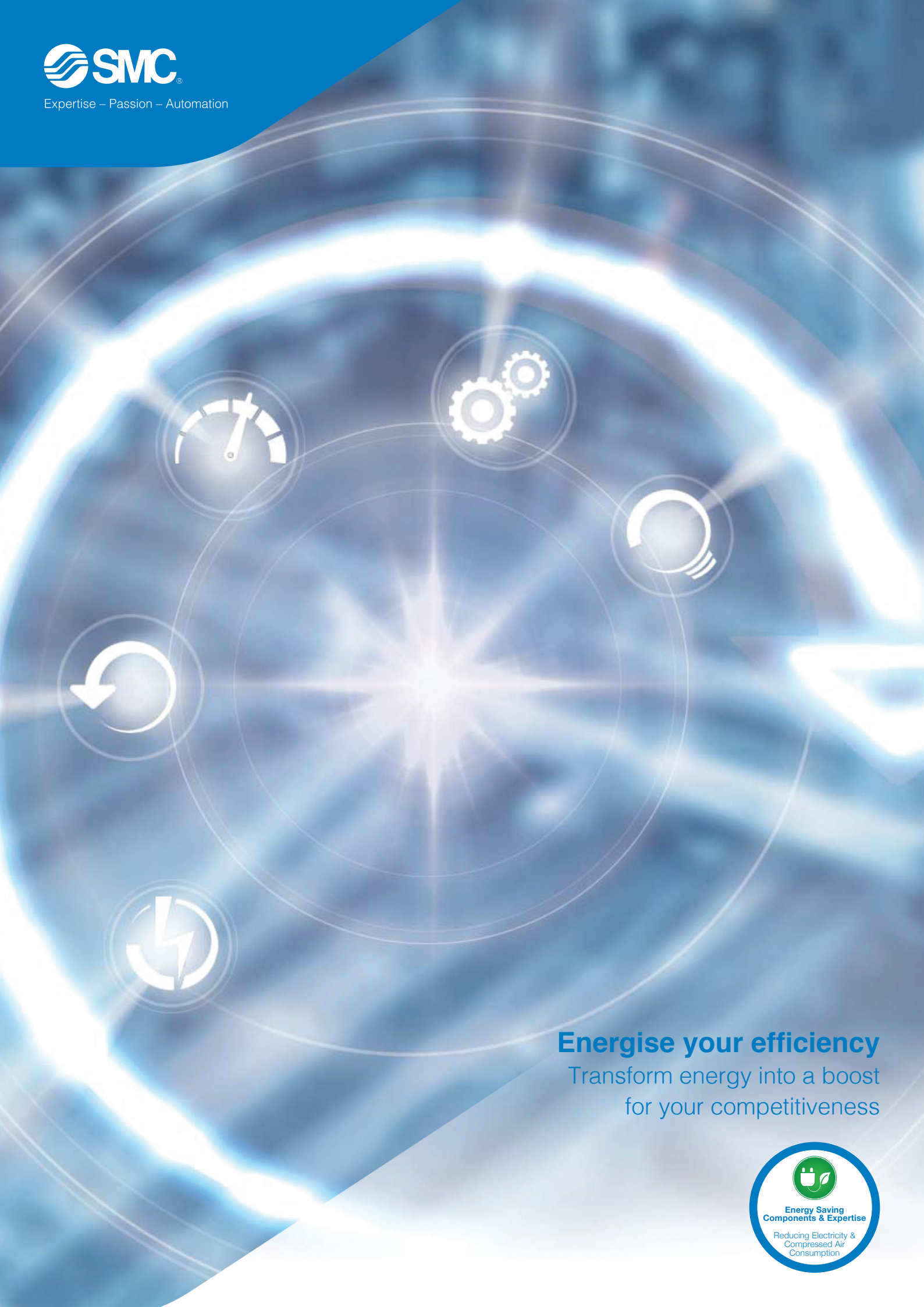
SMC

Expertise – Passion – Automation



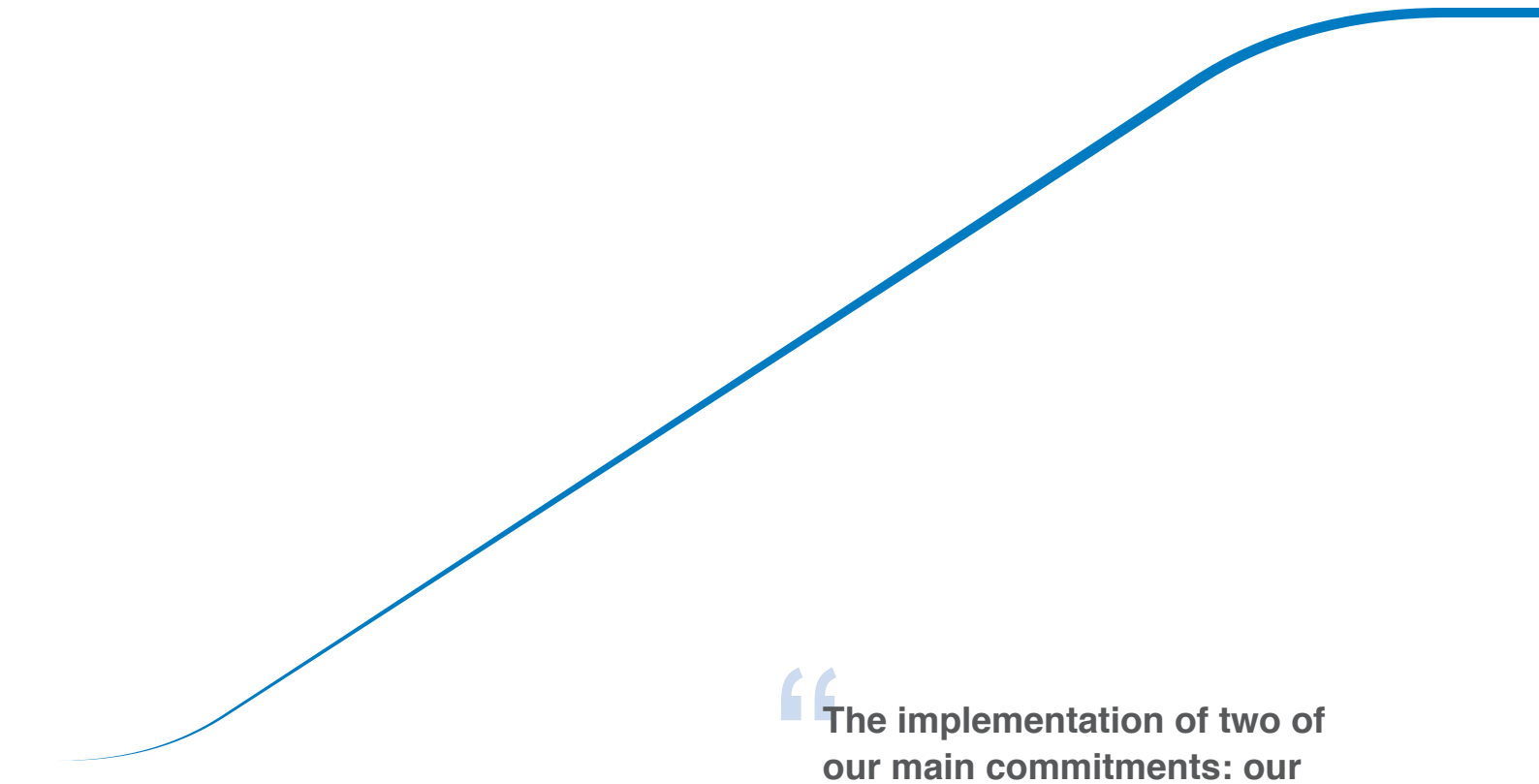
Energise your efficiency

Transform energy into a boost for your competitiveness

Energy Saving Components & Expertise

Reducing Electricity & Compressed Air Consumption

“Nowadays, it’s rather difficult to become detached from energy efficiency”



“The implementation of two of our main commitments: our commitment to you and your efficiency and our commitment to sustainability”



Energise your efficiency

Over the years, at SMC we have been fully committed to different energy saving activities addressed at assisting our customers in reducing their bills and why not, making our modest contribution to global sustainability. We have accomplished different levels of energy saving actions in our customers' factories, working towards green procurement, etc.

On the contrary, in recent years we have seen how legislation has become more restrictive in this sense. Many governments are actively pushing energy efficiency into our lives, with energy performance certificates for houses or household appliances for medium and large-sized companies. Basically, nowadays, it's rather difficult to become detached from energy efficiency.

So, taking our energy saving origins and the imperative towards energy efficiency, we want to share our 5 cornerstones of energy efficiency with you to illustrate the implementation of two of our main commitments: our commitment to you and your efficiency, and our commitment to sustainability.

Let's go towards energy efficiency together, we count on worldwide teams of specialists ready to support you.

- Generate just what you need – Analysing our energy bills with a critical view. Is all what we consume justified?
- Recover what you generate – Different technologies to reuse the energy (heat, released air, etc.)
- Monitor your consumption – Only when we know what's going on, can we enact effective energy management policies
- Use only the essential – How can we use energy more rationally in production processes? Plus the necessary re-think on the way things have been done in the past
- Think efficient – The concept that closes the loop and the most important one. Impregnate your day-to-day with energy efficiency.



“The Stone Age did not end because humans ran out of stones. It ended because it was time for a re-think about how we live”

William McDonough, American architect and renowned expert on sustainability.

The same now applies to energy efficiency. We’ve been presented with a great opportunity to re-think it in order to achieve that competitive edge we all need to compete in our relevant markets and, admittedly, to work towards sustainable development.

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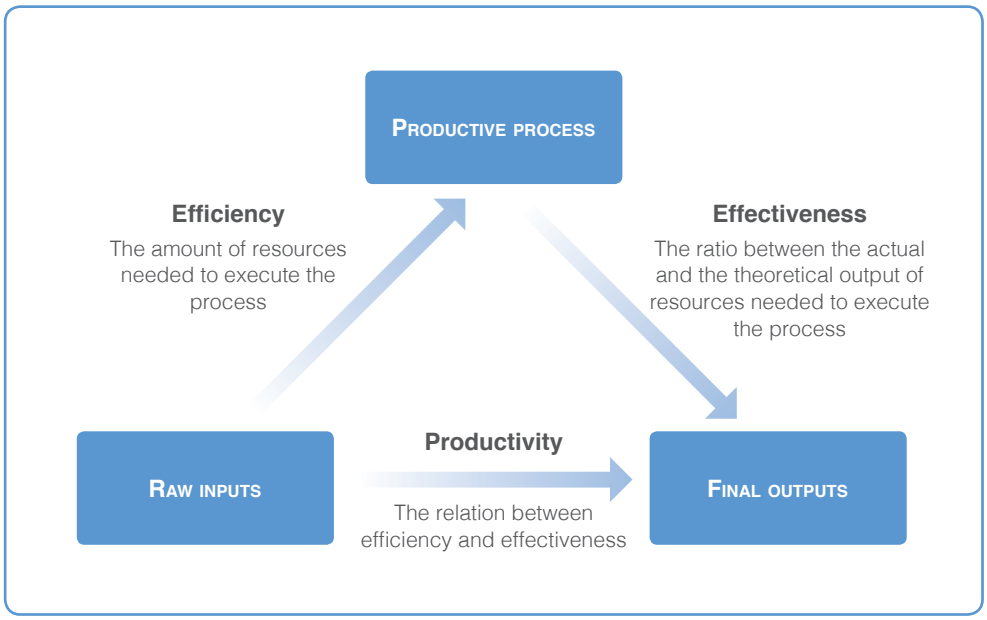
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Doing the right things right

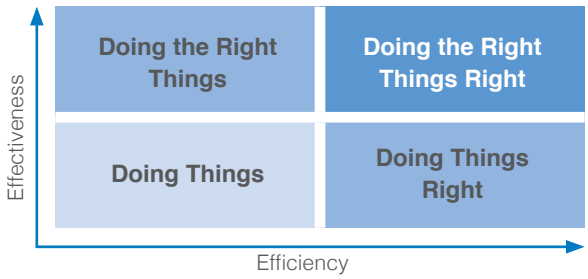
For all of us in a business environment, the ultimate goal is improving productivity. Productivity is, in fact, a major decisive factor in economic growth and responsible for most of the technological advances of this era.

But, what is productivity? How can we define such a complex and versatile concept? In very general terms, it can be said that productivity is the way raw inputs are transformed into final outputs. However, there are indeed many ways to approach this process. One of them is to use both efficiency and effectiveness as a reference. The chart below shows how these three concepts relate to one another.



In other words, efficiency is doing things right, while effectiveness is doing the right things.

According to these definitions, and understanding productivity as a ratio between efficiency and effectiveness, we can ultimately conclude that productivity is nothing more than **"DOING THE RIGHT THINGS RIGHT"**.



Transform energy into a boost for your competitiveness

As we commented above with regard to productivity, the ways forward for achieving efficiency are many and very diverse.

For us, one of the best is through **ENERGY**. Transforming energy into a boost for your competitiveness.

Generate
just what you need

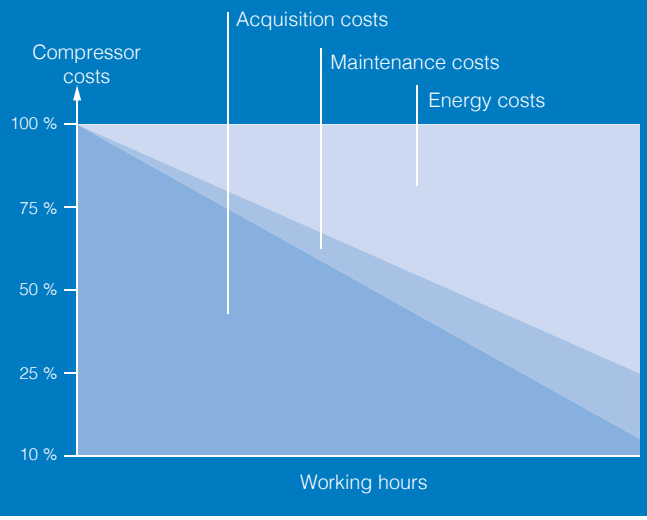
> “The most efficient energy is the one not consumed”

Compressed air as an energy source

In movement and handling control, pneumatic technology is one of the most widely used ones. The reasons are clear: air is safe and non-polluting. What’s more, the acquisition and maintenance of a compressed air facility is relatively simple.

However, all that comes at a cost.

In fact, the real costs of compressed air relate to use. Therefore, we must focus on reducing the amount of air pressure we demand from it.



How much do I really need?

When you are about to manufacture your goods, do you make an indiscriminate use of the raw material? Or, on the contrary, do you carefully plan the exact amount that will be required for the final manufacture?

The special care we normally take with our raw materials is rarely applied to our energy.

Generating just what you need, is the first step to energy-efficient use. It is certainly not simple, as oversupply is not something you can spot easily. But, according to our experience, when measures are applied, the results stand out.

For example, one measure that is always highly rewarding is adjusting, or even turning off, power at night and during the weekend, since this can end up reducing energy bills by up to 20 %. This is, of course, in applications where productivity is not compromised (prior analysis of consumption is required).

In this chapter, you will find…

Different ways to reduce the generated energy while maintaining performance, such as minimising or even cutting off the pressure. Boosting force in critical points only or making vacuum generation intermittent.

Generate just the pressure you need

We are all well aware that higher pressure in our lines, translates into higher energy consumption, therefore higher bills. In terms of efficiency, building multi-pressure systems is the ideal solution where each area has a precise pressure level allocated according to specific necessities thereby culminating in rational energy consumption.

Minimise the pressure

One of the first actions we normally carry out in our energy efficiency projects on customers' premises is lowering the working pressure level. Quick, easy and yet effective given that the majority of areas maintain performance while the bill goes down.

In numbers, based on our experience a 1 bar reduction could achieve 7 % savings in air consumption.



Pressure regulator
AR Series

· Set pressure: 0.05 to 0.85 MPa
· Up to 10000 l/min.



Electro pneumatic regulator
ITV Series

· Up to 4,000 l/min
· Applicable protocols:
- CC-Link
- DeviceNet™
- PROFIBUS DP
- IO-LINK.



Precision regulator
IR Series

· Set pressure: 0.005 to 0.8 MPa
· Up to 5300 l/min.

Boost pressure where needed

Minimising the pressure of your compressed air system could end up compromising productivity. To prevent this from happening there are specific solutions which increase the pressure level in concrete areas. With them we maintain productivity and an overall efficient energy consumption.



Booster regulator VBA Series

A pressure booster provides pressure where and when it is needed, as opposed to creating a high demand on the compressor.

Just where needed

Booster regulator

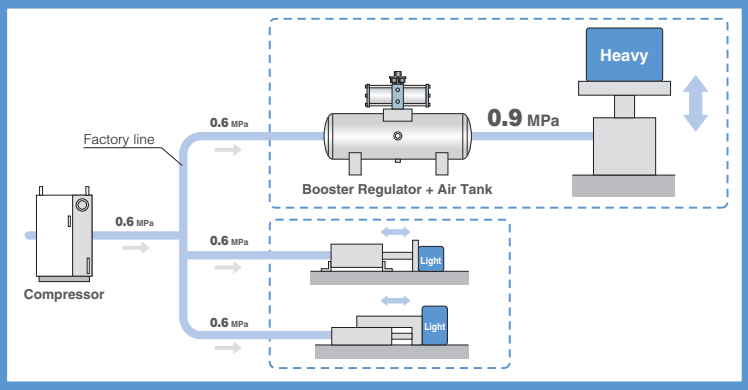
Part number	Operation type	Pressure increase ratio	Port size	Option
VBA10A-02GN	Handle-operated	Twice	Rc1/4	Pressure gauge and silencer
VBA11A-02GN		2 to 4		
VBA20A-03GN		Twice	Rc3/8	
VBA40A-04GN			Rc1/2	
VBA22A-03GN	Air operated		Rc3/8	
VBA42A-04GN			Rc1/2	
VBA43A-04GN	Max. operating pressure 1.6 Mpa			

For dimensions and other details refer to the general catalogue of each series in www.smcanz.com

The Expert's experience:

A few months back we visited a customer in the food industry. During the very first questions related to our energy efficiency activities we realised their huge saving potential. The whole plant was working at 0.9 MPa when in reality only one area needed that specific pressure.

By employing a VBA booster and a tank, we ensured 0.9 MPa in that machine, while we reduced the rest of the plant's pressure to 0.6 MPa without compromising its productivity.



Given their complete satisfaction with the simplicity of this measure, we continued to analyse their pressure requirements and ended up reducing pressure to 0.5 MPa during the night (9.00 p.m. to 6.00 a.m.) when production was considerably reduced.

According to the customer's measurements, this simple multi-pressure system is saving them 17 % of the whole compressor consumption.

You might find the following of interest as well

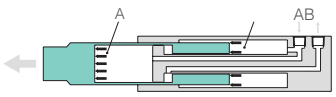
Double power cylinder – MGZ Series

The MGZ design doubles the extended piston area. Thanks to it, the force is doubled without having to vary the supply pressure. A maximum theoretical output of 9700 N can be achieved (1 MPa).

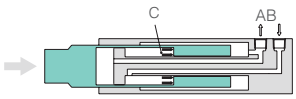
Double your thrust



Air pressure supplied from A operates on both surfaces **a** and **b**.



Air pressure supplied from B operates on surfaces **c**.



Part number	Bore size [mm]	Standard stroke [mm]	Theoretical output, extension stroke [N] at 0.6 MPa	Cushion	Type	Port size
MGZ20-*	20	75, 100, 125, 150, 175, 200, 250, 300 Long stroke version up to 1,000 mm available (800 mm for Ø 20, Ø 25)	436	Rubber bumper	With non-rotating mechanism	M5
MGZ25-*	25		651			Rc1/8
MGZ32-*	32		973			Rc1/8
MGZ40-*	40		1,520			Rc1/4
MGZ50-*	50		2,309			
MGZ63-*	63		3,567			
MGZ80-*	80		5,829			Rc3/8

* Stroke length.

Reduce the pressure during non productive cycles

The multiple pressure system concept can also be applied to your cylinders. Our R & D engineers realised that many customer applications involved a non-productive stroke where the full force of the cylinder was not really needed. The energy efficient answer to this was AS-R & AS-Q Series.

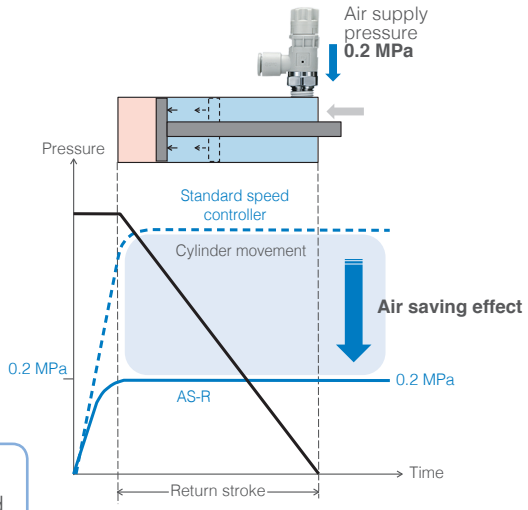
Air saving speed controllers – AS-R, AS-Q Series

Very similar in appearance and operated the same as a conventional speed controller. Air saving speed controller automatically reduces the return stroke pressure to 0.2 MPa. With it, a reduction of 31 % can be achieved (operating conditions: supply pressure 0.7 MPa).

AS-R Series
Reduces the supply pressure at the return stroke to 0.2 MPa.



AS-Q Series
With rapid supply and exhaust function to avoid delays in the response time.



Simply save

AS-R Series

Part number	Maximum flow rate [l/min]	Port size	Tube Ø [mm]
AS22R-01-06	88	Rc1/8	Ø 6
AS22R-01-08			Ø 8
AS22R-02-06		Rc1/4	Ø 6
AS22R-02-08			Ø 8
AS32R-02-08	200		Ø 8
AS32R-02-10			Ø 10
AS32R-03-08		Rc3/8	Ø 8
AS32R-03-10			Ø 10
AS42R-03-10	375		Ø 10
AS42R-03-12			Ø 12
AS42R-04-10		Rc1/2	Ø 10
AS42R-04-12			Ø 12

AS-Q Series

Part number	Maximum flow rate [l/min]	Port size	Tube Ø [mm]
AS22Q-02-06	66	Rc1/4	Ø 6
AS22Q-02-08			Ø 8
AS32Q-02-06	250	Rc3/8	Ø 6
AS32Q-02-08			Ø 8
AS32Q-03-08			Ø 8
AS32Q-03-10			Ø 10
AS42Q-03-10	335	Rc1/2	Ø 10
AS42Q-03-12			Ø 12
AS42Q-04-10			Ø 10
AS42Q-04-12			Ø 12

Set your return pressure to your requirements

Air saving speed controllers – ASR, ASQ Series

If you need a variable return stroke pressure, these other models can set the return stroke pressure from 0.1 to 0.3 MPa.



For dimensions and other details refer to the general catalogue of each series in www.smcanz.com

Generate just the vacuum you need

Vacuum does not necessarily mean continuous air waste

Maintaining vacuum through conventional ejectors implies a continuous air supply, regardless of whether it is needed or not. The longer you adsorb the piece, the more air you waste.

The new generation of vacuum units aims to make vacuum more efficient. The integration of a pressure switch in the ejector allows cutting off the air supply when the desired vacuum level is reached.

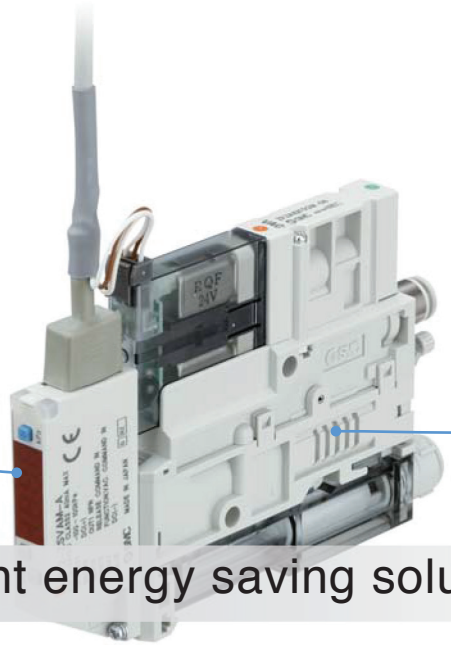
Vacuum unit – ZK2 Series

Besides, this unit is a space saving and lightweight solution, especially when integrated in a manifold.

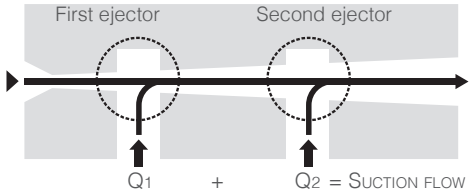
Digital pressure switch with **energy saving function**.

When the vacuum level is below the set value, vacuum generation is activated automatically.

As a result, air supply and exhaust is intermittent during adsorption.



Two-stage ejector



Suction flow rate 50 % ↑
Suction flow rate 50 % ↓

The all-in-one silent energy saving solution

Part number	Body type	Exhaust type	Nominal nozzle size	Rated voltage	Digital pressure switch	Connector type	Vacuum port size
ZK2A07K5RW-08	Single unit	Silencer exhaust	0.7	24 VDC	Energy saving function	L-type plug	Ø 8
ZK2A10K5RW-08			1				
ZK2A12K5RW-08			1.2				
ZK2A15K5RW-08			1.5				

The Expert's experience:

The application we encountered was a robot arm that was picking up a plastic piece and then placing it in the mould of an injection moulding machine, with a 6-second cadence. Out of the 6 seconds of vacuum generation, only 0.6 were actually needed to adsorb the piece. The customer was wasting a huge amount of air only on that application.

Taking all that info into account and the fact that ZK2 integrates a two-stage ejector which consumes 30 % less, the savings are considerable:

	Air consumption	Air consumption/ year [1)]	Cost/year [1)]
Current solution	85 Nl/min	153,000 m^3/year	$3,672/year
ZK2	58 Nl/min	10,440 m^3/year	$250.6/year

* Air cost $0.024/Nm3
* Operating time: 450 cycles/h, 16 h/day, 250 days/year.
1) When 10 units are used.

Only by adding a ZK2 to the robot arm, the customer reduced more than 90 % of the air consumption, translating into $3421.44/year of savings.

Do not generate when not required

Divide & Shut off inactive lines

Would you leave the light on when you leave a room? The same principle should be applied to your machine when it is off for short or long periods. During this time, given that the machine is still pressurised, blowing applications and leaks are continuously consuming air.

In order to optimise it, and to reduce your energy consumption by 8 %, you only need to identify different air lines and install a shut-off valve in each one.

Cut your bills with our process valves for air or fluids such as water, oil, gas, coolant, and even steam.

Electrically or air operated available.



Process valve
VNm Series



Low consumption solenoid valve
VXE Series

Modulate the air entry

Shutting off the air completely could end up compromising certain applications which do, for example, require quick pressurisation.

For such machines, a stand-by valve is the solution since you can regulate the air pressure, adapting it to your exact needs and different working requirements.

Stand-by valve – VEX-X115 Series

Automatically reduce pressure and, therefore, air consumption during short stops or shut it off completely during long ones with a single unit.



Optimise air consumption during stops



Digital pressure regulator

+



Regulator valve makes it suitable for large flows

Compatible with:
- DeviceNet™
- CC-Link
- PROFIBUS DP
- IO-Link.

Part number	Port size	Signal
VEX1300-04F-P-53N-X115-Q	Rc1/2''	16 points preset input
VEX1500-10-P-153N-R-X115-Q	Rc1''	
VEX1900-14-P-53N-R-X115-Q	Rc1 1/2''	
VEX1900-20-P-53N-R-X115-Q	Rc2''	

The Expert's experience:

A car manufacturer had launched a global project aimed to reduce production costs through reduced energy consumption. The energy efficiency activity was targeted at the bodywork production area comprised of 19 machines.

SMC was commissioned for the compressed air consumption.

The first activity we proposed to the customer was to measure flow and pressure in order to have real data to work with. Data from that first analysis resulted in the situation featured in the chart below.

A VEX-X115, Stand-by Valve, was installed in each machine, after the air treatment equipment and with a bypass, thereby ensuring that production was not compromised.

After some measurements during both the working cycle and downtime, we set the operating pressure at 0.6 MPa and the stand-by pressure at 0.2 MPa.

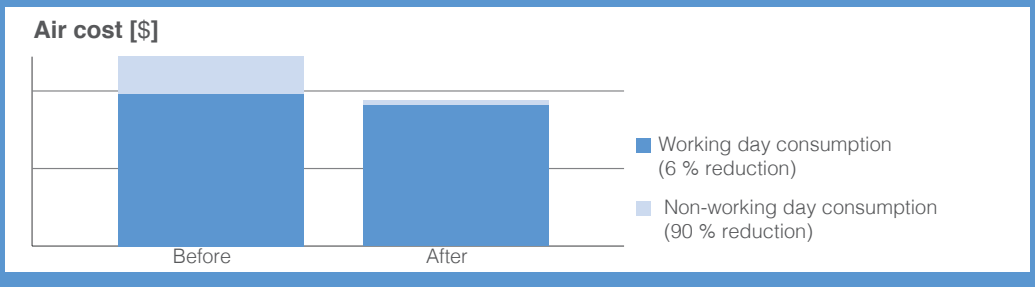
With this simple energy efficiency measure the air consumption at each machine resulted in:

	Air consumption/year	
	Before	After
251 working days per year	$12,379 (2,055m³ air/day)	$11,590 (1,924 m³ air/day)
114 not working days per year	$3,108 (1,136m³ air/day)	$394 (144 m³ air/day)

1) Air cost: 0,024$/Nm³

In total, our customer is saving $3503 per year in each machine.

In the whole bodywork production area nearly $67,000 per year.



What does ISO 50001 involve?

"The Union is facing unprecedented challenges resulting from increased dependence on energy imports and scarce energy resources... Energy efficiency is a valuable means to address these challenges."

Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012.

Based on the European 20 / 20 / 20 commitment (to reduce energy dependence 20 % by 2020) European leaders finally found a way to set Energy Efficiency as a priority.

What? – EU Directive 2012/27/EU, Article 8 of the EU-EED.

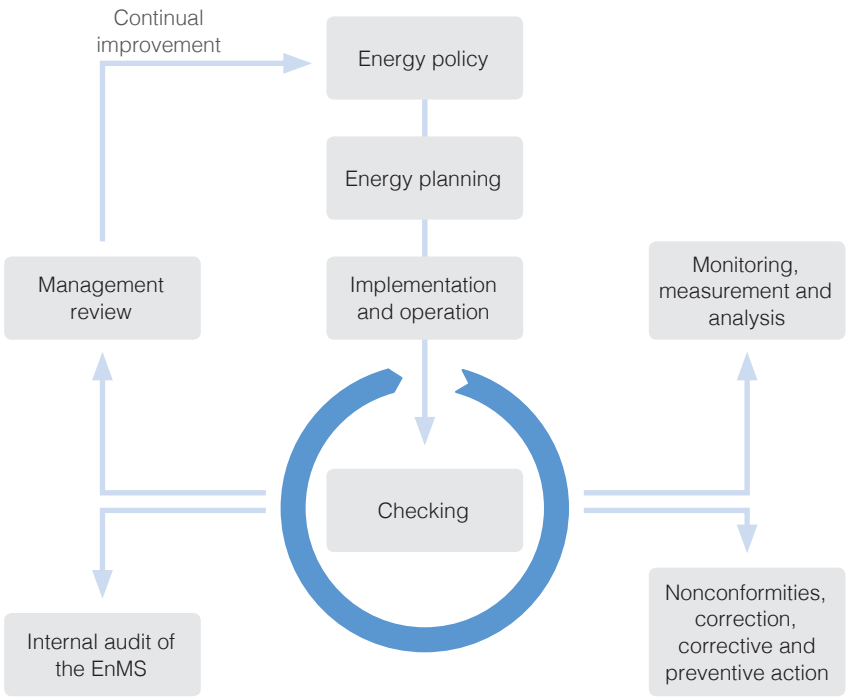
When? – Since October 2012.

Who? – Large enterprises employing at least 250 workers or exceeding an annual turnover of 50 € million ($79 million) and having a balance sheet above 43 € million ($68 million).

How? – Either execute energy audits of their operations, conducted by accredited auditors at least every 4 years, or implement an energy management system according to ISO 50001 or equivalent.

How do you feel about DIY? We love it

Since it started to be mandatory, we have found that many of our customers do prefer complying with the EU Directive through the implementation of ISO 50001, primarily because the emphasis is on continuous improvement, rather than on externally imposed targets. At the end of the day, it is more like a "DIY activity", with the great flexibility this implies. Furthermore, for those companies who have already implemented ISO 9001 and ISO 14001, it makes sense to follow the ISO 50001 route. In the same vein, we cannot but support a project involving continuous improvement and crafted solutions. Subsequently, we naturally accompany our customer through the ISO 50001 process.



Let's talk numbers

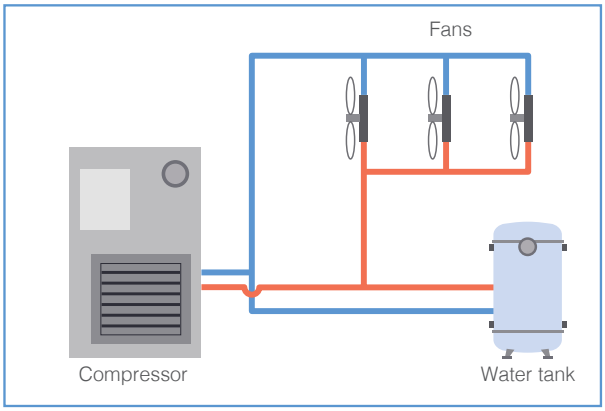
- Metal products manufacturing and the food industry are the sectors with a higher compliance level.
- Companies implementing ISO 50001, have declared up to 30 % savings in their energy bills.
- 9 out of 10 organisations adhering to ISO 50001 recommend it.

Source: ISO survey.

For dimensions and other details refer to the general catalogue of each series in www.smcanz.com

Recover
what you generate

"The recovered energy is worth two"



Just as recycling has turned into an everyday activity which is second nature to each and every one of us, the same could be applied to the energy used in our factories.

The increasing amount of energy recovery systems in the market is to our advantage. These new devices act as a gateway for reusing, recycling and, ultimately, saving the heat excess we produce in our working environment.

In this chapter, you will see…

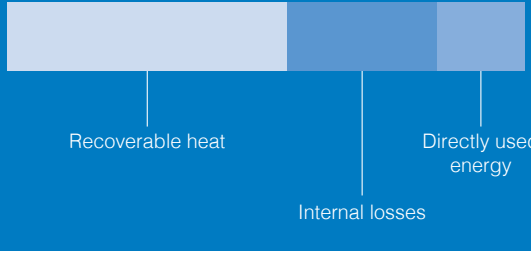
How to reuse energy during the productive process. Some typical applications such as those with high pressure devices. Or more innovative ones: Have you ever considered recovering the air from your cylinders?

Recover at the generation source

The biggest recovering potential is at the generation source. In fact, by definition, energy transformation leads to heat generation. That heat can simply be reused for any other operation, such as warming water (thorough a heat exchanger) or heating up the plant (through hot air distribution).

The energy transformation process of a compressor's electric motor is shown below as an example. The directly usable energy, the pressure, represents only a very small percentage.

Energy transformation process - Outputs



Recover at usage

Once you have to use, why not re-use it?

Industrial processes require energy to perform, trying to recycle that energy has an exponential effect on the plant's efficiency. For many of us, the heat recovery concept is fairly familiar, where heat that would have been dissipated and lost is returned to manufacturing and industrial processes. Why not apply the same to air?



Pilot operated 2 port solenoid valve
VCH Series

· Solenoid or air operated.

For example in heavy air consuming applications, such as PET manufacturing, these heavy air consumers can deliver free energy to the rest of the compressed air systems.

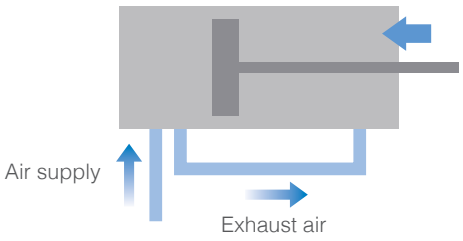
Recover that energy. Let high-pressure applications feed low-pressure ones with SMC's VCH valves.

Operation up to 5 MPa & Large flow passages.

Recover the released air from actuators

Can you imagine recovering air from each cylinder cycle?

Can you imagine reusing the exhaust air on the head side to retract the piston rod?



We can. At SMC we have developed an actuation circuit using our latest range of check valves and flow controllers where the released air is directly sent to effect the return stroke in each cycle. 50 % reduction in air consumption has actually been achieved, which leads to considerable savings, especially when the application requires large cylinders or cylinders with a high working frequency.

We are sure. This is the path to be followed by pneumatic systems in the future. It's up to you to actively take part in it.

Contact us and we will show you how this is already a reality with SMC.

Monitor
your consumption

> "What gets measured, gets managed"

Why do it?

Lord Kelvin, back in 1883 expressed it in very clear terms:

"When you can measure what you are speaking about, and express it in numbers, you know something about it, when you cannot express it in numbers, your knowledge is of a meagre and unsatisfactory kind..."

William Thomson, Lord Kelvin, Irish mathematical physicist.

So get all the numbers, and then take decisions

The data gathered must show your overall usage patterns, such as which of the machines in your factory are the heaviest consumers, or how your consumption fluctuates, e.g. over the day or during the weekend.

The more details there are, the better the decisions will be

Another important factor is to expose the data to all workers involved so they not only have the required information, but also the necessary motivation to reduce associated costs.

The current digitalisation era takes data gathering, management and overall monitoring to a whole new dimension; where remote control, centralisation, as well as big data management, are a very possible reality.

Reveal what's hidden

Monitoring helps detecting and controlling unexpected wastage as well. In compressed air systems, leaks represent an average of 20 % of the air consumption. The addition of switches allows tackling them effectively.

In this chapter, you will find…

SMC's sensors range and the different options they offer, providing you with the information you need for efficient energy management.

Visualise



Analyse



Conclude



Improve



Monitor consumption

Add switches to know what´s going on

With the installation of switches in your machine you will be able to get up-to-date on-going information on its energy use. Thanks to such monitoring you will be able to take informed decisions to improve your machine's productivity, performance and overall efficiency.

Our "out-of the-box" solutions can be seen below, because we know you do not like complicated installations or configurations. Start being informed quickly & easily.

Digital flow switch for large flow – PF3A7mH Series

· For air
· Accumulated or peak value easily visualised
· IP65.

30 to 12,000 l/min* 100:1 Ratio.



3-colour 2-screen display that can rotate to ease the reading.



Helping your efficiency

Part number	Fluid	Rated flow range* [l/min]	Port size	Output specification
PF3A703H-10-ES	Air, N_2	30 to 3,000	Rc1	Output 1: PNP Output 2: Analogue voltage output/External input
PF3A706H-14-ES		60 to 6,000	Rc1 1/2	
PF3A712H-20-ES		120 to 12,000	Rc2	
PF3A703H-10-FS		30 to 3,000	Rc1	Output 1: PNP Output 2: Analogue current output/External input
PF3A706H-14-FS		60 to 6,000	Rc1 1/2	
PF3A712H-20-FS		120 to 12,000	Rc2	

You might find this interesting as well



Digital flow switch for medium flow
PFMC Series

· For air, 5 to 2,000 l/min
· IP65.



Digital flow switch for low flow
PFM & PFMB Series

· For air, 0.2 to 2,000 l/min
· IP40.



Digital flow switch for water
PF3W Series

· For water, 0.5 to 250 l/min
· With temperature sensor
· IP65
· With IO-Link

For dimensions and other details refer to the general catalogue of each series in www.smcanz.com

High precision digital pressure switch – ISE7*/ 7*G Series

· For air & general fluids
· 0 to 1.6 MPa
· With IO-Link
· IP67.



Angled screen & easy rotation mechanism.

3-Screen Display
It can simultaneously display the current pressure and another selectable value (e.g. set value, hysteresis value, bottom value, peak value).

Obtain more

Part number	Fluid	Rated flow range [l/min]	Port size	Output specification
ISE70-02-L2	Air, Non-corrosive gas	0 to 1 MPa	Rc1/4	IO-Link/Switch output 1 + Switch output 2
ISE71-02-L2		0 to 1.6 MPa		
ISE70G-02-L2	General fluids	0 to 1 MPa		
ISE75G-02-L2		0 to 2 MPa		
ISE76G-02-L2		0 to 5 MPa		
ISE77G-02-L2		0 to 10 MPa		

You might find this interesting as well



Remote type pressure sensor
PSE57m Series

· For general fluids
· -100 kPa to 10 MPa
· IP65.



Digital pressure switch
ISE20*(F)/ZSE20* Series

· For air and non-corrosive gas
· -101 kPa to 2 MPa
· With IO-Link
· IP65.



Pressure gauge
G36-L Series

· With limit indicator
· For air, 0 MPa to 1 MPa.

The Expert's experience:

Our customer was a foundry; during the sand casting process the sand is reused over and over again. To do so, the sand gets dragged through a 2" pipe via air blowing.

This method was very inefficient in terms of air consumption. Regardless of whether there was sand or not inside the pipe, the air was been blown constantly.

With the installation of a ISE30 they were able to detect when the pipe was empty to shut off the air accordingly. Simple & Effective: 40 % air consumption reduction.

Monitor wastage

That hissing noise is your compressed air system wasting money

Air leaks are a significant source of wasted energy, of wasted money, of inefficiency. Indeed, an average of 20 % of the generated compressed air.

The installation of flow switches will assist you in knowing where they are and their amount. With that information you decide whether it's worth fixing them or not.

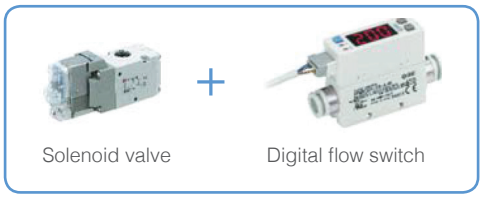
Some other solutions to help you with their control are given below.

Automatic leak detection system – ALDS Series

ALDS integrates a flow switch and a 3-port valve. It automatically measures the given flow, both in home and working positions, gathers all data to conclude where the leaks are.

Furthermore, it exports a detailed report with exact leak location and the value of each leak.





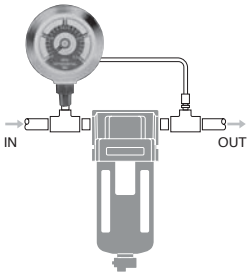
Challenge the leaks in your machine

Part number	Port size	Flow rate [l/min]	Output
VV3P5-X512V	1/2''	2,029	PNP + Analogue (4 to 20 mA)
VV3P5-X513V			PNP + Analogue (1 to 5 V)
VV3P7-X503V	3/4''	3,534	PNP + Analogue (4 to 20 mA)
VV3P7-X504V			PNP + Analogue (1 to 5 V)

Control pressure drops

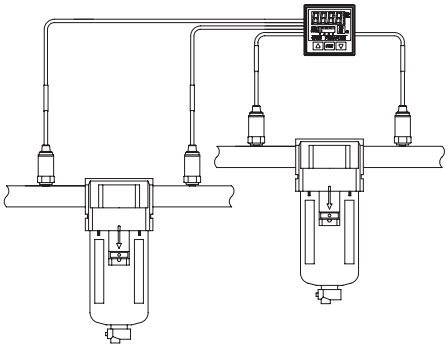
Pressure drops are unavoidable; time causes a natural deterioration in components, thereby compromising their efficiency.

By monitoring the differential pressure you will be aware of the components' status in order to carry out the necessary maintenance activities to keep their efficiency levels up.



Differential pressure gauge
GD40-2-01 Series

· Check pressure drops at a glance.



Multi-channel controller for detecting differential pressure
PSE201-X101 Series

· By installing various PSE pressure sensors, together with a multi-channel controller, it is possible to detect more than one pressure drop at the same time.

For dimensions and other details refer to the general catalogue of each series in www.smcanz.com

Use
only the essential

> “Air is free.
> Compressed air is not.
> Use it wisely.”

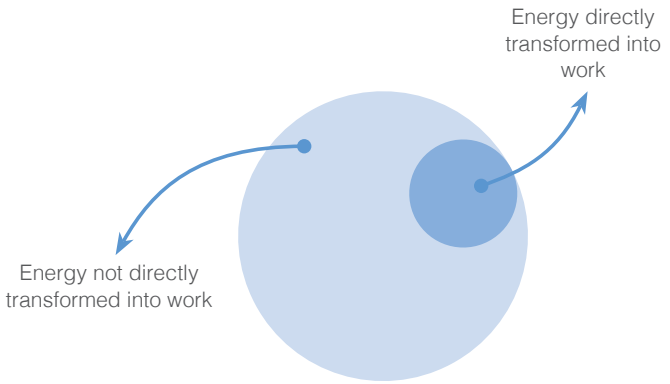
Energy inefficiency in a plant is frequently the consequence of misuse bolstered by the popular belief that “compressed air is free”.

Misuse or sensible use, what’s your situation?

Are your components sized correctly?

Is the air distribution system designed taking into account energy efficiency?

When acquiring a new component, do you consider the ones with an energy-efficient design (like you do when buying bulbs or a fridge)?



Total amount of energy required in a given application

Energy misuse – Rerouting…

In an ideal world, all the topics that we will cover in this chapter would be considered during the design stage.

Is that not your case? No worries.

Any moment is a good one to actually input new coordinates in your compressed air system to use only the essential.

Above, a small sketch to get you thinking.

A huge amount of energy is currently wasted during its transportation through the compressed air system, e.g. tubes, fittings, connectors and valves.

The target should be reducing that amount with an efficient design.

In this chapter, you will discover…

Some solutions that SMC puts at your disposal, specifically designed to reduce energy consumption. As well as tools to assist you in selecting correctly sized components.

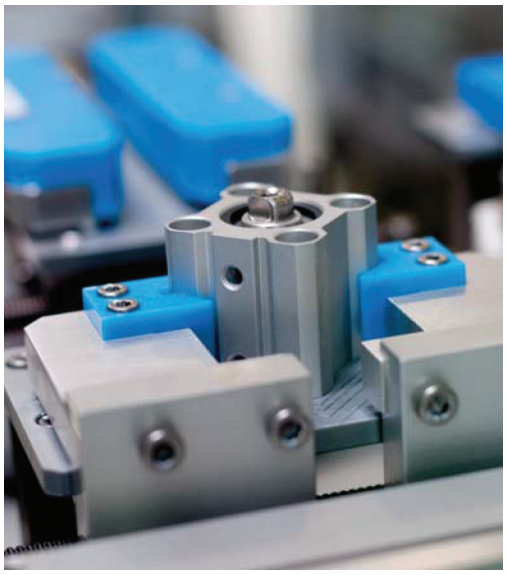
Use the correct size

In the past, productivity led to designing and purchasing decisions: whatever it took to guarantee getting the job done. A compromise in efficiency is not acceptable any more, there is too much pressure nowadays to remain competitive to ignore it.

Every bit counts, and oversizing counts a lot.

From our experience in applying Energy Efficiency, we can confirm that the mere selection of a smaller stroke translates into a 35 % air consumption cut.

It's important to remember that most loads and speeds only require 25 % additional capacity to ensure correct operation.



The right selection matters – The selectors

There are several types, sizes, and variations of cylinders, valves, and other automation components. There are off-the-shelf versions and custom designs available.

Aware of the fact that the sheer number of choices can be overwhelming, we have developed a series of selectors to guide you, to ease your choice and to make sure you choose the exact size you need. No more.







Keep an eye on the tubing & Minimise it where possible

Tube and fitting downsizing has an obvious direct impact on the air consumption, having a positive effect on air leaks and pressure loss as well. And, moreover, without having any impact on the cylinder's speed.

Tube length is often subject to misuse. Experience shows that in many applications, tubing length can be shortened by up to 50 % with no adverse effects.

Use components with an efficient design

In the same way that energy efficiency is already driving our decisions when buying household appliances, such as a fridge or a washing machine, energy efficiency can also lead the way when buying machine components.

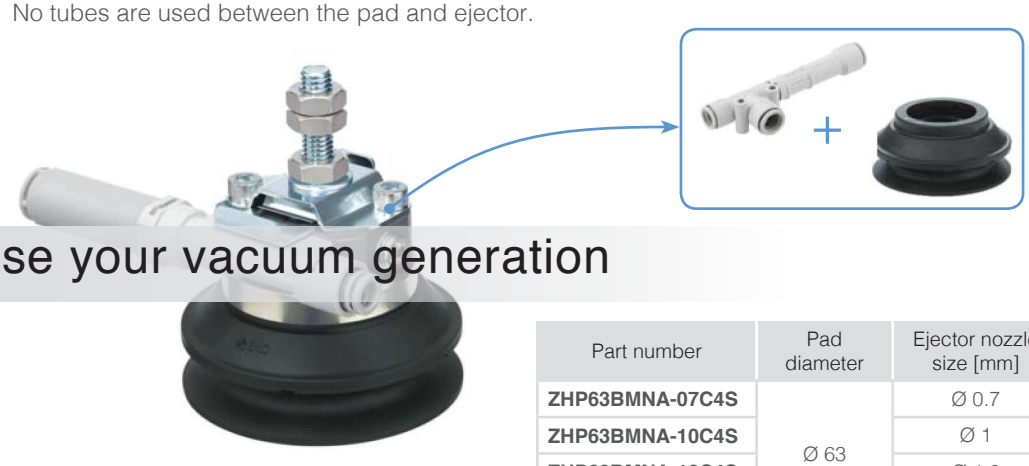
Same performance with a lower energy consumption.

Some examples of our efficiently designed solutions can be found below.

Vacuum pad with ejector – ZHP Series

The ejector and pad are integrated in a single vacuum generation unit.

No tubes are used between the pad and ejector.



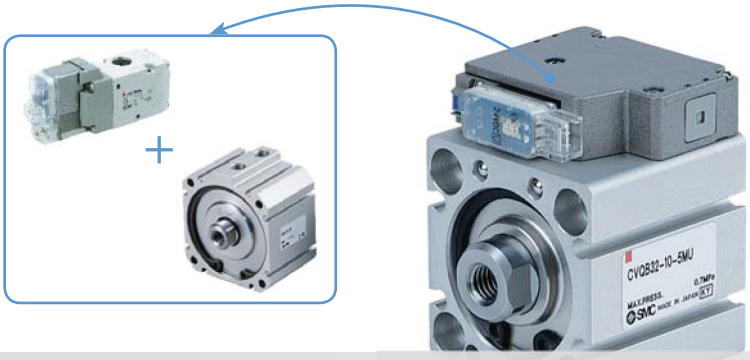
Ease your vacuum generation

Part number	Pad diameter	Ejector nozzle size [mm]	Supply port	Pad type
ZHP63BMNA-07C4S	Ø 63	Ø 0.7	Ø 4	NBR bellows type with groove
ZHP63BMNA-10C4S		Ø 1		
ZHP63BMNA-12C4S		Ø 1.2		
ZHP63BMNA-15C4S		Ø 1.5		
ZHP80BMNB-07C6S	Ø 80	Ø 0.7	Ø 6	
ZHP80BMNB-10C6S		Ø 1		
ZHP80BMNB-12C6S		Ø 1.2		
ZHP80BMNB-15C6S		Ø 1.5		

Compact cylinder with solenoid valve – CVQ Series

An integration of a compact cylinder and a valve which directly governs it.

Without tubing connecting both elements.



Part number	Stroke length [mm]	Port size
CVQB32-*-5MO	5, 10, 15, 20, 25, 30, 35,40, 45, 50, 75, 100	M5 x 0.8
CVQB40-*-5MO	5, 10, 15, 20, 25, 30, 35,40, 45, 50, 75, 100	
CVQB50-*-5MO	10, 15, 20, 25, 30, 35,40, 45, 50, 75, 100	G1/8
CVQB63-*-5MO	10, 15, 20, 25, 30, 35,40, 45, 50, 75, 100	

*Stroke length.

Save 50 % in your air consumption in a simple way

Thermo-chiller – HRSH Series

This series includes a triple inverter. This technology adapts the refrigeration level to demand in real time, avoiding any energy surplus.

The inverter controls the number of motor rotations of the compressor, fan and pump depending on the heat load from the user's equipment.



- Cooling capacity: 9.5 to 28 kW
- Set temperature range: 5 to 40 °C
- Temperature stability: ±0.1 °C.

Cool down your costs

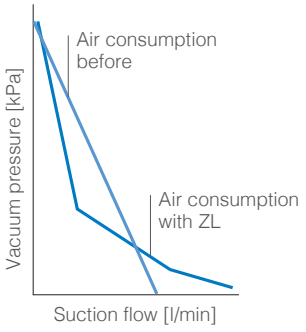
Part number	Cooling capacity [kW]	Refrigeration type	Power supply
HRSH090-A-40	9.5	Air cooled	3-phase 380 to 415 VAC (50/60Hz)
HRSH100-A-40	10.5		
HRSH150-A-40	15.7		
HRSH200-A-40	20.5		
HRSH250-A-40	25.0		
HRSH300-A-40	28.0		

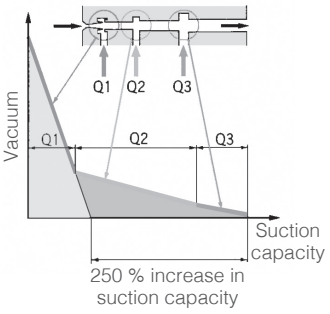
Multi-stage ejector – ZL Series

Multi-stage ejectors considerably improve the relation between air consumption and suction capacity. Their design allow suction flow to be more than doubled while the supplied air does not vary.

This 3-stage diffuser construction also eliminates the need for extra ejectors, thereby increasing energy efficiency.







Efficient push to your suction

Also see our aforementioned efficiently designed products



Double power cylinder
MGZ Series
▶Page 9



Vacuum unit
ZK2 Series
▶Page 11



Air saving speed controllers
AS-R/AS-Q Series
▶ Page 10

For dimensions and other details refer to the general catalogue of each series in www.smcanz.com

Use vacuum wisely

Sometimes suctioning in vacuum applications cannot be performed efficiently. For instance, when there is change in geometry of workpieces, or even when the workpiece doesn't go through. For those cases SMC has also a tailor-made solution.

Vacuum saving valve – ZP2V Series

The suction is automatically switched off when there is no workpiece, which means a considerable reduction in the vacuum pressure loss. With ZP2V Series you can simplify the control circuit with a unique ejector for multiple pads.



Automatically stops your consumption

Part number	Pad side/vacuum generation side	Port size	Fixed orifice size
ZP2V-A5-03	Male/Female	M5 x 0.8	0.3
ZP2V-B5-05	Female/Male		0.5
ZP2V-A01-07	Male/Female	G1/8	0.7
ZP2V-A01-10			1.0
ZP2V-B01-07	Female/Male		0.7
ZP2V-B01-10			1.0

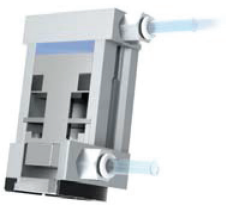
You might find the following of interest as well

Magnetic gripper – MHM-X6400 Series

Our magnetic gripper is capable of adsorbing a great variety of ferromagnetic pieces, with different geometries and properties, even in applications where vacuum pads or grippers are not performing efficiently. Thanks to its operating principle, MHM-X6400 removes the continuous blowing or suctioning that occurs when using a vacuum pad.



The magnet moves together with an air operated piston.



Performs optimally, where others don't

Part number	Holding force [N] 1)
MHM-32D1-X6400	80
MHM-32D2-X6400	50
MHM-32D3-X6400	30

1) Workpiece thickness of 0.6 mm.

Use blowing wisely

50 % of the compressed air generated is used in air blow applications. Therefore, being efficient in this area, will boost your overall efficiency and will save you quite a few dollars.

We've visited many plants with open blowing pipes with the associated safety, noise and energy wastage issues that this practice entails. Calculated on average, we can say that Ø 6 mm open pipe flow leads to 3,000 wasted dollars per year.

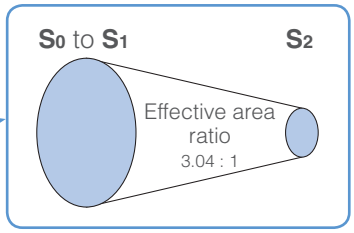
A couple of easy solutions to avoid this from happening are given below.

Blast off your efficiency

Blow gun – VMG Series

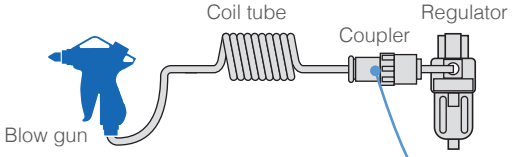
Make your blowing intermittent by employing a blow gun. Furthermore, SMC's VMG presents a minimal pressure loss compared to conventional models; our blow gun can achieve equivalent performance at lower pressures resulting in less air consumption.





Part number	Port size	Piping entry
VMG12BU-02	Rc1/4	Top
VMG12BU-03	Rc3/8	
VMG11BU-02	Rc1/4	Bottom
VMG11BU-03	Rc3/8	

How you can connect it to the line:



S coupler – KK Series

To quickly couple and decouple a line, with no need of despressurisations and without air wastage.



For dimensions and other details refer to the general catalogue of each series in www.smcanz.com

High efficiency nozzle – KNH Series

Maximise air blow efficiency thanks to a more focused blowing impact.

There is a wide range to choose from, either installing in a blow gun or directly in a pipe.

Governed by the Bernoulli effect, the air blow thrust can be improved by 10 %.



High Efficiency

Part number	Nozzle-Ø [mm]	Piping thread
KNH-R02-100	1	R1/4''
KNH-R02-150	1.5	
KNH-R02-200	2	

Focus your efforts

The Expert's experience:

The customer produces home care liquid detergent in bottle sizes ranging from 750 to 2,500 ml.

In the bottle unscrambler machine they had installed 25 air nozzles from a competitor company. Each nozzle had a 2.5 mm diameter and a working pressure of 0.56 MPa. All of them presented annual air consumption of $35,600.

After analysing the application, we offered the customer a swap to our highly efficient nozzles.

KNH series could indeed provide the same blowing performance (flow and impact force), however with a lower nozzle diameter; therefore allowing a lower inlet pressure.

Below, the results of the installation of 25 of SMC's KNH-R02-200.

Consumption was reduced with $9,850/year of savings. A really effective action with a very short period of amortisation: 1.57 months.

	Customer initial situation	Improvement with SMC´s high efficient nozzles
MPa	0.56	0.46
Ø mm	2.5	2
Air consumption	1.120,704 m^3/year	811,575 m^3/year
	$26,897	$19,478/year

The same operation was carried out in another 6 lines. This provided our customer with total savings of $44,406/year (1.854,774 m^3/year).

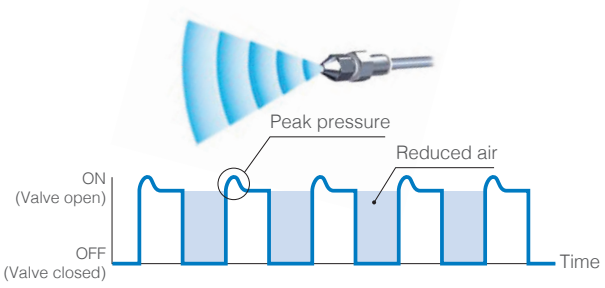
Consumption was reduced with $7,401/year of savings. A really effective action with a very short period of amortisation: 1.57 months.

You might find the following of interest as well

Pulse blowing valve – AXTS Series

The peak pressure of repeatedly colliding air permits efficient blowing, reducing air consumption by 50 % or more. ON/OFF time adjustable individually.





Air amplifier – ZH-X185 Series

A simple, easy-to-operate and smart solution that, thanks to the Coanda effects, multiplies air flow/air suction by 4 and 3 respectively.

Save up to 70 % in your air consumption with SMC's Air Amplifier.



Blow your air consumption away

Part number	Passage diameter [mm]
ZH10-X185	13
ZH20-X185	21.6
ZH30-X185	30
ZH40-X185	42

The Expert's experience:

In this case, the customer was a tyre manufacturer. For the tyre drying process, the customer was using flat-type nozzles: 4 nozzles per tyre, with a total air consumption of 1,100 l/min (according to flow measurement carried out on site).

Our clear recommendation to raise the efficiency in the application was to use air amplifiers instead. Our solution, the ZH10-X185, only consumed 600 l/min, while performance remained the same.

Air amplifiers were successfully tested, therefore the customer decided to replace all 512 nozzles involved in the tyre drying process. With this action, our customer is making a saving of $13,500 per year.

	m^3 air/day	m^3 air/year	$/year
Original nozzles	3,300	990,000	29,700
ZH10-X185	1,800	540,000	16,200
Savings	1,500	450,000	13,500

Air cost: $0,03/$Nm^3$
Operating time: 300 day/year
6000 tyres/day

Use quality air

Contaminants such as oil, water condensation, and particles in general, reduce the service life of components since they accelerate abrasive wear, cause corrosion, and deteriorate the lubricants. Ultimately, poor-quality air circulating around your system can lead to important monetary losses.

Keeping the compressed air dried and filtered helps to increase machine availability and process reliability while reducing maintenance costs.

Good maintenance is carried out systematically, not “once in a while.” It ideally includes the inspection of filter and air preparation units, dew point pressure measurement and checking oil content in the air distribution lines.



Main line filters

· Removes solid particles & water droplets of compressed air
· To be installed on the upstream side of the refrigerated dryer
· The time for replacement can be checked visually thanks to the “Element service indicator”.
· Selectable filtration rates: 0.01, 0.1 and 1 µm
· Flow rate up to 14.5 m³/min (ANR).



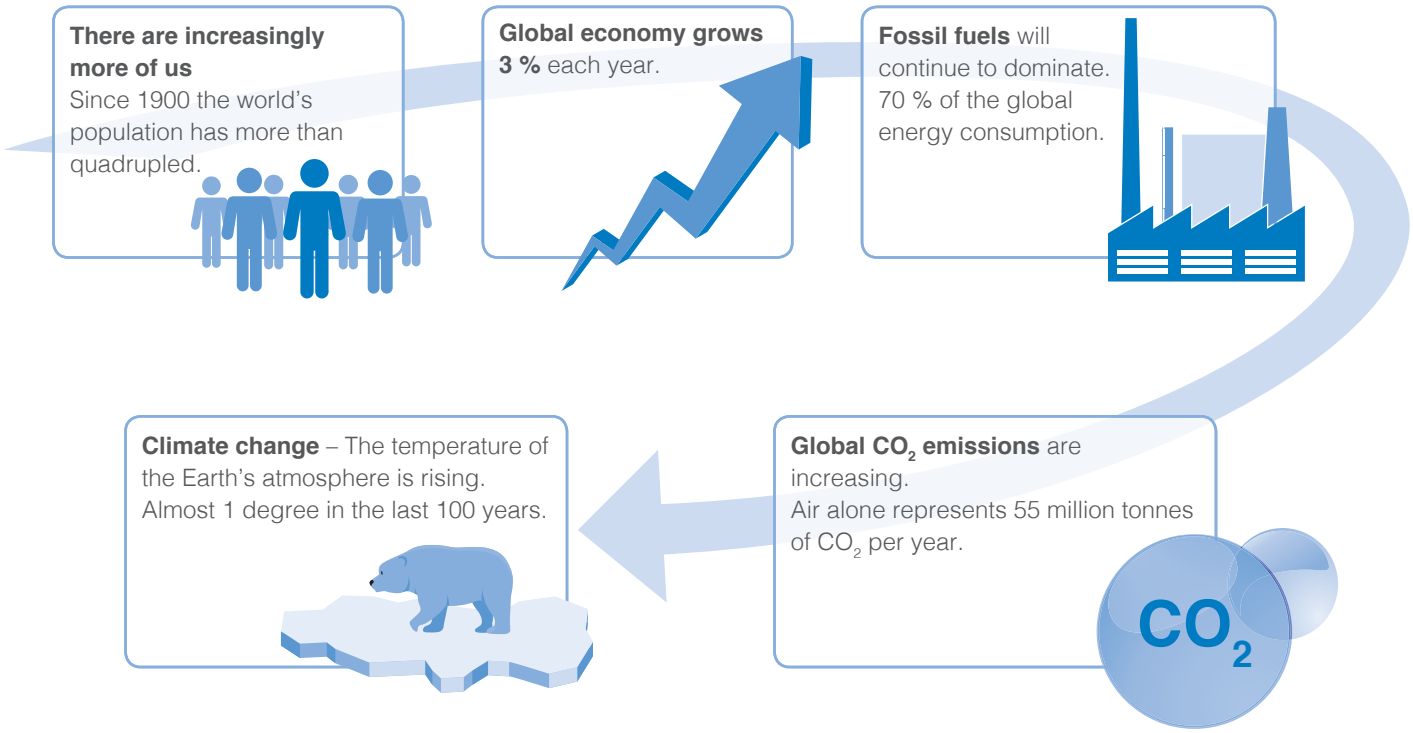
Air filters for modular air treatment units

· To be installed next to the machine
· Element service indicator also selectable
· Filtration rates can be selected: 0.01, 0.3 and 5 µm.

Breathe new life into the world

When referring to climate change, one of the images that first comes to our minds is a lovely and lonesome polar bear standing on an increasingly small piece of ice. The truth is, an ice-free Arctic could potentially spell the end of these white-furred animals if greenhouse gases are not brought under control quickly enough.

The large-scale use of energy for industrial operations in Europe accounts for 32 % of the total energy consumed. This is therefore partly to blame for CO_2 and other greenhouse gas emissions; and ultimately, partly responsible for climate change.



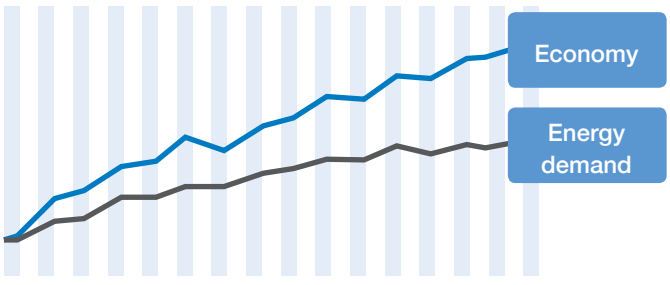
Green… the colour of hope

Leaving business objectives, efficiency or income statements aside for a moment, sustainability is really the move towards a better future for us and our planet.

Facts do, indeed, shed hope. By 2030 we will be 31 % more efficient than we are today, as energy demand has started to grow slower than the economy.

Another ray of green hope comes from the statistics on the use of clean energy.

Renewable energies already represent 44 % of the total energy generated in Europe.





For dimensions and other details refer to the general catalogue of each series in www.smcanz.com

Think
efficient

> “Get a little bit better every single day”

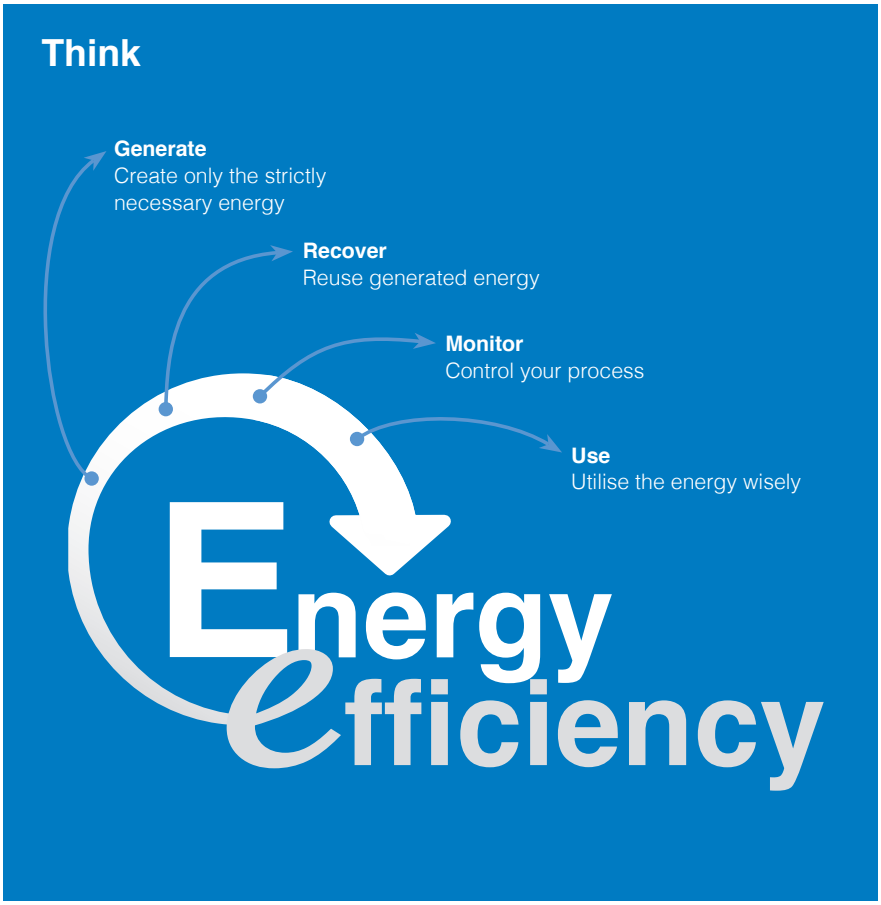
Think efficiency is what helps us to really come full circle.

For us, Energy Efficiency is within the Continuous Improvement philosophy.

All the solutions explained in the sections Generate, Recover, Monitor & Use have not been thought out as a random and unconnected set of actions, but rather than as a continuum. And a continuum that goes beyond these pages. And the connecting thread is Think efficiency.

To genuinely implement efficiency in our facilities, we should adopt a holistic approach to it, and try to see the energy-efficient potential in our day-to-day working activities and decisions.

Think of energising your efficiency



Let’s talk in dollars

Operating conditions

Operating pressure: 0.7 MPa
Working time: 16 h/day
250 days/year
360 cycles/hour
6 cycles/min
Air cost: $0.03/Nm^3

Crimping

1 actuator. Ø 125, stroke 600 mm
Blowing operation: 2 nozzles, Ø 3
Blowing time: 5 sec/cycle
Leaks: equivalent orifice 2 mm

Assembly

4 actuators: Ø 50, stroke 50 mm
2 actuators: Ø 80, stroke 350 mm
Leaks: equivalent orifice 3 mm

Packaging

3 actuators: Ø 63, stroke 100 mm
Leaks: equivalent orifice 1 mm

Palletising

2 ejectors
Ejector air consumption: 167 l/min
Adsorption time: 6 sec/cycle

The following pages illustrate a complete energy efficiency implementation. The example is based on a recent case carried on a customer’s premises; Nevertheless, we’ve made some tweaks to it for confidentiality issues.

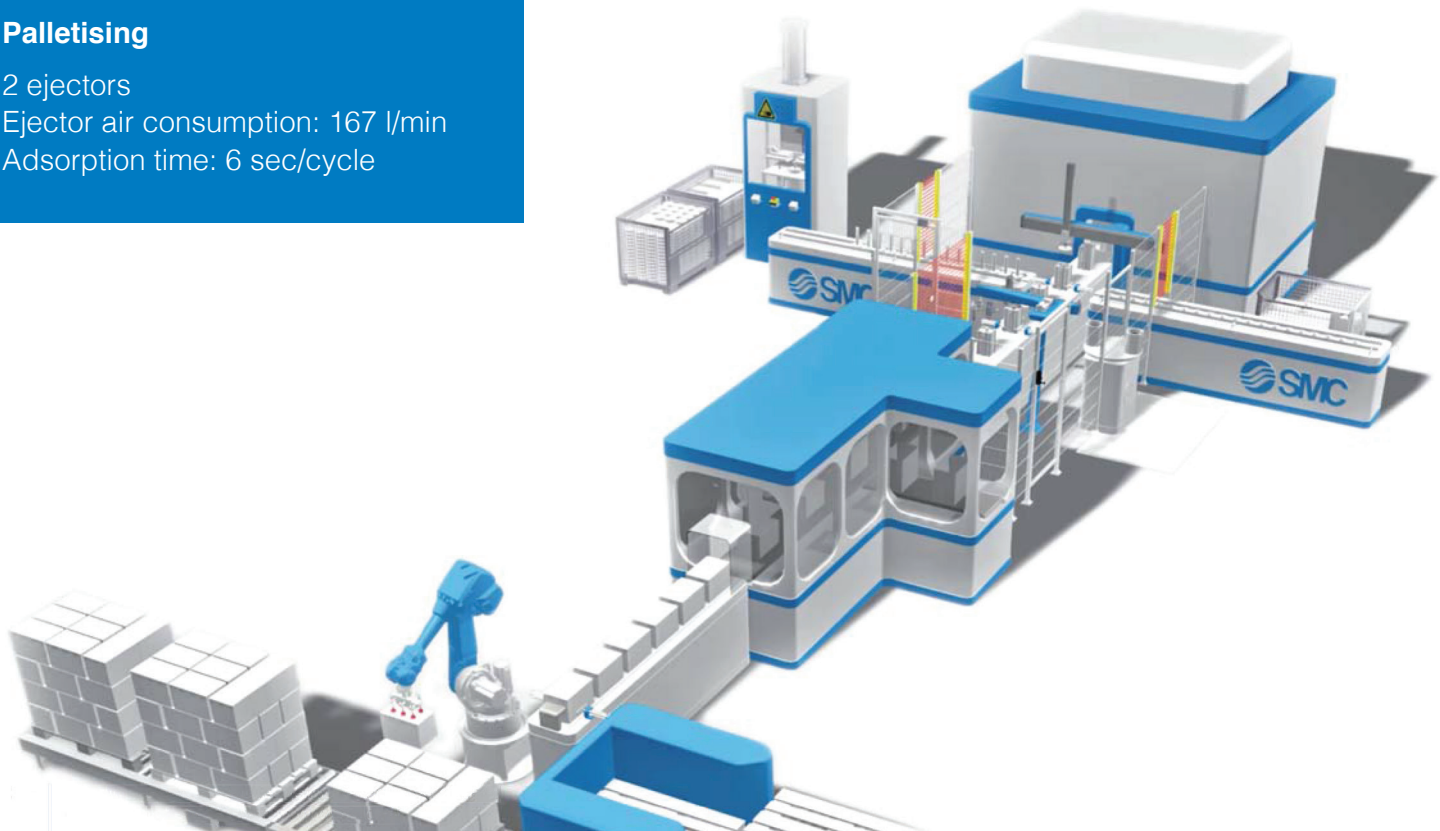
We just want you to see the real impact of all the policies mentioned in the previous pages.

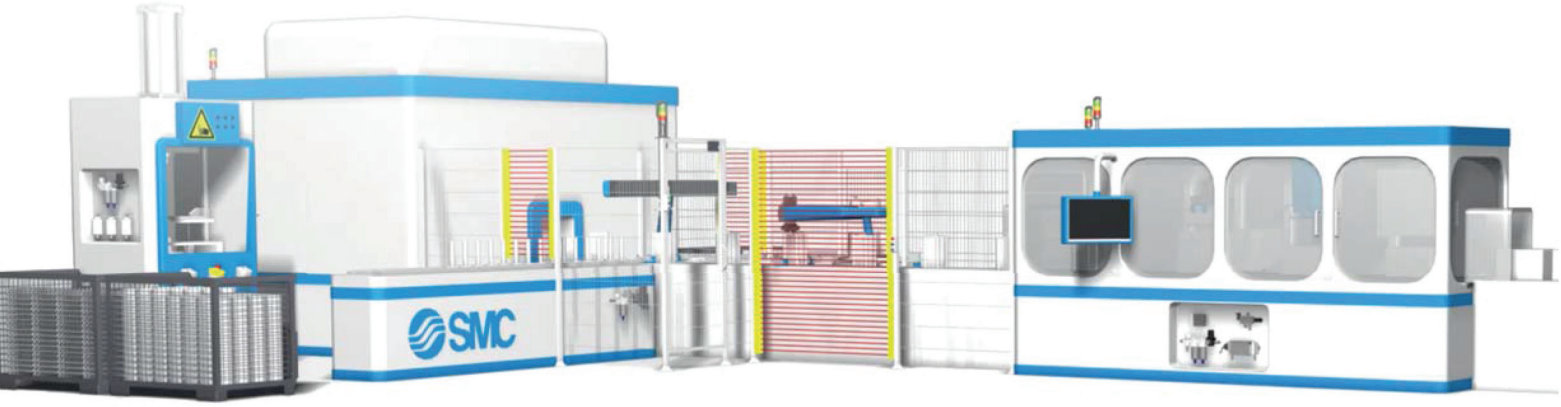
By way of example, we’ll consider that the plant manufactures air cylinders; 1 cylinder every 10 seconds.

The productive process includes 4 main stages: crimping between piston and piston rod; assembly into the cylinder tube, packing and palletising.

The very first action was to install air flow switches in all 4 lines in order to know the initial energy consumption. The results were:

Operation	Stage	$/year	
Actuation	Crimping	5,390	8,939
	Assembly	2,864	
	Packaging	685	
Leakage	Crimping	2,052	7,185
	Assembly	4,619	
	Packaging	514	
Blowing	Crimping	4,619	4,619
Vacuum	Palletising	1,526	1,526
		Total	**$22,269/year**





Reduction in the working pressure level

Total consumption savings → 17 %

Secondly, we analysed the different pressure level demand. After testing, we concluded that pressure could be lowered in every area without compromising on performance.

The biggest impact occurred in the palletising area, where a robot groups boxes into pallets through a vacuum system.

Ejectors could still achieve their maximum suction flow and vacuum pressure with a 0.35 MPa supply pressure.

Crimping: 0.6 MPa
Assembly: 0.55 MPa
Packaging: 0.55 MPa
Palletising: 0.35 MPa*

* Ejector air consumption: 85 l/min

Operation	Stage	$/year	
Actuation	Crimping	4,714	7,595
	Assembly	2,325	
	Packaging	556	
Leakage	Crimping	1,796	5,964
	Assembly	3,751	
	Packaging	417	
Blowing	Crimping	4,040	4,040
Vacuum	Palletising	776	776
		Total	**$18,375/year**

Reduction in vacuum

Total consumption savings → 4 %

ZK2 Vacuum Ejectors, with energy-saving function, ensures vacuum generation only when the pressure level is below the set value. The customer installed units in the palletising area, where only 10 % of the time was required for vacuum generation. ZK2 Series saved 90 % of the air consumption in that area.

Adsorption time: 0.6 sec/cycle
Ejector air consumption: 58 l/min*

* Value with the new supply pressure of 0.35 MPa

Operation	Stage	$/year	
Vacuum	Palletising	52	
		Total	**$17,651/year**

Purchasing part: ZK2A12K5KW-06 (2 units)



Released air recovery

Total consumption savings → 16 %

We designed an air circuit for the actuators located in the crimping and assembling areas. Our customised concept, allowed recycling the released air to be reused to perform the return stroke.

This ad hoc circuit allowed reducing air consumption by 40 %.

Operation	Stage	$/year	
Actuation	Crimping	2828	
	Assembly	1,395	
		Total	**$14,835/year**

High efficiency nozzles

Total consumption savings → 8 %

The installation of KNH Nozzles in each blow application allowed us to reduce the required inlet pressure even more.

Thanks to the high efficiency nozzles, the blowing was performing optimally at 0.4 MPa.

Operation	Stage	$/year
Blowing	Crimping	2,888
		Total $13,683/year

Purchasing part: KNH-R02-200 (2 units)



Downsizing

Total consumption savings → 1 %

Another action consisted in looking for potential oversized equipment. The conclusion was that the actuators in the packaging area, used for stamping the part number and other necessary information onto the boxes, were employing more force than required.

Therefore, bore sizes could be reduced from 63 mm to 56 mm since we installed our JMB Cylinders with intermediary bore sizes.

Operation	Stage	$/year
Actuation	Packaging	439
		Total $13,566/year

Purchasing part: JMDBB56-50



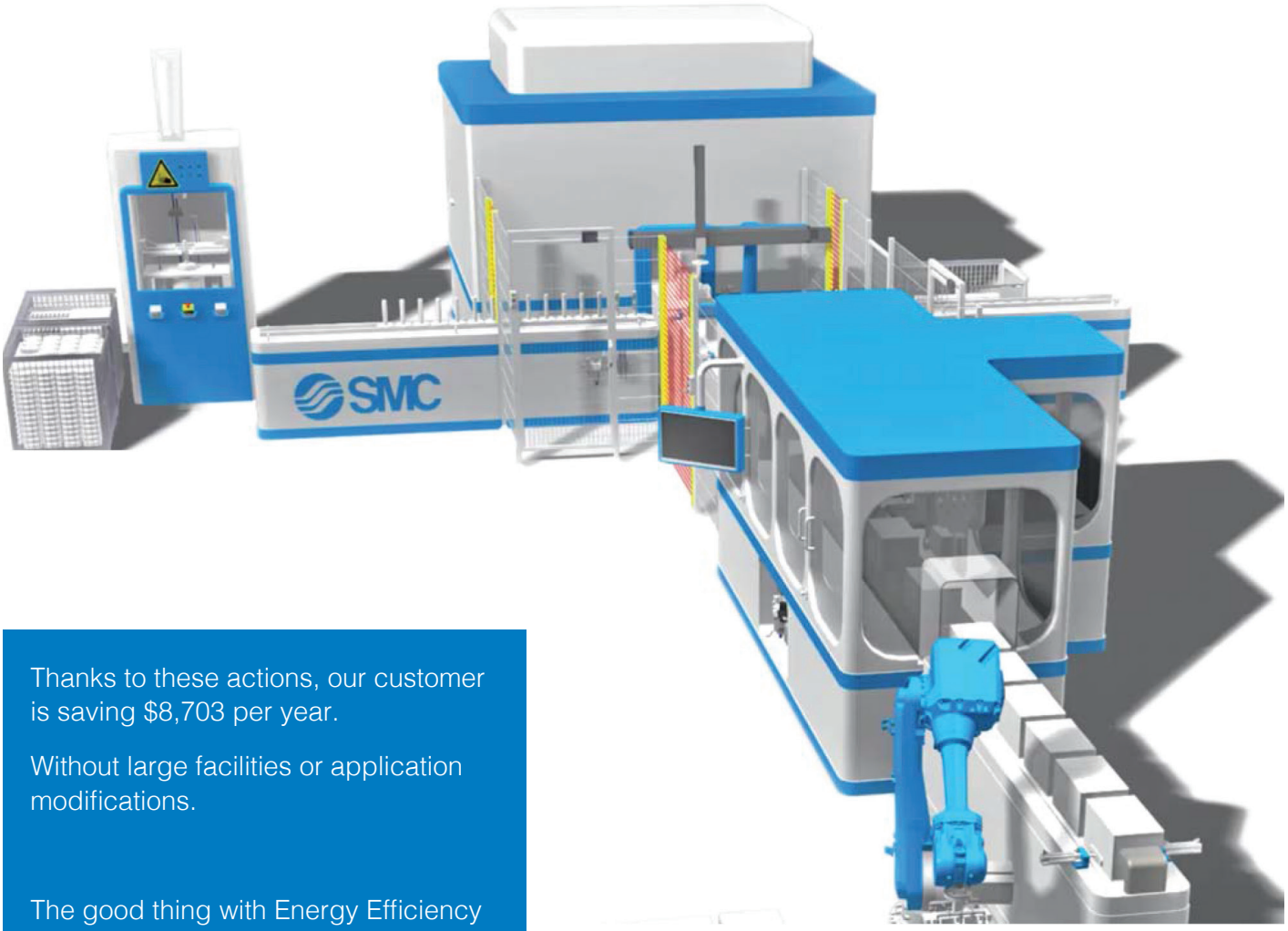
Monitoring

The customer agreed on leaving the flow switches initially installed. With the addition of the flow switches, maintenance staff know what is going on at all times.

Furthermore, they can detect air leaks and be aware of unexpected modifications in machine parameters in real time therefore avoiding surprises.

Purchasing part: PF3A703H-10-FS





Thanks to these actions, our customer is saving $8,703 per year.

Without large facilities or application modifications.

The good thing with Energy Efficiency is that with easy, and not highly resource-demanding actions, savings can be achieved. In big or small companies.

Contact our Energy Efficiency Team of Experts to start **Energising your efficiency**.

Summary

Initial year consumption	**$22,269**
Savings achieved	**39 %**
Final year consumption	**$13,566**
Investment	**$2,564**
Amortisation	**3.5 months**

Let us make your life a bit more pleasant SMC's e-Tools

Time is gold – Software and online tools

We reckon your time is too precious to be spent doing endless manual calculations. That is why we have developed a software with several online tools so they can carry out that tedious work for you.

All of them have a user-friendly interface which, in just a few steps, will provide the desired calculations. Besides, they ensure that potential errors are avoided.

Check them out so you can see how much money you'll save when you start using SMC's energy efficient solutions. User-friendly, question-based and, more importantly, with clear results.

Our list of e-Tools for you include:

Energy saving software

Partial calculations such as air consumption, cost of air, cost of a leak or pressure drops, are now as easily done by downloading this software from our website.

Factory assessment

By answering a simple set of questions you'll discover your factory's saving potential. It's as simple as it seems.

Machine assessment

For each of the different areas (solenoids, air blow, actuators, etc.) this tool provides the savings in dollars and their ROI.

Simple saving calculators

Check the savings you'll achieve by using:

- Energy saving valve VXE Series
- Blow gun VMG Series
- Air saving speed controllers ASR, ASQ Series.



Ready to start?

Visit our webpage and start your calculations

Expertise – Passion – Automation

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