

# PLANT WEST

ADVANCING CANADIAN MANUFACTURING

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## CONCUSSION PREVENTION

Innovative BrainShield decal tackles  
head injuries in contact sports

Maintenance focuses on efficiency  
BC brewery plugs into Bullfrog Power  
Treating tailings with sun power  
Oil sands workers retool for solar  
Freshen up with fans and curtain walls

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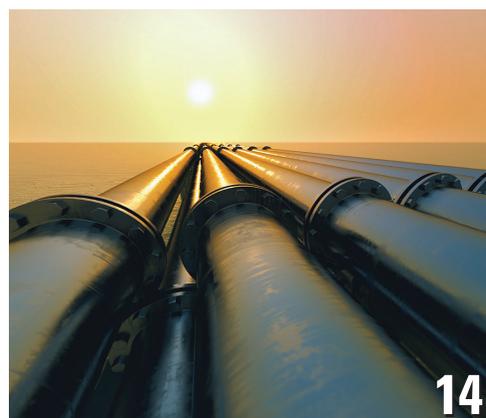
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# Focus on energy use

Changes in government at the federal and provincial levels have resulted in more attention directed at climate change and what we should be doing about it. This is especially so in Alberta where the NDP government has passed its new carbon levy on the oil and gas industry; and in Ontario, which recently announced an aggressive climate change plan.

These and other provincial efforts are very gung-ho and all, but let's acknowledge that the developed and less developed world will continue to burn fossil fuels well into the 21st century. As such, an important component of climate change mitigation efforts for manufacturers must be the adoption of a more judicious use of energy, which was the aim of the national Energy Summit 2016 in Niagara Falls, Ont., presented by the Excellence in Manufacturing Consortium, NRCan and CIPEC.

Manufacturers, as a group, have been somewhat relaxed in their approach to energy conservation, and for a variety of reasons. Some companies are located in jurisdictions where electricity is cheap so why bother; others are paying a lot for electricity (hello Ontario) but are unaware of the potential savings that would drop to their bottom lines; and others just don't care.

With new government measures, pressure from citizens to act and the shame of being on the receiving end of international tut-tutting from those who see Canada as a climate change laggard, manufacturers now have reason to care and act.

The Energy Summit emphasized many of the key issues driving effective energy management, among them the importance of engaging employees to drive and sustain change, and why support from senior management is key.

The CEO of an automotive company who described himself as the "chief energy officer" exemplified this latter point. He described projects designed to reduce a \$48,000 a month electricity bill that involved the elimination of wasted energy (for example, from compressors and lighting); the use of more efficient variable frequency drive motors; cashing in on government rebates and incentives; and being a lot more focused on finding errors in billing. These kinds of projects aren't tough to execute and surely any manufacturer would benefit from auditing where energy is used to identify how much of it is wasted.

The Summit also highlighted interesting developments that would enhance the viability of renewables, one in particular courtesy of a young Canadian scientist and the company she co-founded, which aims to generate useful energy from compressed air.

Danielle Fong, chief scientist of LightSail Energy, a keynote speaker, offered some interesting insights into the work of her company.

First some background: she was born in Halifax, went to Dalhousie University at 12, then to Princeton at 17, where she intended to conduct nuclear fusion research, but quit when she foresaw commercial application was a long way off (2050). That led her to a simpler solution: energy storage and the founding of LightSail in Berkeley, Calif.

She told attendees the generation of electricity has reached a critical point. For the first time production and lifetime operating costs of renewables are competitive with conventional power production (see Lazard, [www.lazard.com](http://www.lazard.com)).

That's where her thermodynamic innovation adds an important new element to the renewable energy challenge. LightSail's technology creates heat that can be stored and converted to energy – a handy feature for intermittent power sources such as solar and wind. (See how it works at [www.lightsail.com](http://www.lightsail.com)).

LightSail is banking on almost \$14 billion in infrastructure upgrades over the next 20 years, 30% of which could be served by storage technology. It's easy to see the possibilities, as high-profile financial backers such as Bill Gates have done.

It's a new world out there that's about disruption and change. Manufacturers need to respond to this reality by making environmental concerns and the size of their carbon footprints more of a strategic priority. Better management of energy use is a good place to start.

**Joe Terrett, Editor**  
**Comments? E-mail [jterrett@plant.ca](mailto:jterrett@plant.ca).**

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**Publisher**  
 Michael King  
 416-510-5107  
[mking@plant.ca](mailto:mking@plant.ca),  
[mking@cienmagazine.com](mailto:mking@cienmagazine.com)

**Editor**  
 Joe Terrett  
 416-442-5600 ext. 3219  
[jterrett@plant.ca](mailto:jterrett@plant.ca)

**Associate Editor**  
 Matt Powell  
 416-510-5145  
[mpowell@plant.ca](mailto:mpowell@plant.ca)

**Art Director**  
 Andrea M. Smith

**National Account Manager**  
 Ilana Fawcett  
 416-510-5202  
[ifawcett@plant.ca](mailto:ifawcett@plant.ca)

**Account Coordinator**  
 Barb Vowles  
 416-510-5103  
[bvowles@annexbizmedia.com](mailto:bvowles@annexbizmedia.com)

**Annex Business Media Vice President**  
 Tim Dimopoulos  
 (416) 510-5100  
[tdimopoulos@annexbizmedia.com](mailto:tdimopoulos@annexbizmedia.com)

**President & CEO**  
 Mike Fredericks

**Circulation Manager**  
 Beata Olechnowicz  
 416-442-5600 ext. 3543  
[bolechnowicz@annexbizmedia.com](mailto:bolechnowicz@annexbizmedia.com)

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**Mailing Address**  
 Annex Business Media  
 80 Valleybrook Dr.,  
 Toronto, ON M3B 2S9  
[plant.ca](http://plant.ca)  
 Tel: 416-442-5600,  
 Fax: 416-510-5140

**Customer Service**  
 Silva Telian  
 416-442-5600 ext. 3636  
[stelian@annexnewcom.ca](mailto:stelian@annexnewcom.ca)



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# Powder & Bulk Solids Events Calendar

## Advanced Manufacturing

Expo | Mexico

**November 15–17, 2016**

Centro Banamex  
Mexico City, Mexico  
ManufacturingMx.com

MONTRÉAL SHOWCASE

## POWER & BULK SOLIDS

CONFERENCE & EXHIBITION

**November 30–December 1, 2016**

Palais des congrès de Montréal  
Montréal, Québec  
PBSmontreal.com

TORONTO

## POWER & BULK SOLIDS

CONFERENCE & EXHIBITION

**May 16–18, 2017**

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Toronto, Ontario  
PBStoronto.com

TEXAS

## POWER & BULK SOLIDS

CONFERENCE & EXHIBITION

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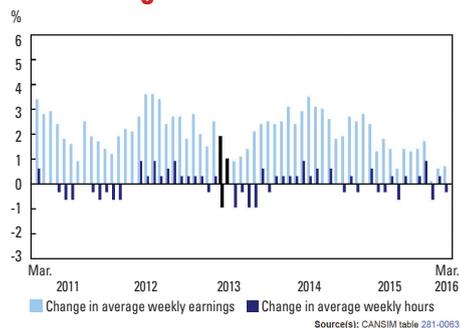
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**Earnings increase in March**



Growth in weekly earnings to March 2016.

Average weekly earnings were \$960 in March, up 0.5% from the previous month and 0.7% from March 2015, according to Statistics Canada. Manufacturing rose 1.4% to \$1,091, with fabricated metal and plastics and rubber products contributing the most to the year-over-year increase. However, earnings declined notably in transportation equipment and primary metal manufacturing. In the West, earnings declined 2.2% in Alberta and 0.3% in Saskatchewan, but were up 1.3% in BC and 3% in Manitoba. Seven provinces recorded increases.



**1%**

Q1's increase in manufacturing productivity. Overall, goods-producing businesses

posted a 0.3% decrease in productivity, mainly a result of sharp decreases in construction (-2.7%) and utilities (-2.5%).

**\$36.5B**

What oil and gas extraction industries anticipate spending on capital assets this year down 26.3% from preliminary annual expenditures of \$49.5 billion in 2015, and capital expenditures of \$76.1 billion in 2014. Spending in Alberta will be down 27.1% to \$26.5 billion from 2015, and 54.4% from 2014.



**\$41.8B**

Canada's exports in April, up 1.5% over March. Export prices increased 1.1% and volumes rose 0.5%. Imports increased 0.9% to \$44.7 billion, volumes were up 0.8% and prices edged up 0.1%. Canada's merchandise trade deficit with the world narrowed to \$2.9 billion from \$3.2 billion in March.



ILLUSTRATIONS: THINKSTOCK

**NEWS**

**485 Xcelsiors heading for Connecticut**

New Flyer deal involves 30- and 40-foot hybrid transit buses

**WINNIPEG** — New Flyer Industries Inc. has won a US\$122 million order from the Connecticut Department of Transportation (CTDOT) for up to 485 of its clean diesel and diesel electric Xcelsior buses.

The contract includes a firm order from Winnipeg-based New Flyer's US subsidiary (which has manufacturing facilities in Crookston and St. Cloud, Minn., and Anniston, Ala.) for 267 Xcelsior XD40, XD35, XDE40 and XDE35 buses.

The deal includes options for an additional 218 units over the next five years.

The order replaces older vehicles in Connecticut's current fleet.

CTDOT currently provides more than 31 million passenger trips annually with a fleet of 570 vehicles serving urban areas Hartford, New Haven, Stamford, Waterbury, New Brit-



The Xcelsior XDE40 clean diesel electric hybrid.

PHOTO: NEW FLYER

ain, Bristol, Meriden, and Wallingford. These services are operated by private contractors under CTDOT's CTtransit.

New Flyer has delivered nearly 600 heavy-duty transit buses to CTDOT since 1993.

**OCE, CCEMC partner on innovation**

Focus is on reducing GHG emissions



Tom Corr, president and CEO of OCE and Steve MacDonald, CEO of CCEMC sign an agreement to collaborate on reducing greenhouse gas emissions. PHOTO: OCE

**EDMONTON** — Ontario Centres of Excellence (OCE) and Alberta's Climate Change and Emissions Management Corp. (CCEMC) are partnering to bolster cross-provincial efforts that support technology breakthroughs for reducing carbon emissions.

The two organizations signed an agreement to focus on the strengths of both provinces to accelerate solutions that will reduce greenhouse gas emissions.

OCE is managing Ontario's \$74 million greenhouse gas innovation initiative, which aims to reduce greenhouse gas emissions by encouraging large GHG emitters to adopt leading-edge technologies, and supporting the development of solutions.

CCEMC has committed more than \$320 million in funding to over 100 projects to help Alberta address climate change.

**Protonex to demo PEM propulsion on UAV**

**VANCOUVER** — Ballard Power Systems' Protonex subsidiary has delivered prototype proton exchange membrane (PEM) fuel cell propulsion modules to a Boeing subsidiary for use in an unmanned aerial vehicle (UAV).

The ScanEagle UAV made by Insitu, a wholly owned Boeing subsidiary based in Bingen, Wash., has logged more than 800,000 flight hours in military and civilian applications.

"Fuel cell-powered systems offer compelling value for unmanned aerial vehicles due to improved reliability over small internal combustion engines, as well as very low heat and noise signatures. We believe that fuel cell systems have an extraordinary opportunity to play a key role in the propulsion of many unmanned systems," said Paul Osenar, president of fuel-cell power producer Protonex in Southborough, Mass.

The ScanEagle is 1.55 metres in length, has a wingspan of 3.11 metres, a maximum takeoff weight of 22 kilograms and flies at a maximum speed of 41.2 metres per second (80 knots). It can reach a ceiling of 5,944 metres and has an endurance capability of more than 24-hours.

The modules are to improve mean time between failures (MTBF) by up to five times; provide silent operation and 100% throttle flexibility, including mid-air start-stop capability; and use existing JP8 fuel in ground refuelling systems.

Flight demonstrations are planned for the second half of this year.

Ballard Power Systems is a developer of clean power technologies based in Vancouver.

## Husky Energy in production at Edam East

**CALGARY** — Husky Energy is producing heavy oil at its Edam East Lloyd Thermal Project in Saskatchewan, the first of three developments scheduled to come online this year.

The Calgary-based integrated energy company said first oil at the 10,000 barrels per day (bbls/day) development was achieved about seven weeks following the startup of steaming operations.

Husky's operating costs for its Lloyd thermal product line in the fourth quarter of 2015 averaged about \$7 per barrel, including energy.

Two additional Lloyd projects are to begin production in the third quarter: the 10,000 bbls/day Vawn and the 4,500 bbls/day Edam West projects.

Total production is to reach 80,000 bbls/day by the end of 2016.

Husky's thermal projects are supported by its Lloyd value chain, which includes the Saskatchewan gathering system, the upgrader and asphalt refinery, and oil storage capacity at Hardisty.

## Fluor a modularization winner

### 3rd Gen Modular Execution technology recognized for best practices

**CALGARY** — The Construction Owners Association of Alberta (COAA) has declared Fluor the 2016 Best Practices Award winner for a modularization innovation applied by the Shell Quest carbon capture and storage (Quest) project.

The global engineering and fabrication firm was recognized for its 3rd Gen Modular Execution technology at the COAA's awards presentation in Edmonton.

The technology increases the portion of a facility that can be modularized by consolidating equipment and components, which allows for decentralized electrical and instrumentation distribution. The process also significantly reduces plot plan footprints. The result is improved construction and safety performance and reduced onsite labour, material quantities and capital costs.

3rd Gen helped reduce Quest's plot plan from initial project estimates by 20%, and reduced capital costs by 30%.

Quest, Shell's flagship carbon capture and storage (CCS) project, has been designed to capture and permanently store more than 1 million tonnes of CO<sub>2</sub> from the Scotford Upgrader in Alberta each year. That equals one-third of the emissions from the upgrader, which turns oil sands bitumen into synthetic crude.



Simon Nottingham, vice-president and general manager of Fluor's Calgary Office, accepts the award from Mark Mackay, president of COAA.

PHOTO: COAA

## CAREERS

KSB Pumps Inc., the Canadian arm of the German pump manufacturer in Mississauga, Ont., has appointed **Marcus Henderson** business development manager. He'll provide extra support to its coast-to-coast sales teams stationed in Calgary, Edmonton, Montreal and the Maritimes.



Marcus Henderson

IBC Advanced Alloys Corp., a beryllium, advanced alloys and precision castings company based in Vancouver, has appointed **Mark Smith** and **Geoff Hampson** to its board. Smith, a major shareholder, is currently the executive chairman and CEO of NioCorp Developments Ltd. Hampson is a seasoned entrepreneur with 34 years of experience in special materials, technology and mining.



Geoff Hampson

Micalyne Inc., an Edmonton-based manufacturer of micro electromechanical systems (MEMS), and its parent company FTC Technologies, have appointed **Ian Roane** president and CEO. He replaces **Mike Ciprick**, Micalyne's CEO for the last four years, who is now CFO. Previously Roane was CEO at Kaben Wireless Silicon and at Sound Design Technologies. **John Harley** joins the company as vice-president of technical marketing and business development. Previously he was vice-president of product and process engineering at Innovative Micro Technology in Santa Barbara, Calif.

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<sup>2</sup> Interest is paid on the entire deposit balance.

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## SPORTS INJURIES

Concussions among teens involved in contact sports have grown by 200% in the last decade – Shield-X wants to reverse that trend.

BY MATT POWELL,  
ASSOCIATE EDITOR

It's an unfortunate trend that football, hockey, other tough contact sports and "concussion" seem to go hand in hand.

The ruthlessly physical sports that can result in traumatic brain injuries have led to multiple lawsuits in professional sports leagues such as the NFL and NHL.

Canadians may be more familiar with the deaths of three NHL hockey players in 2011. Derek Boogard, Wade Belak and Rick Rypien, who as enforcers were better known for their fists than their scoring prowess, all died within four months of each other. Although an overdose of painkillers and alcohol in one case and suicides in the other two were the direct causes of their deaths, post-mortem research determined another underlying factor. Chronic traumatic encephalopathy (CTE), a progressive degenerative disease, has been found in people who have severe or repeated blows to the head. The disease was discovered in 2002 by Dr. Bennet Omalu (the subject of the 2015 film "Concussion" starring Will Smith) who found CTE's neurological deterioration in football players similar to Alzheimer's.

Boogard's family donated his brain to the Boston University School of Medicine (BUSM), which determined he was suffering from CTE in the years before his death at 28. And autopsies of former NFL players Junior Seau, John Mackey and Ray Easterling confirmed the effects of CTE on each of their brains.

Shield-X, a Vancouver company, has developed a technology that aims to lessen the effects of angled impacts on the head and is targeting the next generation of professional athletes.

Indeed, youth concussions have



Youth concussions, especially those sustained in contact sports such as football, are on the rise.

# CONCUSSION CRUSADERS

## BRAINSHIELD DECALS BLOCK BRAIN INJURIES

been on the rise. Statistics Canada reports 23% of adolescents sustained head injuries in 2014, and the Canadian Brain Injury Association estimates 500 out of every 100,000 people are diagnosed with a brain injury annually. Twenty per cent of those injuries are sports related, second only to motor vehicle accidents.

In the heartland of rough and tumble American football, the number of reported concussions has doubled in the last 10 years. The American Academy of Paediatrics reports emergency room visits for kids aged 8 to 13 have

doubled and concussions among teens aged 14 to 19 increased more than 200% in the last decade.

### Decreasing rotation

Shield-X, a Simon Fraser University spin-off, was established to develop and manufacture BrainShield, an unassuming yet complex decal. It's made of micro-engineered layers designed to reduce brain injuries by decreasing rotation in contact sports such as football and hockey. A version for cyclists is also in the works. Marketed as an accessory, the decals are affixed to any sports helmet.

BrainShield is the result of six years of research led by Daniel Abram, Farid Golnarghi, Shield-X's chief technology and operating officer as well as the university's School of Mechatronics System Engineering (MSE) director, and professor Gary Wang.

"We wanted to understand how the helmet worked and how it protects the athlete's head, and our research showed that helmets are manufactured to only protect against compression force," says Abram, who is also a post-doctoral fellow at SFU's MSE. "But the main culprit behind head injuries



PHOTOS: SHIELD-X

torque is reduced as well as rotational acceleration of the brain, a major factor in concussions.

### Effective lining

Shield-X's testing revealed the decals also addresses the compression issue by spreading an impact's force across a larger area at the moment of impact, making a helmet's lining more effective.

The company, which includes a team of five engineers busy with R&D and product sampling and testing, sources its materials from Germany and assembles the decals at its lab in Surrey, BC. Shield-X is manufacturing decals for pilot studies for now, mostly for football helmets but also manufacturers testing the technology in their own facilities.

A proprietary manufacturing process fuses the layers together, which are designed to slide underneath each other in a collision to divert impact over a larger surface area.

Canada, but that will depend on how the market reacts."

In 2013, the company unveiled the BX-1, an earlier version of the decal. Simon Fraser's football team deployed them during the 2014 season, reducing the number of head injuries to four from 14 in 2013 – a 72% improvement.

The BX2 unveiled this year is 50% thinner and 40% lighter.

Last fall, two BC high schools began using BrainShield and reported positive results. Handsworth Secondary in North Vancouver finished the season without a single concussion.

But Abrams warns customers: "We're adding one more layer of protection. Having good headgear is important and our goal is to reduce concussions, but there's no way you can call [BrainShield] concussion proof."

Abram says the next step for Shield-X includes entering the snowboard and ski helmet markets, and there's ongoing

in the US and results have shown the newest offering to be twice as effective as the product from the market's leading competitor, Multi-directional Impact Protection System, a Swedish company that develops helmet technology.

There's also a glow in the dark version for cyclists and decals that can be customized with a logo for sports teams.

The increase in head injuries, especially among kids, is alarm-



BX-1 inside the helmet acts as an invisible shield.

is actually rotation."

The design has been refined over the last year to be thinner and lighter, and consists of four micro-engineered materials about one millimetre thick and weighing 12 grams, which are "sandwiched" together. They're made of aerospace grade film, a micro layer of non-toxic medium and a solvent-free high-strength adhesive.

Abram explains sports-related brain injuries and concussions are typically the result of a sharp twisting or jiggling and the compression of the brain.

The decal's rubbery outer layer sticks to the field as the inside layer stretches across the helmet and slides. This reduces the jerking motion. If the force of a collision exceeds a certain limit, the decals are designed to shear off.

"Research on brain membranes suggests they're one million times more sensitive to sheer force than compression. The brain is sort of a fatty membrane, so it's naturally much more resilient to compression than it would be to what amounts to squishing," says Abrams.

By reducing friction force,



The decal's rubbery outer layer reduces the jerking motion of an impact.

Abram wants manufacturing to stay in Canada as expansion continues.

"My hope is that we keep manufacturing here because quality control is so much easier. There's a number of factors intriguing to us about making the decals in

talks with bicycle helmet manufacturers to integrate BrainShield into their products. That includes BrainShield's BX-1, which is applied to the inside of helmets and acts as an invisible shield.

Shield-X is testing the BX-1 with an unnamed manufacturer

ing, but Shield-X's BrainShield decals can help to limit them, and help to prevent the kind of devastating injuries sustained by too many professional athletes.

**Comments?**

**E-mail** [jterrett@plant.ca](mailto:jterrett@plant.ca).

# FOCUS ON EFFICIENCY

## HOW TO IMPLEMENT AN EFFECTIVE SYSTEM TO IMPROVE RELIABILITY

Maintenance must be re-invented as a business to demonstrate it contributes to the bottom line.

BY STEVE GAHBAUER

Most companies strive to improve their maintenance operations but hunches, rules of thumb, intuition and years of experience are no longer effective tools for making critical asset management decisions.

Today's decision-making is based on evidence, data collection and financial aspects.

High performance requires high performance systems operated by qualified people and reliability must be improved to make your manufacturing operation more competitive. That is the business case for maintenance.

At a conference on re-inventing maintenance convened by Federated Press, Charles Knight, the maintenance and engineering manager of Tembec Newsprint in Kapuskasing, Ont., shared some thoughts on implementing an efficient maintenance system.

He told conference delegates that to improve the maintenance function and ensure it contributes to the bottom line, a plant needs to: know its business and have a vision for the longevity of the business; understand where maintenance scores relative to good practices; be prepared to recognize the value of training, identify training needs and train effectively; implement a rigid review process using only those KPIs that drive change; and address chronic time wasters ahead

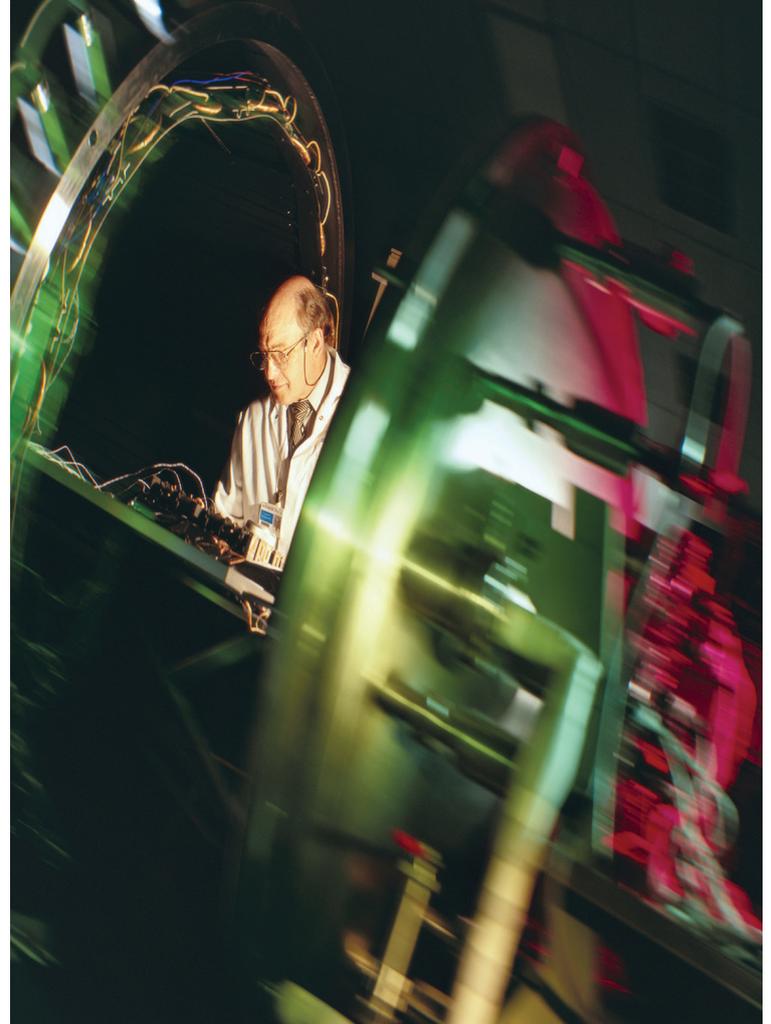
of the occasional irritant.

Knight said by using contemporary computer tools to bridge the gap between documentation and action, the framework for implementing an efficient maintenance system will be displayed in a layered format. Wall charts help to put things into focus; hyperlinking allows the continuous link between the quality system and the delivery system; and the information technology development tool "Agile Development" can be adapted to provide a structured way to keep your operation producing while you continue to improve.

### Identify outcomes

Planning and scheduling are two distinct functions, but often in small companies one person carries them out. Knight suggested rather than define these functions, it's more productive to identify the required outcomes: work orders that allow the trades people to execute the job safely and efficiently, and timelines for execution of the work in a way that optimizes productivity. This is not easy. Planning and scheduling functions need to be staffed appropriately. The quality of the system, along with the quality of the resources, determines the quantity of the resources required. Intuitively, better systems will require fewer resources for the same outcome.

Knight did not spend time dis-



Maintenance work results must be rigorously reviewed.

PHOTO: THINKSTOCK

cussing wrench pulling, believing in most organizations, maintenance trades people will perform satisfactorily if they are given the work and are properly supported. The focus should be on the job of the frontline supervisor (FLS). Key aspects are ensuring trades receive high-quality work orders; they receive the correct tools and materials; that realistic expectations are established; and the work is monitored; and support with comprehensive feedback to the trades is provided.

To achieve an acceptable level of continuous improvement, maintenance work results must be rigorously reviewed starting with the short-range outlook.

The first is by the FLS, which confirms the proper work was executed correctly and requests a follow-up if it was not. This review must also verify or correct non-conformances and address recurring constraints. If this is not done daily, chances are the review will be ineffective.

The planning group does the second review. Feedback for the maintenance trades and FLS requires follow-up work and/or an equipment history, plus

metrics; and it must be timely to be meaningful.

A skilled trade person supported by a group of apprentices, given the right parts at the right time will achieve far more than a group of master trades who have to be creative and innovative because the parts are not there. Yet, many organizations are still slow or reluctant to overhaul and make their parts system better.

Knight concluded when an organization is in a position to properly plan, execute and review maintenance work on an agreed-to standard, it will be in a position to improve other aspects of the department.

What he describes is a journey, but implementing an efficient maintenance system improves reliability, which boosts the bottom line, and this is something management will support.

*Steve Gahbauer is an engineer, a Toronto-based business writer and a regular contributing editor. E-mail gahbauer@rogers.com.*

**Comments?**  
**E-mail mpowell@plant.ca.**

# IRON & EARTH

## BRIDGING OIL SANDS AND RENEWABLES

Liam Hildebrand is leading an initiative to retrain oil workers and develop Canada's green energy economy.

BY MATT POWELL, ASSOCIATE EDITOR

Steel fabricator Liam Hildebrand has worked in Alberta's oil sands over the past six years. But as oil prices plunged and jobs disappeared, like many of his peers, Hildebrand was soon out of work. Now he's at the helm of a national campaign that aims to bridge the gap between contributing to climate change and helping to eliminate it.

Founded in 2015, Iron & Earth consists of oil sands workers who want to catalyze Canada's renewable energy sector by retraining displaced petroleum industry tradesmen.

Its initial campaign supports the retraining of 1,000 unemployed Alberta electricians as professional solar panel installers by 2018.

### **Why did you start the initiative?**

Renewable energy sources, such as wind and solar, geothermal, biomass, biofuels and energy storage, are all critical to reaching climate targets set by provincial and federal governments.

We recognized that large scale construction won't start for another couple of years because policy is so far behind. That leaves us with a small window of opportunity to build up a workforce that can handle those jobs when they do come online.

Working in the oil sands, I realized our trade was creating the infrastructure responsible for contributing to climate change, but our skills can also be applied to build the infrastructure that will help eliminate it.

### **What's your career background?**

I started as a steel fabricator over a decade ago at Ramsey Machine Works in Victoria, BC. We were making these massive steel infra-



Liam Hildebrand fronting the Iron & Earth initiative in Alberta.

PHOTO: IRON & EARTH

structure projects such as bridges, pressure vessels and large renewable energy projects for biomass applications, such as industrial composters.

Since then I've worked in the oil sands. Through a number of conversations with coworkers, there's a lot of recognition that we all have the ability to put our skills to work in renewable energy capacities, and those conversations were only amplified when oil prices plunged.

### **Why is the initiative necessary?**

In the immediate term, we want to retrain 1,000 electricians for energy retrofits and optimizations, and EV charging stations. All of these industries are growing rapidly, and if that continues there's going to be major demand for workers with the skills we have as tradesman and oil and gas workers.

But there's also a lot of policy that needs to catch up. We're trying to mitigate that by establishing partnerships with local manufacturing companies producing oil and gas products. We have one company that's interested in building metal PV racking systems for solar installations. When that capacity comes online, there will be a need for people to install them.

### **What other areas of the economy could benefit from this initiative?**

Manufacturing is a national opportunity. There's a lot of overlap: a biofuel plant is almost identical to an oil and gas facility. The same could be said about pressure vessel shops and wind tower manufacturers.

### **Any conversation with the government?**

We've met with Catharine McKenna (Minister of Environment and Climate Change) and are hopeful some federal funding is in our near future. There's been some chatter with the Alberta government, and a lot of ministries are interested. But the Alberta budget is tight, so we're hopeful the federal government

will see value in what we're trying to do.

This has become a national initiative on its own. We have a director from Newfoundland and Labrador who has had so much interest from co-workers that he brought together 35 people with two days notice. A number of MPs were at that meeting, a number of local industry leaders. The initiative would particularly benefit Newfoundland because of its reliance on Fort McMurray for work.

### **How will training be delivered?**

One of the most unique components of the initiative is we're going to train on the job site. If a training provider is accepted, we find 10 workers that can come in and within three and a half weeks, they'll have installed a solar PV system, conducted an energy assessment and optimization, and installed an electrical vehicle charging station. That's what makes our program different. Some renewable energy training programs cater to people right out of high school, without any previous knowledge related to these skills. We believe the biggest opportunity is to leverage existing skilled journeyman and retrain them to build the renewable economy.

### **What's in the future for Iron & Earth?**

We are going to launch skills programs for geothermal and wind energy sources and the products they require.

I think it's going to continue to grow and get a lot of support from industry. We want to continue to break down the polarization of renewable energy development, create a widespread recognition of the opportunities renewable energy presents by bringing together people from all sorts of backgrounds. By developing the skills necessary, we can help the country meet its aggressive climate change goals, including those in Alberta.

*This interview has been edited.*

**Comments? E-mail [mpowell@plant.ca](mailto:mpowell@plant.ca).**

# TARGETING TAILINGS

## CLEAN TECHNOLOGY REMOVES NAPHTHENTIC ACIDS

University of Waterloo technology harnesses the sun to destroy contaminants in oil production wastewater.

BY PLANT STAFF

Tim Leshuk thinks removing naphthenic acids from the more than a billion tonnes of water stored in Alberta oil sands tailing ponds is one of Canada's greatest environmental challenges.

He's part of a team of researchers developing a process that removes contaminants from oil sands wastewater using sunlight and nanoparticles.

The process involves photocatalysis, a chemical reaction that involves the absorption of light by nanoparticles to completely eliminate naphthenic acids in oil sands wastewater.

"Conventional treatments either haven't worked, or [have] been far too impractical and expensive to solve the size of the problem. Waterloo's technology is the first step of what looks like a very practical and green treatment method," says Leshuk, a PhD candidate in chemical engineering at the University of Waterloo in southern Ontario. He's the recipient of the prestigious Vanier Canada Graduate Scholarship and the lead author of *Solar photocatalytic degradation of naphthenic acids in oil sands process-affected water*.

Water in oil sands tailings ponds is left to biodegrade naturally, leaving behind contaminants that hang around for decades. Naphthenic acids pose a significant threat to ecology and human health. In fact, aluminum salts of naphthenic acids were combined with palmitic

acid during World War II and the Korean and Vietnam wars to produce napalm, which was used extensively by US forces for incendiary attacks.

Waterloo's research team, led by professor Frank Gu, a professor in the university's faculty of engineering and Canada Research Chair in Advanced Target Delivery Systems, was the first to discover the benefits of applying photocatalysis to tailings ponds.

### Energy-efficient technology

The ponds in Alberta cover 176 square kilometres and contain enough fluid to fill 390,000 Olympic-sized swimming pools, according to Alberta Environment and Parks. The Pembina



Tim Leshuk with before and after tailings water.

PHOTO: UNIVERSITY OF WATERLOO

Institute, a Calgary-based environmental watchdog, estimates 1.5 barrels of tailings are added to the environment to produce one barrel of oil.

Unlike treating polluted water with chlorine or membrane filtering, Waterloo's technology is energy-efficient and cheaper. Research revealed nanoparticles become extremely reactive when exposed to sunlight and break down persistent pollutants into individual atoms to completely remove them from the water. The treatment uses

sunlight for energy.

Tests revealed solar photocatalysis achieved complete mineralization of organic carbons in tailings water within a week and can be used multiple times.

The next steps for the research is ensuring the treated water meets Canadian environmental legislation and regulations, which require water to be safely discharged from sources larger than samples.

### Comments?

E-mail [mpowell@plant.ca](mailto:mpowell@plant.ca).

## RENEWABLES

### Granville Brewery goes green

First brewery in BC to plug into Bullfrog Power

Granville Island Brewery has partnered with Bullfrog Power to become the first 100% green electricity and green natural gas powered brewery in BC, thus avoiding 100% of the energy-related emissions used by its facilities.

Bullfrog Power's generators will feed 100% clean, pollution-free electricity onto the grid to match the amount of conventional power the brewer uses. Across Canada, Bullfrog Power's green electricity comes from a blend of wind and low-impact hydro-power sourced from new Canadian renewable energy facilities.

Bullfrog Power's producers

also inject green natural gas onto the national pipeline to match the amount of fuel used by Granville's brewing operations. Sourced from a methane-capture project at one of Canada's landfills, the cleaned-up natural gas is a climate-friendly alternative to the conventional stuff.

Canada's first microbrewery, founded in 1984, remains at its original location beneath the Granville Street Bridge in Vancouver. The brewery was purchased by Molson Coors Brewing Co. in 2009 through the beer giant's Creemore Springs subsidiary.

Other green initiatives include a

bottle pool that ensures glass containers are recycled up to 10 times before they're broken down, and spent grain is shipped to local farms to be used in animal feed.



Bullfrog-powered brew.

PHOTO: GRANVILLE



Survey respondents report oil and gas producers are requesting price reductions (on the high end) of more than 30%.

PHOTO: THINKSTOCK

Manufacturers serving the energy sector are taking a hit but their prospects needn't be grim.

BY MANUEL CACERES

The historic slide in global oil prices has forced Canada's oil and gas producers to drastically cut field activity, pricing and employee head counts. Yet despite all the headlines devoted to this dreary economic phenomenon, very little attention is being paid to a vital part of this sector: service and supply companies. That's why Grant Thornton, part-

# SUFFERING FROM LOW ENERGY?

## GET AHEAD DURING THE DOWNTURN

nering with JWN Energy Intelligence, produced the *Service and Supply Outlook Report: Adapting to a lower-for-longer commodity market*. We wanted to see how this sector – which includes manufacturers who service oil and gas producers – is faring.

With less work available, and at significantly lower-margins, companies large and small are being squeezed from all angles. Sixty-five percent of manufacturers across this sector reported customers asking for pricing concessions of some kind in 2015. At the extreme end, 28% said their customers requested price reductions greater than 30%, and 55% reported having contracts cancelled or deferred. As a result, players in the service and supply sector are being forced to cut costs, either employees (66%), non-employee cuts (63%) or inventory reduction/asset sales (38%), all of which limited their ability to seize new opportunities.

Smaller organizations – particularly those bringing in \$5 million or less – are seeing some of the

greatest changes to profitability, with 40% reporting a decline in net income greater than 20%. That said, many companies still believe there's a silver lining in all this. Overall, 29% were either optimistic or very optimistic about the year ahead – and 21% anticipated an increase in profitability despite low oil prices.

### Tough times

What are these manufacturers doing differently? Here are a few suggestions.

#### 1. Take pride in your output.

You don't need exporting expertise to succeed globally but you do need to be confident in the product you're offering and willing to ask for assistance. Export Development Canada (EDC) can help you make contact with business partners and customers outside of Canada, as well as provide letters of credit. There are also organizations that specialize in exporting Canadian technology that will promote your products and services around the world,

and help you make contact with interested customers.

#### 2. Look for new market needs – and fill them.

Sometimes innovation is as simple as applying your existing product or service to a new market need – or creating a unique business arrangement. For example, why not offer a steep discount if a customer consolidates its purchasing and buys all of its parts from you? Do your processes and expertise translate into opportunities in other sectors? Merging or acquiring another company provides a head start into a new industry.

#### 3. Get out of survival mode.

Take a longer-term approach. Identify how your customer needs are changing either as a result of the oil and gas downturn or because you've ventured into a new market and uncovered innovative ways to satisfy those needs. For example, rather than simply sending sales people out on calls, offer more added value and assign an engineer to accompany them.

You may also want to take a proactive stance when it comes to cash flow and financing. Work with your lenders to manage potential debt challenges ahead of time and consider negotiating bank covenants for longer periods. You might be surprised by how much your lender is willing to help, particularly if you require money to invest in hard assets such as equipment.

Times are tough but it's possible to come out ahead. The secret is to get out of the \$80/barrel mindset and prepare for the possibility \$50/barrel days could be here to stay. Taking the appropriate measures to run a profitable business at this lower price point will make your company stronger and better equipped to face adversity into the future.

*Manuel Caceres is a partner at Grant Thornton LLP in Edmonton, a Canadian accounting, tax and advisory firm. E-mail manuel.caceres@ca.gt.com.*

**Comments?**

**E-mail jterrett@plant.ca.**

### SURVIVAL TIPS

- Decide what business you are in.
- Cut costs while improving productivity.
- Focus on sales and marketing to maintain and grow market share, while mitigating pricing pressure.
- Work closely with lenders/banks to manage debt challenges and to maintain access to capital in case of a turnaround.
- Proactively manage your talent.
- Look for consolidation or integration opportunities that add market share and provide cost savings to customers.
- Pursue opportunities to diversify.
- Focus on improving customer productivity and driving down costs.



Asia-Pacific offers significant opportunities for LNG exports.

PHOTO: THINKSTOCK

# BC's LNG FUTURE

## An annual \$5.3 billion hike to GDP

Developing BC's liquefied natural gas (LNG) industry would provide a \$7.4 billion per year boost to the Canadian economy over the next 30 years, according to a Conference Board of Canada report.

Economic activity would create up to 65,000 jobs nationally and 46,000 in the province annually, reducing BC's unemployment rate by 0.5% over 30 years. Increased employment would enhance disposable income by an average of \$860 per person and \$4.8 billion per year.

*A Changing Tide: British Columbia's Emerging Liquefied Natural Gas Industry* says the province would require an annual investment of \$7 billion to develop 30 million tonnes of LNG annually.

Gas exports to the US have declined amid the shale gas boom there, but the Asia-Pacific region represents a significant opportunity for BC's LNG prospects.

Each dollar of investment would generate approximately \$1.06 in GDP for Canada and \$0.76 for BC (the lesser impact due to components being sourced outside the province). Benefits will peak in the early stages as LNG terminals and related pipelines are built, but the report says it will continue at significant levels through the operations phase with ongoing drilling and production investments.

Government revenues will grow with increasing labour income (\$808 million) and corporate profits (\$577 million), while increased drilling activity would contribute an additional \$686 million annually in royalty payments to BC over 30 years.

Nationally, the impact is estimated at close to \$6 billion per year, of which 47% (\$2.8 billion) would accrue to BC.

The Conference Board's analysis is based on the current long-term natural gas price forecast, which projects the North American benchmark to increase from US\$2.85 per MMBtu in 2015 to \$7.94 by 2035.

**Comments?**

**E-mail [jterrett@plant.ca](mailto:jterrett@plant.ca).**

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## TECHNOLOGY



HVLS fans gently move air from the ceiling to the floor.

PHOTO: RITE-HITE

# KEEPING IT FRESH

## IMPROVE PLANT AIR QUALITY WITH HVLS FANS AND CURTAIN WALLS

Improving airflow and ventilation helps eliminate the symptoms of sick building syndrome.

Indoor air affects more than product quality, it can negatively impact the health of workers. Operations like cutting/grinding and welding can leave dust/particulates hanging in the air, which could lead to a host of problems. And air quality issues aren't unique to these applications. Virtually any distribution centre, manufacturing facility or large, open

warehouse has challenges.

More facilities are turning to solutions that improve airflow and working with HVAC systems to boost efficiency, such as high-volume, low-speed (HVLS) fans and fabric curtain walls that cordon off smaller spaces into more manageable zones for HVAC and particulate control systems.

Sick building syndrome (SBS) describes situations in which building occupants experience acute health and comfort issues that appear to be linked to time spent inside. Most affected employees feel better soon after

leaving the building.

The primary cause of SBS is related to stagnant or dead air and ventilation is often found to be at the heart of the problem. Increasing ventilation rates and air distribution reduces indoor pollutant levels.

HVLS fans relieve workers by dispersing concentrations of airborne contaminants such as chemical fumes, pollens, bio-aerosols or other volatile organic compounds. Their unique blade design and the low air speeds they generate circulate larger volumes of air

*Continued on page 16*

## PLANTWARE



Cellular RX1400 router.

PHOTO: SIEMENS

### IMPROVE NETWORK PERFORMANCE

Siemens has raised the IQ of energy industry networks with its Ruggedcom VPE1400 virtual machine software for the compact, cellular RX1400 router.

It runs your Linux operating system and applications on the RX1400 at the network edge.

Data is pre-processed before it's transmitted to a data centre, which reduces the volume while increasing network performance.

Applications running in the VPE1400 environment are safely partitioned from the Ruggedcom ROX II operating system, while still having full access to the RX1400's network, LTE and serial interfaces.

Siemens is a German manufacturer of industrial technologies.

[www.siemens.com](http://www.siemens.com)

### MINIMIZE TOOL WEAR

Walter Tools' new app helps operators decrease wear rates and machining costs.

The app, which works on all current mobile devices and operating systems, identifies in 24 languages specific wear forms on indexable-insert and round-tool solid carbide applications.

For each wear template a description of wear type is provided, where it's occurred and how it can be prevented.

Walter is a manufacturer of machining tools based in Waukesha, Wis.

[www.walter-tools.com](http://www.walter-tools.com)



Curtain walls create an enclosure seal as effective as hard walls. PHOTO: RITE-HITE

Continued from page 15

greater distances than traditional high-speed fans. At just 3.2 to 4.8 kilometres per hour (km/h), a 7.5-metre HVLS fan covers more than 2,000 square metres of floor space, the equivalent of between 10 and 20 floor fans. In a process called destratification, the gentle breeze pushes air from the ceiling down to the floor, where it rises back up before being recirculated.

The fans also keep workers cool and more productive. A breeze of only 4 km/h can provide a cooling sensation of 5 to 6 degrees C, which is significant relief for workers operating in hot production areas.

### Enhancing HVAC efficiency

There are a number of factors to consider when deciding how and when to use HVLS fans, including obstructions such as pallet racks, machinery, product staging areas, personnel work areas and overall building layout. Smaller diameter fans will be most effective in specific work areas or where installation space is limited.

Another way to improve the system's efficiency is to make the space it services smaller so smaller exhaust equipment can be specified. However, constantly changing layouts in industrial facilities makes permanent walls a poor option.

Flexible, easy-to-install fabric curtain walls made from vinyl (and typically antimicrobial

batting) will separate processing areas from clean/finishing areas to aid in exhaust separation. If and when the layout of the facility changes, curtain walls are easily reconfigured.

If a positive pressure space is desired, an enclosure (or box) around the space maintains the pressure differential. Fabric curtain walls are less expensive to install and create an enclosure seal similar to that of a hard wall. Curtain walls are also effective if there are many penetrations through the partition such as piping or conduit.

Depending on the application, a curtain wall can be suspended from the room ceiling or supplied with a standalone framework for hanging. They're available as stationary or sliding units (suspended from roller track), and fit with strip curtains, personnel doors, or high-speed industrial doors.

HVLS fans and the strategic use of curtain walls are effective tools for combatting stagnant air, air particulate contamination and SBS. Creating a more comfortable, healthier workplace clearly signals to employees a willingness to invest in the company's greatest asset – its people.

*This is an edited version of an article provided by Rite-Hite, a manufacturer of industrial fans, dock equipment, industrial doors and safety barriers based in Milwaukee, Wis. E-mail Andy Olson, aolson@ritehite.com.*

### ACTUATORS



Integrated encoder.

### ACTUATORS EASE PROCESS AUTOMATION

Festo's DFPI-NB3 linear actuators handle harsh process automation conditions thanks to an integrated displacement encoder and optimized piston rod guide that are protected from the effects of extended exposure to water, dust, dirt or other aggressive media.

The rugged units are used in chemical and mining, energy production, machine and plant builders, water treatment and the handling of bulk goods.

Festo is a global manufacturer of automation technology with Canadian operations in Mississauga, Ont.

[www.festo.com](http://www.festo.com)

### PUMPS



### PUMPS ENHANCE ENERGY EFFICIENCY

Armstrong Fluid Technology's Horizontal End Suction Design Envelope (DE) Pumps boost energy savings with sensorless integrated controls.

Both the DE 4200H and DE 4280 include Armstrong Design Envelope technology, with sensorless control and enhanced BAS connectivity to achieve efficiency improvements.

The DE 4200H pumps are supplied with split-couplings and outside balanced seals while the DE 4280 pumps use a close-cou-

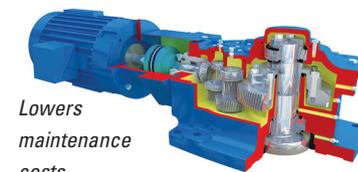
pled design.

Other features include integrated controls that eliminate the need for VFD wall space or mounting with extra cable runs; built-in harmonic mitigation, soft start and motor adaptation; and they're available to 125 hp/90 kW (DE 4200H) and 7.5 hp/5.5 kW (DE 4280).

Armstrong is a Toronto-based manufacturer of fluid flow equipment.

[www.armstrongfluidtechnology.com](http://www.armstrongfluidtechnology.com)

### FLUID CONTROL



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Chemineer, a subsidiary of NOV, is a manufacturer of fluid agitation and control products based in Dayton, Ohio.

[www.chemineer.com](http://www.chemineer.com)

### TEST AND MEASUREMENT

### GAS CORRECTOR SIMPLIFIES FIELD REPAIRS

Honeywell Process Solutions (HPS) EC 350 PTZ gas volume corrector uses pressure, temperature and compressibility factors to accurately measure gas volumes. Program the bracket, wall- and rotary-mount



Keypad interface simplifies operation.

device in the field, then employ a multi-line keypad interface to simplify operation.

HPS is a developer of automation and testing equipment based in Houston.

[www.honeywellprocess.com](http://www.honeywellprocess.com)

**MOTION CONTROL**

**EASILY PROGRAMS PROTOTYPES**



Current control to 5.6 A.

Haydon Kerk Motion Solutions' PBL4850E programmable 3-phase brushless motor drive replicates the functionality of stepper-based drives on brushless counterparts thanks to a common graphical interface.

The interface automatically populates motion profile parameters based on the entry of just a few motor characteristics. The 4-quadrant brushless controller uses sinusoidal commutation to produce smooth motion, which

minimizes torque ripple. The drive further refines motion by incorporating trapezoidal and s-curve motion profiles.

Current control is programmable up to 5.6 A with an optional current boost during ramping of up to 6.5 A peak with an input voltage of 12 to 48 VDC.

Hall cell signals are used for phase initialization and an encoder provides positional feedback. There are eight opto-isolated general purpose inputs (rated for 5 to 24 VDC, 8 mA maximum per input) and outputs (5 to 24 VDC, 200 mA maximum).

Haydon Kerk's IDEA software is configurable with a number of programming units.

The drive integrates into systems that require the storage of multiple programs and extended memory, then executes them outside the software without connecting to a computer.

Hayden Kerk is a manufacturer of motion control products based in Waterbury, Conn.

[www.haydonkerk.com](http://www.haydonkerk.com)

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EAO is a switch manufacturer based in Switzerland.

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The Fluid Power Innovation and Research Conference (FPIRC) brings together fluid power industry and academic research, technical sessions, networking opportunities, laboratory tours and panel discussions. Visit [www.nfpahub.com](http://www.nfpahub.com).

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This two-day conference and exhibition includes automation and robotics, additive manufacturing/3D printing, materials and software. Visit [www.advancedmfg.ca](http://www.advancedmfg.ca).



# Stop throwing public money at corporate Canada

BY GWYN MORGAN

Canadian governments regularly fund corporate ventures, but it is invariably money poorly spent. Bombardier Inc. received its first federal subsidy of \$36.9 million back in 1966 from Prime Minister Lester Pearson's Liberal government. The Montreal-headquartered company has since received Industry Canada funding of more \$1.1 billion, plus another \$1.1 billion that the federal agency poured into airplane manufacturer de Havilland, which later became Bombardier's airplane division. The company has also received nearly \$300 million from provincial governments, bringing the total to \$2.5 billion.

Now Prime Minister Justin Trudeau's government faces intense pressure to match Quebec's \$1.3-billion bailout of Bombardier's financially strapped airplane division, more than doubling the taxpayer largesse received by the company in the past 50 years.

This latest aerospace subsidy saga is only a part of taxpayer support for the sector. Quebec-based aero-engine manufacturer Pratt & Whitney has received a whopping \$3.3 billion and Montreal-based flight simulator manufacturer CAE has received \$646 million.

Overall, Industry Canada doled out \$22.4 billion to private businesses from 1961 to 2013, and that's just part of Ottawa's corporate welfare generosity. The \$350-million Atlantic Canada Opportunities Agency and the \$250-million Western Diversification Program dispense direct handouts that tend to favour governing party constituencies. And then there are the tax-based subsidies worth upwards of \$770 million.

Among the provinces, Quebec is the champion corporate subsidizer, handing out billions per year. Besides the recent \$1.3-billion bailout of Bombardier, there's the \$350-million handout to McInnis Cement for a plant under construction in the Gaspé region that, interestingly, is owned by the Bombardier-Beaudoin families.

Ontario is also a generous subsidizer. It gave US-based technology giant Cisco \$220 million to hire 1,700 people. Other recent subsidies to business include \$120 million to software company Open Text, \$87 million to Honda and a plethora of smaller handouts. The province has also established a Jobs and Prosperity Fund that will dole out \$2.7 billion in subsidies over a 10-year period.

Taken together, Canada's federal, provincial and municipal governments hand out tens of billions of dollars annually to private businesses that are great photo opportunities for politicians who extol the

jobs to be created.

But do these pronouncements paint a true picture? Ontario Premier Kathleen Wynne called Cisco's funding "the largest job-creating investment that we've seen in the technology sector." But University of Western Ontario economist Mike Moffatt points out Cisco will be hiring people who would have been employed by other high tech firms, rather than people who wouldn't have had jobs otherwise.

Other perverse effects of selective subsidization is the tilting of the playing field against unsubsidized competitors and businesses that failed after being granted a subsidy, illustrating the truth of the adage, "Governments are terrible at picking winners but losers are great at picking governments."

An analysis by Australian professor Terry Buss, formerly with the World Bank and a foremost expert on business subsidies, found most job and economic benefit studies are "based on poor data, unsound social science methods and faulty economic reasoning." He states that such reports "provide politicians and practitioners with justification to award political favours without appearing to be political."

And then there's the bees-to-honey effect of putting billions of dollars in the hands of politicians to dispense.

Montreal-based business columnist David Descoteaux points out that "The more governments hand out subsidies . . . the more corporate success is dependent on government assistance, forcing companies to hire lobbyists to get their share of the pie."

But what about the argument: if we don't do it, the investment will flow to a jurisdiction that will? The US think-tank Good Jobs First estimates state and local governments shell out US\$70 billion a year in business subsidies, sometimes funding half or more of a new investment. Trying to compete with such aggressive tactics is a losing game.

Descoteaux says the only way to halt this race to the bottom is by strengthening international trade agreements to eliminate subsidies. Canada should be a big booster of such agreements, because the ten-fold larger economy to the south can win a subsidy competition any time it chooses. And as long as that imbalance exists, we tend to throw good money after bad.

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*Gwyn Morgan is the retired founding CEO of EnCana Corp. This column is distributed by Calgary-based Troy Media © 2016.*

**Comments? E-mail [jterrett@plant.ca](mailto:jterrett@plant.ca).**

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**87%**  
**DECREASE**  
**IN DOWNTIME**



**75%**  
**REDUCED**  
**CLEANING TIME**



**80%**  
**DECREASE**  
**IN SCRAP**

## SUPERIOR SPRAY. SERIOUS RESULTS.

Looking for tangible results like improved quality and cost reductions? Here are just three examples of how our spray technology has helped other processors.

**Downtime decreased by 87%** – Clogged nozzles were causing hourly shutdowns for a manufacturer spraying pigment on floorboards. Solution: An AutoJet® spray controller triggers nozzles to spray only when needed and automatic spray nozzles equipped with clean-out needles prevent clogging.

**Cleaning time reduced by 75%** – Manual cleaning of powder residue in blenders after each batch resulted in a significant production loss for a food producer. Solution: Two TankJet® 75 tank cleaners automate the cleaning process; production time increased by two hours per shift.

**Scrap decreased by 80%** – Sesame seeds that didn't stick to dough due to inconsistent moisture application were eroding profitability for a food processor. Solution: An AutoJet Modular Spray System that precisely controls the volume of water applied and makes automatic adjustments when line speed changes.



***Spraying Systems Canada Ltd.***  
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