and Mr. Olver compliments USCCG for their dedication to openness and working with people to gain their trust.

“We posted our objectives and the minutes of our weekly meetings. I made a point of talking to the union president and the process came up in union management discussions. The union president even sat in on some of our steering committee meetings.” He adds that, though there were some dramatic middle management changes throughout the process, USCCG’s consistent approach and communications skills were “a great help to the union-management relationship.”

On top of that, he says, “We got our workers to use our shift communications tool on a regular basis.” Based on feedback from an audit tool that USCCG devised for Agrium to measure communications improvements, “we’re getting better at formal communications.”

Asked what advice he would give to anyone overseeing a project like this, Mr. Olver said, “Identify who you can put in place to learn from USCCG and you’ll get a better transfer of information. Get the right people involved so they can learn how to facilitate change and continuous improvement.”

It seems to be working well for Agrium. According to *Motley Fool* on July 12, 2008, “Based on the aggregated intelligence of

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110,000-plus investors participating in Motley Fool CAPS, the Fool’s free investing community, agricultural chemicals producer Agrium (NYSE: AGU) has earned a coveted five-star ranking. Our data has shown that five-star stocks outperform the market by a significant margin; conversely, one-star stocks have woefully lagged the market average.” The article also stated, “In January agridealer [a Motley Fool CAPS member] said that Agrium is ‘the first company in the fertilizer sector that is fully integrated from the mine to the farm... Believe me, the ag industry is scooting along and any company poised to capture incremental revenue at every step will do well.’”



**Richard (Dick) H. Olver, P. Eng. CMRP**  
Senior Asset Reliability Specialist, Agrium Inc.

*Dick Olver has held many maintenance and operations positions in mining, metals refining, and the manufacture of bulk fertilizers. He has also managed a variety of system and CMMS implementations, including the introduction and upgrading of SAP for Agrium. Currently he is the senior asset reliability specialist leading the Agrium asset management improvement work.*

*Mr. Olver has spoken on maintenance and reliability topics at a number of conferences including MainTrain; Plant Engineering and Maintenance Association of Canada’s (PEMAC) national conferences; the SMRP annual meeting; the Canadian Institute Maintenance Conference; and the SAP-Centric EAM, RCM-EAM and EuroMaintenance. He is chairman of the SMRP Best Practices team and a founding member and executive of the Alberta PEMAC Chapter. Mr. Olver is a Maintenance Management Professional (MMP) certification program instructor.*

# Enabling Technology

Businesses are drowning in data, but very few of them have the ability to collect, analyze, and interpret it, let alone act on it, with the immediacy that will impact day-to-day operations, where it is most needed to ensure attainment to plan. This is the case despite hefty investments in technology, and it is particularly true, and most problematic, in those environments consisting of many disparate legacy systems.

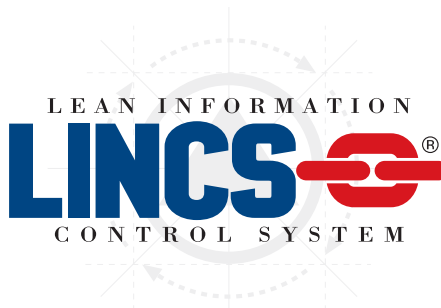
One of technology's most important roles is to provide business managers timely feedback on key performance indicators, along with other business intelligence, that reflects the results of a company's collective efforts to help drive and sustain continuous improvement.

The proper use of technology allows people in various roles and departments across a company to be tightly associated in a way that makes expectations and objectives visible, actionable, and, ultimately, more attainable.

USC Consulting Group (USCCG) has drawn upon its 40 years of operational improvement experience with numerous Fortune 1000 companies to develop a suite of technology solutions that collect data from existing applications and reformat it to make it more actionable and user-friendly for management. The suite includes the firm's proprietary Lean Information Control System, or LINCS<sup>®</sup>, with its Performance Analysis and Reporting (PAR) tool; and its Proxim-IT<sup>™</sup> business intelligence portal.

Other LINCS tools include such components as advanced planning and scheduling, value stream mapping, manufacturing and logistics solutions, simulation, and inventory analysis that facilitate real-time, fact-based decision-making across the supply chain.

PAR collects, reformats, analyzes, displays, and re-purposes data as it becomes available, enabling operators to see and evaluate their work as it takes place. In addition, it better equips executives and managers to set priorities for activities based on accurate, actionable business intelligence.



LINCS/PAR interfaces with enterprise-level and SCADA-level systems, as well as human input. It identifies and quantifies improvement opportunities within an organization, provides accurate tracking and analysis of key performance indicators, and includes analytical and statistical tools to highlight performance problems. This tool features an easy-to-use web-based user interface that can be custom-configured to allow management to view operations at a glance or to drill down to examine specific areas of opportunity.



Proxim-IT (pronounced *proximity*) transforms data into business intelligence by collecting, aggregating, displaying, and delivering operational, financial, and organizational information to any desktop or laptop computer, phone, or PDA. Proxim-IT features an integrated series of applications that optimize the way people, content, and processes interact within an organizational structure, allowing them to visualize the business through dashboards, graphics, tables, and lists. In addition, Proxim-IT stores and organizes reports, documents, and content in one location, making information readily available.

The best performing companies are also the most knowledgeable and, in today's edge economic climate, the nimblest. When it comes to decision-making on both the strategic and operational levels, these companies have the information they need when they need it to make timely, fact-based decisions. LINCS/PAR and Proxim-IT facilitate this by providing rapid visibility into actionable information that drives accountability and, ultimately, business performance.

# Asset Reliability Forum

## *An Expert's Perspective on RCM*

Senior managers who want to optimize the performance of their capital assets now can gain valuable new insights from asset performance management experts offering a wide range of perspectives on the subject. USC Consulting Group has established a public dialogue on the topic, which is available in the form of a series of podcasts that can be heard on its web site, [www.usccg.com](http://www.usccg.com). Here are excerpts from the first in a series of interviews on Reliability Centered Maintenance, this one with Larry Roberts, project manager and a member of the firm's Reliability Centered Maintenance Practice.

### **Q: What is Reliability Centered Maintenance?**

**LR:** Reliability Centered Maintenance, also referred to as RCM, is a framework for managing an organization's assets by focusing efforts on the assets' availability and reliability through maintenance groups. It's a process used to determine what must be done to ensure that any physical asset continues to do what its users want it to do in its operating context. When correctly applied, RCM leads to remarkable improvements in maintenance effectiveness and often does so surprisingly quickly.

### **Q: What does RCM achieve for an organization?**

**LR:** For virtually any industry, RCM will achieve:

- greater safety and environmental integrity;
- improved operating performance through output, product quality, and customer service;
- greater maintenance cost effectiveness;



- longer useful life of expensive items; and
- a comprehensive database of maintenance requirements.

RCM also better motivates individuals by fostering better teamwork by combining efforts from all the maintenance trades, as well as operations.

### **Q: Where did this new maintenance strategy come from?**

**LR:** RCM is not new at all. The RCM foundation was developed from studies done in the airline industry as early as the 1960s. At the time, airlines could not figure out why their aircraft continued to crash at an alarming rate, even after they had increased repair work by

almost double. Tactics derived from early studies were very successful in turning around the airlines' performance. Those improvements continue to have impact and, as of 2008, the safety of our airlines is at an all-time high.

But RCM goes much further than the airline industry. It's compatible with any industry and any type of maintainable asset. RCM is a systematic approach to determining what work needs to be done – or, in some cases, not done – on anything that requires maintenance. It also determines when that work needs to be completed. In other words, Reliability Centered Maintenance applies to any asset and helps determine the right work to be done at the right time.

**Q: Traditionally it has been thought that all equipment was more likely to fail over time, that all equipment has a life. Does RCM share that view?**

**LR:** Yes and no. For certain types of moving equipment that generate friction or come in contact with abrasives, yes, there is a measurable rate of wear that begins as soon as the component is put into service. Examples would include brake shoes, cutting blades, drill bits, and motor brushes, among others.

For other equipment types, the answer is no. In the airline studies, it was discovered that there are at least six distinct patterns of failure, which show us that equipment can also fail in a totally random pattern. It's important to note that failure can be more prominent just as the equipment is placed into service – which is called “infant mortality” – and more prominent after a long period of random probability.

**Q: Do all assets in an organization need to be analyzed using the formal RCM2 methodology or are there other options for accelerating improvements?**

**LR:** In a word, no. Assets that *do* need the RCM2 analysis are those that have serious safety, environmental, or operational consequences if they fail. You can also include new assets or those where information on their care and maintenance is not well documented.

Under the facilitation of a seasoned reliability consultant, there is an alternative to RCM2 and that is Maintenance Task Analysis (MTA). This approach also uses RCM as its foundation, but it focuses only on the primary function of the asset, along with reasonably likely failures and those that involve safety or the environment. The purpose of MTA is to quickly and safely protect the intended

function of the asset, while allowing more assets to be analyzed in a shorter time frame.

**Q: How does the role of the maintenance department differ under RCM?**

**LR:** In many maintenance organizations today, work is driven by unplanned failures that only seem to add to the delinquent work-order backlog. The analogy I use is that RCM helps an organization transition from a group of firefighters to a group of fire marshals. The firefighter, which refers to typical maintenance groups, is viewed as the hero who enters a burning building to save a family who could not find an escape route. Having a firefighter nearby is fantastic, but wouldn't it be a better scenario if the fire marshal had arrived before the fire started and planned a way for the family to escape, to help the fire fighter pre-plan his attack, and survey the building to find the things that could cause fires in the first place?

Basically, RCM focuses on ways to predict and plan for failures, instead of putting all the maintenance effort into fixing the failure after it has occurred.

**Q: To get RCM started, does an organization have to scrap everything and start over?**

**LR:** Scrapping existing maintenance programs is not the intent of RCM. The last thing you want to do is tell a mechanic that everything he's done for the past 30 years is wrong!

There are likely issues, along with some holes in the existing maintenance practices that cause an organization recurring pain. But some of what is being done is good.

What RCM does is first look at what maintenance is currently in the system and how effective it is, then makes improvements and additions as

needed, based on an organization's own expert input.

**Q: How can an organization determine if RCM would benefit it?**

**LR:** All it takes is answering a few simple questions like:

- Are you satisfied that your maintenance organization is “fully planned” for all safety and environmental issues?
- Is your overall equipment effectiveness (OEE) at least 85 percent?
- Is your percentage of completed planned work 100 percent?
- Are you experiencing recurrences of unplanned downtime?
- Do you have a seasoned workforce nearing retirement?

Any organization can benefit from RCM and some more dramatically than others.

*To learn more about RCM and its bottom-line benefits, visit [www.usccg.com](http://www.usccg.com), click on any Industry in the drop-down list, and select “Podcasts” in the right-hand tool bar. Or simply contact a Reliability Practitioner at 800-888-8872 to discuss your specific needs.*

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*Larry Roberts is a project manager and RCM2 practitioner with USC Consulting Group. He has over 12 years of experience working in industrial operations and engineering in which he has acquired an extensive background in world class maintenance, TPM, Six Sigma, Lean, and supply chain management techniques and methodologies. Mr. Roberts is a Certified Maintenance and Reliability Professional (CMRP).*



*First we make it work. Then we make it last.®*

For more information contact us at **800-888-8872** or [www.usccg.com](http://www.usccg.com)

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