



Making our customers look *good*  
and their operations *better*.

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# ENERGY MANAGEMENT SERVICES

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## 1. INTRODUCTION

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There are a lot of good reasons to manage energy use at industrial sites. Reducing process energy use reduces operating costs. Tracking energy use can help identify unplanned process changes or malfunctioning equipment early, which allows problems to be corrected promptly.

Utility companies across Canada fund Energy Management programs, which can include energy audits of existing plants, project feasibility studies, new plant design reviews, and energy use monitoring and reporting. Utilities also provide capital incentives, which can include millions of dollars for equipment upgrades.

These Energy Management programs can be used to identify energy reduction opportunities, assess project feasibility, perform equipment selection trade-offs, and monitor and manage energy costs. Benefits of energy management programs include not only reduced energy costs, but also reduced maintenance time and cost, increased plant automation, and a reduction in unplanned shutdowns. Sacré-Davey Engineering knows how to access utility incentive funding and has performed over 40 Energy Management studies for various industries including oil and gas, mining, pulp and paper, and ports and marine. We have consistently found energy savings opportunities worth hundreds of thousands of dollars to our clients. Even in new plant projects we can find opportunities that have been overlooked in the design.

## 2. Q & A

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### **Q - What is Energy Management?**

A - Energy Management can be defined as adjusting and optimizing equipment, systems, and procedures to minimize energy cost while maintaining or increasing production rates.

### **Q - We need to run the equipment to make our product. How can we reduce our energy use without impacting production?**

A – When we look at reducing energy use, we look at four main approaches.

1. Maximizing the efficiency of the equipment or operation. Equipment should be operating at its design point and should be properly maintained and lubricated to eliminate friction and other losses. As an illustration, you can reduce the amount of money you spend on gasoline (energy) for your car by making sure the engine is tuned and the tires are properly inflated.
2. Matching the equipment or operation to the true requirement. Equipment should be sized properly for the operation it's performing. To carry on with the car illustration, now that the children have grown up and you don't need to drive soccer teams around, maybe you should sell the van and get a smaller car.
3. Operational changes. Sometimes we find equipment running unnecessarily or we find equipment is performing an operation that is not really necessary. In the car example, maybe you could carpool some trips.
4. Technology changes. Perhaps the existing equipment can be replaced with more efficient equipment. An example would be replacing an older car with a new hybrid.

All of these approaches will identify energy savings without impacting production.

**Q – Is there anything else we can do to reduce energy cost?**

A – While reducing energy use is the most obvious way to reduce energy cost, sometimes other measures can be considered.

- Fuel shifting: if there is a choice between say, natural gas and electric, the cost of each should be evaluated and compared.
- Time-of-use shifting: Electric utilities charge for peak demand load. We can reduce energy cost by smoothing out the demand to reduce the peaks. Some electric utilities also have time-of-day rates; in that case we can look at whether some equipment should be run only when the rates are lower.
- Power factor correction: Electric utilities also charge for low power factor. (Power factor refers to how well the AC current and the AC voltage cycles align.) We can help you correct the power factor and eliminate the surcharges.
- Making use of waste and maximizing onsite generation capacity: In many cases waste heat from one process area can be used in another process area. Or the waste heat can be used to generate electricity. As a bonus, this can also reduce the load on the cooling system.

Sacré-Davey Engineering can help you identify and implement the most effective measures to reduce your energy costs.

**Q – We spend a lot of money on water. Can we also manage water use?**

A – Yes, Sacré-Davey's Energy Management team can help you find ways to manage any utility resource, whether it be energy (electricity, natural gas, diesel, etc.), fresh water, waste water, or gases (such as nitrogen).

**Q – Is there anything else in it for me?**

A – Absolutely! Process energy optimization projects often include de-bottlenecking the process, increasing automation, and/or upgrading equipment. The outcomes include

- Reduced maintenance costs and increased equipment life, because when equipment is operating at its design point there is less heat and vibration
- Fewer forced outages, because if there is less wear and vibration the equipment is less likely to fail
- More consistent product quality, because with increased automation the process conditions can be continuously optimized
- Increased production through elimination of bottlenecks and because of reduced down time
- Happier operating and maintenance staff, because they no longer have to deal with difficult and unreliable equipment

**Q – We don't have budget for an energy study. Are there incentives available?**

A – Utility incentives for industrial energy studies are available in British Columbia, Saskatchewan, Manitoba, Northwest Territories, Ontario (varies by utility area), Quebec, and Nova Scotia. These incentives typically cover energy audits, new plant design studies, and feasibility studies for specific energy projects. Incentives are also available to offset the cost of new equipment or the cost of an upgrade for equipment that was going to be replaced in kind. Some utilities also offer incentives to implement processes for energy management

(up to and including ISO 50001 certification) and for systems to collect, analyze, and report on energy spending. Funding from other sources is available in other provinces and territories. Depending on the specific study, federal funding may also be available.

Sacré-Davey Engineering would be pleased to help you identify sources of funding. We have years of experience in helping our clients get the maximum funding available for their energy projects.

**Q – Why would utilities pay for energy-use reduction? Doesn't it cut into their revenues?**

A – Some utility energy supplies and/or delivery systems are close to capacity. It costs less for the utilities to offer customers incentives to reduce energy use than it would to increase the capacity. Also, most utilities are government-regulated and governments are putting substantial pressure on the utilities to offer energy-efficiency programs. Energy-efficiency programs are in the public interest because reducing costs of production helps make Canadian industries more competitive.

**Q – Why should I hire SDE to do my energy study rather than having my own engineers do it?**

A – We understand that our clients often

- Are short on staff
- Don't have time
- Don't have budget
- Don't have expertise in this area

SDE will

- Identify available incentive programs from your local utility and handle the majority of the paperwork
- Perform the energy study
- Identify hidden process and equipment problems and offer solutions
- Identify applicable new technology
- Help you identify and prioritize energy projects

**Q – I am having my new plant designed by experts in the field. Why do you think you can find improvements?**

A – Your plant designers are experts in your particular process area and SDE are experts in improving energy efficiency on industrial sites. SDE is happy to work together with your experts to help you get the best of both areas of expertise.

Generally speaking, when SDE does a New Plant Design Energy review, we begin by identifying specific areas of the process that show the most potential for energy improvement. We then focus our efforts in these areas. Because we have a narrower focus than the design team, we can explore more options in those areas. Our study may include process design, equipment design, and/or operations. In addition, we work across a variety of industries and can often bring in ideas that have successfully been used in other industries but have not yet been applied in your industry.



**Q – What happens during a typical energy study?**

A – SDE will develop a scope for the energy study and create a proposal to be submitted to the utility company. If you have a specific project in mind, we can pre-screen it to determine whether it is likely to meet the utility's funding requirements.

Once utility approval has been received, we will start the project. First, we do an information review. We review past utility bills, P&ID's, and single-line diagrams, and equipment specifications to characterize the baseline utility consumption. Depending on the project, we may also review operating manuals and maintenance history to identify potential problem areas. For an existing plant, we make a site visit to observe the equipment and to interview operating and maintenance staff. SDE will develop a list of possible energy conservation measures (projects) and review them with you. We will then perform a more detailed study on the top projects, including an initial assessment of the cost and potential savings. SDE will prepare a final report to summarize the study findings for you and for the utility company's review.

Depending on the utility company, the utility may review the report themselves or they may accept your review and approval. After the technical review is complete, the utility will generally calculate a final incentive and provide you with a letter of commitment. After receiving the letter of commitment, you can move ahead with the project.

The typical duration of the study is about five months: one month for utility approval, three months for the actual study, and one month for the final review. If necessary, the timeline can be accelerated.

**Q – Please give me more details about Sacré-Davey's energy management experience.**

A – SDE has a dedicated energy management team that has performed over 40 energy studies in the last three years in various industrial areas including oil and gas, mining, wood products, and ports and marine. During that time we have identified over 385,000 MWh/yr of electric savings, worth \$19 million / year to our clients. We also have experience in natural gas and water use audits.

Examples of some of our energy studies are given in the following paragraphs.

### 3. SACRÉ-DAVEY ENGINEERING ENERGY MANAGEMENT EXPERIENCE

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#### 3.1 *AltaGas Compressor Replacement Optimization*

AltaGas intended to install a new auxiliary positive displacement compressor at a Natural Gas Liquids Extraction plant. The new compressor would replace an old unit that was at end of life and was becoming a maintenance problem. They asked Sacré-Davey to determine the potential energy savings by using a VFD on the compressor motor.



SDE reviewed the duty cycle and the specifications for the new compressor to estimate the baseline energy use, developed several design options, and performed a feasibility level assessment of each of the options. AltaGas's chosen option, which uses a technology that is new to them, cost less than the VFD and saves more energy: predicted energy savings are about \$40,000 per year. The selected option also allows a wider window of operation than the VFD.

The study was 100% funded by BC Hydro PowerSmart and AltaGas received an implementation incentive of about \$150,000.

### 3.2 Pipeline Compressor Station New Plant Design Study



Sacré-Davey performed a new plant design study on a new 800 MMSCFD, 460-km natural gas pipeline and compressor station. The station was to have electric-powered compression. Our team reviewed the specifications for both the Phase 1 and 2 compressor station including the natural gas compressors, cooling system, and auxiliary systems, and for the pipeline itself. The study identified several opportunities to reduce fuel costs, including pipeline efficiency improvements, waste heat recovery co-generation, and compressor VFD modifications representing a potential annual savings of more than \$7 million.

### 3.3 Heat Exchanger Cleaning



Several of the Cold Boxes in a Natural Gas Liquids Extraction plant were fouled, resulting in high pressure drops. This limited the plant capacity and caused the recompression compressors to run at higher-than-design load. The client was interested in a vendor process for solution-cleaning the heat exchangers in place but wanted reassurance that the cleaning process would work as promised before committing the money and plant down time.

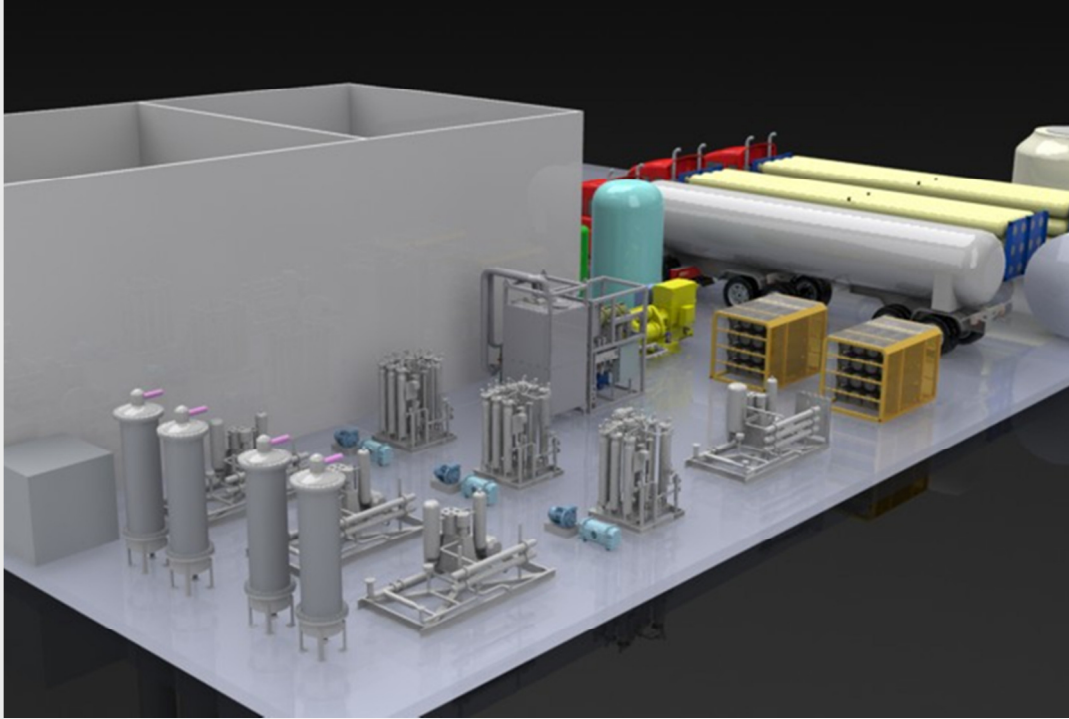


SDE developed a plan to test the process on a spare Cold Box that had previously been removed due to the same fouling. SDE designed a procedure to measure the heat exchanger pressure drop before and after the cleaning, prepared a conceptual design of the test set-up, and identified all required test equipment, instrumentation, and data to be collected. SDE performed detail engineering of the test stand and prepared a detailed test procedure. After the test, SDE analyzed the test data and performed an economic analysis showing a potential electric savings of \$162,000 per year, in addition to increased recovery of ethane, propane, and other natural gas liquids.

SDE's participation in the study was 100% funded by BC Hydro PowerSmart, and the client will be eligible to receive a project incentive of roughly \$500,000.



### 3.4 Gas Liquefaction Plant



Sacré-Davey Engineering performed a New Plant Design Study on the design of a small-scale (5000 GPD) hydrogen purification and liquefaction plant. In this design, the core liquefaction process was a proprietary vendor design. SDE focused on balance-of-plant and auxiliary systems and identified four energy conservation measures, which, if implemented would save 575 MWh of electricity and \$26,000 annually.

## 4. AN INTRODUCTION TO SACRÉ-DAVEY ENGINEERING

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### 4.1 *Sacré-Davey Business Philosophy*

#### PHILOSOPHY:

Everything we do must conform to and be examined against our philosophy to add measurable VALUE to our clients. We will provide:

- rapid response, on-time and on budget
- superior service
- innovative solutions having quantifiable benefits
- access to our multi-industry experience and “out of the box” thinking

#### CULTURE:

Continuous improvement is the distinguishing feature of our culture. Our projects are diverse and draw on the talents of our multidisciplinary project teams. Practicality, reliability and attentiveness to our clients’ needs are important characteristics of our people. In all our activities, we strive to be:

- nimble and able to react quickly
- efficient, effective and not encumbered by bureaucracy
- hands-on, providing guidance far beyond the document
- functioning project managers engaged in design activities

#### PROJECT CONTROLS:

Sacré-Davey in-house QA/QC system is in full compliance with the Association of Consulting Engineers of Canada, the Consulting Engineers of British Columbia, and the Association of Professional Engineers & Geoscientists of British Columbia. A key function of our QA/QC system is Project Controls, aimed at controlling scope, cost and schedule. Using these tools we are able to:

- increase efficiency
- control costs limiting errors
- keep clients and stakeholders informed
- provide a framework for decision making
- reduce the risk of claims
- maintain auditable records

#### PROJECT DELIVERY:

Sacré-Davey believes a project's success depends on exceeding the goals of our client. We must go beyond the typical requirements of scope, schedule and cost. For us to be successful, we must consider those things that are essential for our customers' success including the need for operational guidance, training, post-project assistance and socio-economic impact. For example:

##### **During Project Definition and Detailed Design:**

Consideration must be given to the impact of the project on economics of the facility including current availability and cost of labor. In other words, what is the availability and cost of labour as it relates to the project? Consideration must be given to the impact on the community and environment. Local contracting resources and available expertise must be measured to ensure designs incorporate aspects that can be readily accessed locally. This will involve evaluating existing skills of contracting forces, and tailoring the design and development of modules to ensure maximum local benefit.

##### **During Construction:**

Sufficient effort is placed on developing local project participants in the execution of the project, and ensuring that the intent of the design is maintained, the integrity not compromised, and the project is delivered on-time and on budget.

##### **During Commissioning:**

Sufficient training takes place to ensure the facility will be operated by competent people. To ensure this, we develop comprehensive operations and maintenance manuals and assist in the hiring, and training of facility personnel.

##### **After Commissioning:**

We maintain dialogue with the facility operators and are available to help them through operational issues that may arise.

#### ABOVE ALL:

The primary tenet that forms the keystone of our business is the knowledge that successful projects start with a partnership founded on **respect**, with each partner shouldering **responsibility**, and delivering **results**.

**Most of our projects come from repeat clients; clients with whom we have established partnerships.**

## 4.2 Sacré-Davey Corporate Profile



Sacré-Davey provides value based engineering and project solutions to our clients in the oil and gas, petrochemicals, alternative energy, mining, industrial / manufacturing and building sectors.



Founded in 1986 as Sacré Consultants Ltd, our foundation was set on the premise of superior service, sound engineering, and honest advice - this holds true today. In 1999, we acquired Davey Engineering, and since that day, have been carrying on business as Sacré-Davey.



Our customer centered business and the innovative solutions we bring have allowed us to thrive. Since our inception, we have grown from a small, single disciplined group to a mid-sized, full service, engineering and project management company, providing process and disciplined engineering and project management services. Our team, coupled with our industry experts and associates, serve the world from our base offices in North America and Abu Dhabi. We seek first to understand our customer's needs so that we may present meaningful solutions having direct relevance to their business.



Our desire to provide value based project advice has opened doors for us in the Middle East, to which Sacré-Davey has responded by establishing an office in Abu Dhabi, United Arab Emirates, where we offer Canadian based engineering expertise.

Service, Value and Innovation.....







Sacré-Davey's reputation has taken us around the globe with projects in the United States, South America, Africa, Middle East, China and other parts of the world. Our versatility enables us to service clients in many geographic regions and across a spectrum of project services including consulting, contracting, design-build projects, and joint ventures. We are registered in the following provinces and states in North America:

**Canada:**

- British Columbia
- Alberta
- Saskatchewan
- Manitoba
- Ontario
- Yukon
- Nunavut
- Northwest Territories

**USA:**

- California
- Illinois
- Kentucky
- Missouri
- Oklahoma
- Oregon
- South Carolina
- Washington
- Wisconsin
- Wyoming



**International:**

We perform our international work through associations with local firms. Sacré-Davey has an office in Abu Dhabi, United Arab Emirates and we have completed projects in countries as diverse as:



- |                |         |       |                      |
|----------------|---------|-------|----------------------|
| United Kingdom | Belarus | China | United Arab Emirates |
| Morocco        | Egypt   | Congo | South America        |

**Our Mission:**

*"Making our customers look good and their operations better"*

*We will add value by providing client-centered engineering and project management services through:*

- Taking care of our clients' needs as if they were our own
  - Investing in our people so that we may better serve our clients
  - Continually building our expertise and value proposition
- Staying dynamic, creative, and innovative



Sacré-Davey multidiscipline services extend from the earliest stages of project development through to start-up and also with established operations. Our services include:

PROJECT PLANNING	PROJECT IMPLEMENTATION	PLANT OPERATION
Conceptual Designs	Preliminary Engineering	Process & Energy Use Audits
Capital Cost Estimates	Detailed Engineering	Budgeting
Definition & Pre-Feasibility	Systems Integration	Safety & Hazop Reviews
Comprehensive Feasibility	Project Management	Maintenance & Reconditioning
Project Delivery Strategies	EPCM services & EPC	Optimization & Rehabilitation

Sacré-Davey has been providing innovative solutions for years and our tradition of serving clients through continuous improvement remains the distinguishing feature of the firm's culture. We service the industrial sector, port and marine facilities, water and wastewater plants, transportation industry, oil and gas refineries, infrastructure, and government organizations.

#### Services

- Management Services
- Design Services
- Energy Management
- Process Engineering
- Structural / Civil Engineering
- Mechanical Engineering
- Electrical Engineering
- Ancillary Services

#### Disciplines Served

- Project Management
- Mechanical & Process
- Civil & Structural, Seismic
- Electrical, Controls, Instrumentation

Sound knowledge of leading edge practices and technologies provides Sacré-Davey with a solid foundation to meet our clients' needs. Regardless of the size or location of the project, Sacré-Davey tailors its approach in response to our clients' specific requirements and perspective. Our responsiveness and versatility is the direct result of the diverse experience of the professionals on our team.

***“Our total Commitment...  
Your complete Confidence!”***

### 4.3 Key Customer List

The clients of Sacré-Davey Engineering include industrial and commercial companies, government, non-profit organizations and individuals. A partial listing of our clients is given here below. Please view our website to view more clients and project details.



#### **4.4 Our Clients**

The clients of Sacré-Davey Engineering include industrial and commercial companies, government agencies, non-profit organizations and individuals. A partial listing of our clients is as follows:

##### ***Oil, Gas & Petrochemical***

AltaGas  
 ATCO Gas  
 Canexus Chemicals  
 Chevron Canada  
 Enbridge Inc  
 FortisBC (Terasen Gas)  
 Kinder Morgan  
 Koch Fertilizer  
 Methanex Corp  
 National Research Council  
 QuestAir Technologies  
 Spectra Energy  
 Westport Innovation

##### ***Mining & Materials Handling***

Barrick Gold  
 Cascadia Terminals  
 Competition Bureau of Canada  
 Crestbrook Forest Products  
 Lafarge Canada  
 Louisiana Pacific Corp  
 Mosquito Consolidated  
 Nevada Copper  
 Overland Minerals  
 Prince Rupert Grain  
 Prince Rupert Port Authority  
 Roca Mines  
 Tech – Highland Valley Copper  
 Vancouver Wharves

##### ***Ports/Marine***

BCR Marine  
 Neptune Terminals  
 Pacific Coast Terminals  
 Prince Rupert Port Authority  
 Teck Inc  
 Vancouver Port Authority

##### ***Food and Beverage***

Canada Bread  
 Labatt Breweries  
 Lucerne Foods  
 Maple Leaf Foods  
 Okanagan Springs Brewery  
 Olivieri Pasta  
 Saputo Foods Ltd. (Dairyland)

##### ***Pulp & Paper***

Canfor - PG Pulp  
 Cariboo Pulp and Paper  
 Crestbrook Forest Industries  
 Eurocan Pulp and Paper  
 Harmac Pacific - Nanaimo  
 Louisiana Pacific Corp.  
 Neucel, Port Alice  
 NorskeCanada (Crofton, Elk Falls, Port Alberni)  
 Quesnel River Pulp  
 Rauté Wood  
 Simpson Tacoma Kraft  
 Western Pulp, Squamish

##### ***Seismic Restraint/Certification***

Cuttler-Hammer/Westinghouse  
 Detroit Diesel-Allison  
 General Electric  
 Miscellaneous Contractors  
 Vibra-Sonic Control  
 Virginia Transformer

##### ***Transportation***

District of North Vancouver  
 Ministry of Transportation and Highways  
 Vancouver International Airport

##### ***Waste Reduction***

Delta Recycling Facility  
 Metro Vancouver  
 Westcoast Reduction