

THE ENERGY-EFFICIENT CHEMICAL SUPPLIER

(And How To Become One)

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Canadian Plastics

Energy Efficiency in the Chemical Industry

Brought to you by the Independent Electricity System Operator and your local electric utility.

A NEW WAY OF THINKING ABOUT ENERGY EFFICIENCY



Conventional wisdom used to be that increased demand for electricity was a great indicator of economic growth. The logic was simple — the more we produce, the more energy we must need. Not anymore. Today, businesses throughout Ontario have embraced energy efficiency as a key to greater competitiveness. For them, using less

energy actually powers new business opportunities.

Between 2011 and 2014, Save On Energy business programs saved 4,077 GWh of energy and 389 MW of demand in the province. With energy efficiency, businesses can realize substantial energy savings, but also improve their cost structures, processes and overall competitiveness. Some businesses see improved employee engagement, for others it means reinforcing ties with their community, and for others still, it translates into a better customer experience. And perhaps most of all, many value the opportunity to contribute to the health and well-being of their communities by using energy wisely.

To help businesses continue to move forward toward greater efficiency and competitiveness, the province has introduced a new approach that puts energy efficiency ahead of all other supply options. This approach, “Conservation First”, is designed to take us to the next level of energy savings.

With ambitious new energy reduction targets in place, the bar is set higher now than it’s ever been. Save On Energy programs delivered by local electric utilities have been re-designed to ensure that, together, businesses can meet provincial goals while at the same time reaping the rewards of sound internal energy management practices. Looking ahead, there will be even greater opportunities for businesses to reduce their overhead through retrofits, energy audits, lighting and equipment upgrades.

This publication will help you find ways to take advantage of the many benefits of using energy wisely. In reading about different approaches to energy management, and business leaders’ determination to turn great ideas into great results, perhaps you’ll find the inspiration to do the same. To find out more about what energy efficiency can do for your business, visit saveonenergy.ca or contact your local electric utility (ieso.ca/findutility).

Terry Young

Vice-President, Conservation and Corporate Relations
Independent Electricity System Operator

Energy costs are on the rise in Ontario, and chemical manufacturers are huge consumers. So now is definitely the time to get serious about finding new and efficient ways of using your electricity. The good news? There’s a wealth of experts and incentive programs at hand to help you along.

By Mark Stephen

Resin is the lifeblood of the plastics industry, and electricity is the lifeblood of the chemical facilities that manufacture it. Now picture having to pay an ever-higher bill for your blood: That’s how it feels to be a chemical supplier in 2016.

Why? Unless you hit the snooze button about five years ago and never woke back up, you’re probably aware of a constant and growing din of noise from all business segments in Ontario about the high price of electricity and its effects. Energy costs have always been an issue for Canadian manufacturers. But rising energy costs — particularly in Ontario — are now becoming a real threat to their competitiveness, and might just become the tipping point that weighs against international investment.

It’s a particular problem for Ontario’s chemical sector. Three years ago, a report prepared by the Canadian Industrial Energy End-use Data and Analysis Centre for the Chemistry Industry Association of Canada found that feedstock and energy costs make up about 70 per cent of a chemical company’s process costs. So you can take it as a given that the number has risen in the ensuing years — unless you’ve discovered opportunities to cut costs, which means understanding how and when your facility uses electricity, and acting on that information to implement a serious and coherent energy saving program.

Did you know, for example, that businesses that use over 250,000 kilowatt-hours (kWh) of electricity per year (or at least \$2,000 per month in electricity costs) pay the market price for electricity rather than the time-of-use prices that households, small businesses, and designated consumers such as farms pay? Or that, as a business that pays market prices for electricity, your costs are based on how much you use, your peak demand, and the time of day and week you use it if you have an interval meter?

Too many chemical makers don’t know these and other facts, making it hard for them to implement a conservation strategy that will give them a break on costs. Which

is a shame, because there are a host of experts, tools, and programs available to make it happen. But it's not too late to turn things around. Helping Ontario's chemical industry get smarter about electricity consumption is the goal of this report, made possible by the Independent Electricity System Operator (IESO). *Canadian Plastics* interviewed chemical manufacturers, utility providers, and energy industry consultants, and engaged them in a debate about such questions as how to keep consumption figures from rising further, and what it would take to get them to level off or — better yet — drop. The answers can mean the difference between making a profit and losing money...and maybe even losing your business.

EXECUTIVE DECISION

When it comes to taking the first step towards developing an effective energy saving strategy, the interviewees for this report are unanimous: engagement from senior management is crucial. They're equally unanimous, however, that it's not always easy to achieve. "Getting buy-in on the executive level — particularly the CEO and CFO — is critical to a chemical maker putting an energy saving policy in place, but they're often the ones who are the most difficult to convince," said Brian Baxter, the supervisor of conservation and demand management and program delivery at Hydro One Brampton. "As opposed to mid-level managers, it can be hard to get table time with upper management because they tend to be very busy. But they're the decision-makers that we have to convince to do these projects." Adding to the challenge, Baxter continued, some senior management still believe that power is a fixed cost — which, given the wide range of programs available today, it definitely doesn't have to be. "Trying to get management buy-in to invest half a million dollars in a lighting project can be difficult when some of the CFOs and others still don't believe it will reduce their power bill," he said. "So we talk their talk, and try to put the investment in a language they understand — for example, that the cost of a program will equal the cost savings of 'X' amount of chemicals. Since companies are looking at all costs, and since Ontario is a high-cost jurisdiction, we always relate our conversations with management back to the priority of costs. Once you can relate the payback to company priorities, it connects with the C-suite and vice presidents and really drives the project home."

On the subject of saving energy, DuPont Canada is what you'd call an early adopter. The company has been engaged in energy conservation for almost 50 years, and has continued to maintain energy use data since 1972. Examples of energy saving projects are legion. In 2002, for example, it

REDUCING YOUR PEAK DEMAND

You can use the same amount of energy overall and still reduce your electricity bill. Sounds far-fetched? The trick is to manage your company's electricity demand and draw the same amount of electricity from the system at a slower rate.

Demand charges cover the cost of the size and type of wires and equipment needed to get the electricity to your business. Drawing a lot of electricity at one time creates a higher demand, and higher demand requires additional wires and transformers that can supply electricity at the rate you draw it without overloading. So, the higher your monthly peak demand, the higher your bill.

Your electricity delivery charges for the month are based on one 15-minute or 60-minute peak. If you can reduce your peak, you'll also reduce your delivery charges.

Your local utility has conservation and demand management programs to assist in reducing or shifting the peak demand of your facility — so contact them for more information.

invested \$1.2 million for a complete energy-efficient lighting retrofit at its site in Kingston, Ont. — a project that reduced electricity use by 575 kW and helped them save significantly on annual energy use.

So it knows how to do it right, beginning with executive buy-in. "DuPont has a global executive network, and the energy saving mandate comes directly from them," said Scott Sharpe, the company's FS&RE facilities supervisor, Western Region. "They decided a long time ago that treating energy savings as a series of one-off projects at various sites was not the way to do it. So right from the start, they implemented a coherent corporate strategy."

Buy-in from senior management wasn't an issue at Hamilton, Ont.-based Benson Chemicals, either. "Electricity was a significant cost for us and we wanted to reduce it," said Randy Wagenaar, the company's marketing manager. "Senior management talked about energy saving strategies with the lower echelon employees — who had their own ideas, which they in turn shared with senior management. So while everybody at the company agreed on doing it, the key to going forward with the reforms we've made — which include installing automatic light switches and LED lighting, and improving the insulation of our chemical tanks — was the firm commitment at the executive level. Without that, we wouldn't have had a consolidated strategy."

For mid-level managers at chemical manufacturing companies who are looking to engage an unconvinced senior management in an energy saving strategy, try this:

undertake a relatively small project that demonstrates a quick return on investment. It helps to know that not all energy saving ideas require a big capital investment. For chemical manufacturers in Ontario, the Save on Energy program provides incentives for upgrades to old equipment and energy-efficient lighting. “Depending on the number of lights installed, the payback period for a relatively simple project like switching to LED lighting can be shorter than you’d think — within a matter of months, in some cases,” said David Whitehouse, corporate services and conservation officer with Peterborough Utilities Group. “This tends to gain management’s attention because it can be amplified over the entire plant or the enterprise infrastructure.”

AUDIT THIS!

Once senior management is on board, launching a new energy efficiency strategy begins with understanding how electricity is used in a typical chemical plant. In other words, you have to measure it before you can control it. Two words describe this next step: energy audit.

An energy audit provides a useful, detailed breakdown of how much electricity is consumed in your facility and where, which is crucial to identify opportunities for improvements. Moreover, audits can identify energy savings by potential projects; identify potential non-energy related improvements by project, including productivity, safety, yield, sales, and so on; identify the capital cost of the projects; summarize the return on investment for each project; and prioritize the projects based on capital cost, life cycle cost savings and non-energy related financial benefits, return on investment, savings to investment ratio, payback periods, and more.

The good news is, Ontario’s Save on Energy incentive programs can cover up to 50 per cent of audits — and once opportunities are identified in the audits, more detailed engineering studies can define what exactly is required and provide more accuracy on the potential savings and costs. Even better, Save on Energy users can receive 100 per cent of study costs up to \$10,000 in incentive funding for completing a Preliminary Engineering Study, and 100 per cent of study costs up to \$50,000 in incentive funding for completing a Detailed Engineering Study.

Hydro One Brampton and Peterborough Utilities both identify three basic kinds of audits: a building electrical survey — typically done by an outside company or consulting firm — which provides an overview of a company’s energy consumption; a system-specific audit of important, potentially energy-wasting equipment like compressors; and higher level audits of processing systems, characterized by detailed engineering studies.

A thorough audit also reviews more than just machinery.

“A good auditor interviews staff to find out what they do during the day, what their energy habits are, what maintenance programs the company has, and who the providers are,” David Whitehouse said.

The cost of the audit depends on how many layers of the onion it peels back. According to Brian Baxter, the price can range from \$1,000 on the low end all the way up to a whopping \$100,000 for a truly deep dive audit. Kitchener, Ont.-based chemical supplier Ampacet Canada Co. had an intensive energy audit performed a few years ago as part of a program offered by the Canadian Plastics Industry Association. “The audit was all-inclusive, and found a number of areas that needed improvement, from compressed air leaks to inefficient lighting,” said Ampacet Canada president and CEO Terry Elliott. “As a result, we upgraded our compressor technology and improved our heat recovery, and also switched over to efficient LED lighting.”

DuPont Canada is a long-time believer in energy audits. “We’ve had a series of energy audits performed over the years — not at all sites, but those where we think the biggest energy hits are taking place,” said Scott Sharpe. “On the basis of these, we compile lists of which projects should be tackled first in accordance with budget constraints.” Aside from lighting upgrades, Sharpe continued, the latest audits highlighted improving HVAC unit efficiency as a top priority. “We have made progress installing variable frequency drives on some of the HVAC units, and also found big savings by installing cutting-edge control systems,” he said.

LET THERE BE (ENERGY-EFFICIENT) LIGHT

Once the energy audit has been completed, the focus usually shifts to implementing your program. Not surprisingly, grabbing the low-hanging fruit is the first and easiest step. A favorite target is switching to energy-efficient lighting — which is ironic, given that lighting is typically the last line item on the budget that operators worry about or assess. Building lighting systems have been the subject of energy saving retrofit projects for decades now, so this isn’t exactly a new fix, and a lot of companies take this project on even without the benefit of an energy audit.

It had a respectable run, but after more than 100 years of market dominance, the age of the incandescent light bulb is definitely over, killed by the LED. And it’s about time, too; most older-type lights produce 30 per cent less light after just one year and continue to dim until they die, which means that manufacturers are paying the full light bill for less than half the light output. Old lighting includes high-pressure sodium and metal halide lamps that can take up to five minutes to achieve full brightness, and T12 fluorescent lights. By comparison, LEDs use up to 90 per cent less energy in a manufacturing setting. In addition to LEDs,

new lighting technology includes energy-efficient metal halide, T5, and T8 fluorescents.

LED lighting in particular makes especially good sense in a chemical facility. Why? Since many chemicals are highly flammable or even explosive, fire represents a higher than average risk for these plants. LED industrial lighting, unlike legacy light sources, is spark-free, since it doesn't require ballasts or other potential sources of ignition. There is also very little heat generation from LED industrial lighting fixtures. Finally, because maintenance and replacement frequency is reduced, there's less need for employees to access lighting in areas where chemical exposure poses a risk. So while it's true that LED lights are triple the cost of regular lighting, they should more than make up for that in a chemical plant over their eight-year lifespan.

Material supplier Kal-Trading Inc., of Mississauga, Ont., began its aggressive energy reduction strategy with its lighting. "With incentive funding from Save on Energy, we started by reducing the number of light fixtures in our warehouse by one-third, and then switched the remaining light fixtures from HPS 400 Watts to more energy-efficient induction lights, and also equipping them with motion sensors," said company president Gobi Saha. "We then upgraded over 400 office lights to LEDs, and reduced the number of light fixtures by 50 per cent, as well. All our offices are equipped with occupancy sensors to further save energy." How much energy? "Occupancy sensors can reduce your lighting energy use by 25 per cent," said Bob Arbuckle, director of energy services at Nedco. The amount of the incentive is based on the difference between the amount of electricity the lighting currently uses and the amount that the new lighting will use.

After the relatively easy fix of lighting, there are other areas that can deliver big energy savings. As identified by an Ontario Power Authority (now IESO) Achievable Potential study conducted last year, leading candidates for improvement include installing variable frequency drives (VFDs) for fans, pumps, and HVAC; compressed air systems upgrades or replacements; and chiller plant upgrades or replacements.

Kal-Trading is set to start work on several of these. "As the next step in our program, we will be replacing all our high-power motors with new energy-efficient motors and VFDs," Gobi Saha said. "We will also be looking to install energy-

EIGHT STEPS TO A BETTER ENERGY MANAGEMENT PLAN

Having an energy management plan helps you to identify goals and systematically work to achieve them.

Understanding your business's technical systems and how your employees operate them are two of the keys to identifying opportunities to use electricity wisely and reduce your electricity costs. Outlining this information in an official plan helps your employees understand what changes need to be made and why. It also helps you track your progress, cost savings and payback on investments in energy efficiency over time.

The following eight steps provide a simple, systematic approach to understanding how your business uses electricity, what influences costs, how you can use less and how to chart your success.

STEP 1: Understand your energy costs	Knowing the factors on your bill that influence your demand (kW or kVA) and energy (kWh) costs provide insight to the steps you can take to reduce those costs.
STEP 2: Monitor and target	Comparing monthly data can help you determine how energy consumption at your facility varies over time. For example, comparing energy consumption against production can help you determine energy costs per unit of production as a means of assessing potential savings opportunities.
STEP 3: Understand when energy is used	The cost of electricity is influenced by when it's consumed. Your company's demand profile shows your energy use patterns — information which is essential if you're considering changes to lower demand, or, if you have an interval meter, to take advantage of times of day or month when electricity prices are lower.
STEP 4: Understand where energy is used	Identify equipment that draws the most power. If you improve its efficiency, you will see a bigger reduction in your electricity costs. An energy audit provides a useful, detailed breakdown of how much electricity is consumed in your facility and where.
STEP 5: Eliminate waste	Energy waste can appear in many forms including excess time, volume, pressure and temperature. In order to realize energy savings opportunities, it's important to match the energy your business actually uses to what is really needed. Once these requirements are established, eliminating waste becomes an effective cost-savings tool.
STEP 6: Maximize efficiency	The condition of your company's equipment and operating conditions can have a significant impact on potential energy savings. Consider changing the way you operate, maintain existing equipment, or investing in more energy-efficient technology. While some operational changes can have relatively low or no implementation costs, investments in equipment upgrades or retrofits may have a shorter payback period than you would think and can lead to permanent long-term savings.
STEP 7: Optimize the energy supply	Once you have reduced your requirement for energy, you may consider supply-side alternatives to meet your energy needs such as heat recovery, cogeneration and renewable generation options like wind, solar or biofuels.
STEP 8: Monitor your progress, share the results	Charting your progress over time helps you share these successes with staff and encourage them to keep looking for ways to lower electricity costs.

Source: IESO

efficient compressors and chillers.”

You might be surprised at the difference new or retrofitted equipment can make to your power bill. “A 20 per cent reduction in motor speeds could result in 50 per cent less demand for energy,” Bob Arbuckle said.

Building envelope improvements shouldn’t be ignored, either. “A year ago, Ampacet Canada put an economizer on its rooftop unit to reduce our cooling water costs,” said Terry Elliott. “We were recognized by Kitchener Wilmot Hydro for that project, and received capital support from them for it.” The company has also replaced its wooden bay doors with insulated bay doors, Elliott continued, and is considering increasing its natural lighting by putting in skylights and window panels along the top of the bay area walls.

Once a business is ready to upgrade to high-efficiency systems, funding is available through Save on Energy. Companies can receive up to 50 per cent of their project costs through the program. “The most popular Save on Energy offering for chemical makers is the Equipment Replacement Incentive Initiative, which focuses on improvements in lighting, motors, heating ventilation, HVAC, and overall electricity systems,” Brian Baxter said.

Even with all this funding, there’s definitely an up-front financial investment for new lighting and retrofitting. But Brian Baxter, for one, has noticed a phenomenon which makes the return on investment seem even sweeter. “One thing that I’ve found, historically, with companies that go through an energy saving process and want to develop a long-term strategy, is that they develop what’s called a

revolving energy fund,” he said. “The savings from the initial project — the low-hanging fruit — can pay for the next project, which then pays for the next project, and so on. Instead of realizing the savings on their bottom line, a company uses the savings to continue with the development of its energy saving plan.”

TEAMING UP

Another step towards having an effective energy saving program is to appoint an energy manager — or even an energy management team — charged with overseeing the company’s energy needs and developing its future energy strategy. It’s the best way to avoid what you don’t want: people on the plant floor, in IT, and in the front office all pursuing their own independent energy saving schemes.

When it comes to fielding energy management teams, DuPont Canada might be the ultimate best-practices example. “Almost every DuPont site that I’m involved with has an energy representative; some sites will have two or more, depending on the size,” said Scott Sharpe. “I meet with these representatives approximately every two months, and we discuss the global management team’s directives and, based on those, look for opportunities for energy savings where we can. But I’m not forcing a corporate viewpoint on them; we have genuine conversations, since each representative knows more about his or her particular site than I do. At the end of the day, we set project goals from a site level, a regional level, and a corporate level.”

It’s one thing for a global player like DuPont to assemble a group of energy management teams; it’s a lot more

UNDERSTANDING POWER FACTOR

In theory, it’s simple: Power factor is a measure of how effectively you’re using electricity. More specifically, it’s the ratio of the real power that is used to do work and the apparent power that is supplied to the circuit.

But you’d be amazed how many manufacturers — chemical and otherwise — don’t really understand the concept...and how much money they’re wasting as a result.

Hydro companies supply two kinds of power: active power (measured in kW), which is used by all types of electrical equipment to deliver required work; and reactive power (measured in kVAr), which is only required by certain types of equipment, such as those that produce motion (motors, for example), and those containing electronics (everything from computers to fluorescent lights with electronic ballasts).

Power factor is expressed as a percentage, with 100 per cent being ideal. The trouble starts when equipment is drawing

too much reactive power, causing inefficiencies in the electricity transmission system. The lower the percentage falls below 100, the less efficiently your operation is handling its reactive power needs. And the higher the inefficiency, the more your utility company charges you, since generating facilities and carrying facilities must be sized for peak demands. Distribution and transmission charges are often billed on either the metered kW or 90 per cent of the metered kVA, whichever is greater.

Luckily, it’s easy to reduce power factor surcharges. In most situations, the key is to install one or more capacitors, either at the specific point where equipment is using reactive power, or where electricity is delivered to your overall operation.

And you better believe it’s worth the time and trouble. According to the IESO, correcting power factor can provide one of the fastest paybacks when making investments to reduce industrial electricity costs. Contact your local utility to find out more about your power factor.

challenging — and might seem impossible — for smaller firms to do the same. Some chemical suppliers have a large enough pool of skilled employees to form an ad-hoc energy management team that can do the job satisfactorily. “We don’t have an energy team per se, but our global engineering department plays a strong role in looking at Ampacet plants and performing internal audits,” said Terry Elliott. “They will come in and examine the plant and offer recommendations. If we have a very old compressor, for example, they’ll recommend that we upgrade it.”

For other, smaller companies, sometimes finding even one person to act as an energy manager can be tough, since the ideal candidate needs the ability to understand the dynamics of the various energy markets and identify the trends that will define the framework of their energy strategy. “Energy managers require a sophisticated skill set to maximise the potential of this situation, and the more sources of energy used, the more difficult the role becomes,” said Brian Baxter. “It can be tough to ask for a volunteer to do this, especially since, post-recession, most manufacturers already have fewer employees doing more work.”

And even if someone does step up, the odds are that he or she won’t have either the expertise or the technical background needed to do the job properly. One way around this hurdle for small and medium-sized enterprises is to rely on outside energy consultants to help them address their energy challenges. These advisers design energy purchasing strategies that minimize risk for clients, and may also negotiate with potential energy providers to get the best deals or organize buying pools.

A second strategy comes courtesy of the Energy Manager initiatives through Save on Energy and Industrial Accelerator programs. For eligible firms, the IESO and local distribution companies can offer significant funding for the hiring of an energy manager. With the added bonus of the incentive, hiring an energy manager becomes feasible for many companies.

GETTING INCENTIVIZED

We’re listing this one last, but it should actually be among the first things you investigate before implementing a consolidated energy saving program: learning how to work with your local utility, the IESO, and your natural gas supplier to make the most of the available financial incentives for businesses that take steps to conserve electricity or change the way they use electricity.

And at the risk of repeating ourselves, there are a lot of incentives available. “As long as a project saves energy, the IESO and your local distribution company will give you funding for it — this money is available on the table right now,” said David Whitehouse.

Even a short list of the Save on Energy incentives would

have to include audit funding, with building owner incentives available up to \$25,000 for audits; tenant incentives available up to \$7,500; and up to 50 per cent of the total cost of the energy audit paid for. There’s also retrofit incentives, with up to 50 per cent of the project cost paid for; non-lighting incentives of \$800 per kW or \$0.10 per kWh of first-year energy savings; and lighting incentives of \$400 per kW or \$0.05 per kWh of first-year energy savings. And finally, VFD funding, including \$2,565 in incentives for 50 HP motors and \$4,835 in incentives for 100 HP motors.

And some of Ontario’s various industry associations are there to help, too. In partnership with energy services provider 360° Energy, CME Ontario is offering its members the CME 360° Energy Coach Program. The program brings trained consultants into a client company to analyze its workflow and areas of potential energy savings; and also includes training client staff members to serve as energy coaches who develop, recommend, and implement energy saving policies and changes on an ongoing basis. The result is an in-house energy management team drawn from all major departments that comes up with energy saving ideas, many of them not requiring any capital investment to put into action.

CME is also teaming up with the IESO for Ontario’s Energy Pathfinder Research Initiative, designed to help companies achieve easy wins in process energy savings by identifying new best practices for process energy management, and also enabling them to quickly identify areas where they can go further.

So if you’ve always thought of your electricity bill as a fixed cost of doing business in Ontario, think again. With all of the best practices, programs, and incentives available, there’s almost no industrial hydro bill that can’t be reduced — and sometimes dramatically so. And it’s not like you have much of a choice. With Ontario’s electricity policy moving towards decentralized technologies, including energy efficiency and low-impact renewables, energy conservation is becoming the new normal. Manufacturers that don’t get with the program — literally — will find themselves paying an increasingly heavy price for their carbon footprint. “I can make a business case for any chemical maker out there, no matter how large or small, to do something to reduce its electricity usage,” said David Whitehouse. “You might not be able to do everything at once, and you might have to stage the changes, but there is no business model in which you’re good where you are without having done anything. Companies that don’t have an energy program need to run — not walk — to their utility provider and say, what can you do for me?”

So get running, and start saving.

Energy Managers Mean Business



Energy Managers are trained to find energy savings, make smart energy investments, boost their organization's bottom-line and unleash competitive advantage. Can your business afford not to hire one?

Incentives through **Save on Energy** and **Industrial Accelerator** are available to help bring an energy manager into your workforce. Contact your local hydro company or the Independent Electricity System Operator (IESO) to see what programs are available in your area.

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saveonenergy.ca

IndustrialAccelerator

industrialaccelerator.ca

“The best part about being an energy manager is that I’m helping my company to stay competitive. The less energy we use, the more efficient we are.”

Behdad Bahrami, Energy Manager,
Vision Extrusions Ltd

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