

> **UNDERGROUND TRAINS IN CHINA**

Huasuitong or the art of boring tunnels

> **VICTORY BOUND**

Watt&Sea hydro generators and the Vendée Globe

> **INNOVATION**

Unidrive M - Drives for Manufacturing Automation



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## INNOVATION

Resulting from close collaboration between teams from Leroy-Somer and Control Techniques, Uni-drive M has established itself as the new reference product on the automation market.

## BATTLE AT THE TOP

When the Dyneo® motor took on the Nema Premium motor and won, in a contest set up by Presto Products Company, the leading supplier on the American retail and distribution plastic bag market.



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## THE ART OF BORING TUNNELS

The Chinese underground system is expanding rapidly. Leroy-Somer's involvement is assured, equipping the drive systems on the cutting head of tunnel-boring machines for the Huasuitong company.

## VICTORY BOUND

During the last Vendée Globe race, 19 of the 20 yachts were equipped with a hydro generator designed by Watt&Sea. A veritable success story for this young French company.



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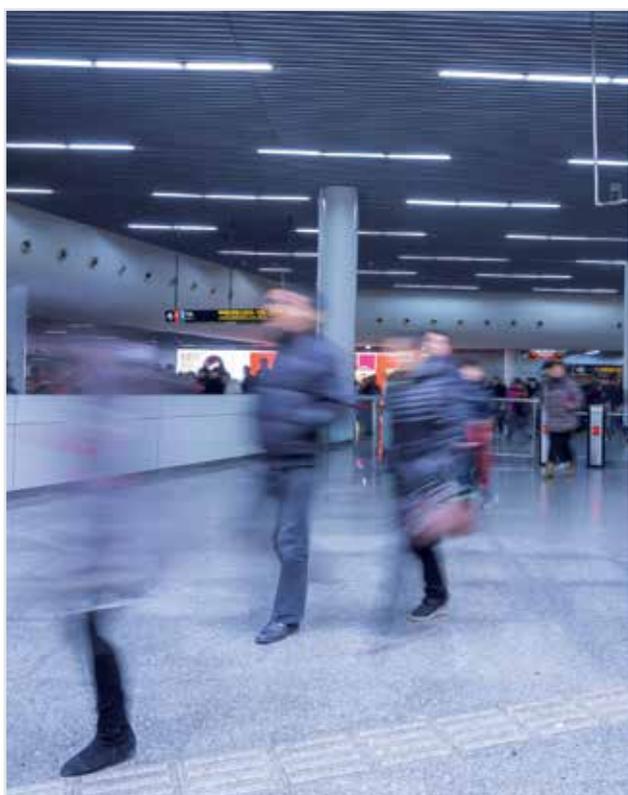
## GEARING DOWN YOUR ENERGY BILLS

Explore Leroy-Somer's range of industrial gearboxes, which has been adapted to the needs of the «quarrying» sector.

**T**eams from Leroy-Somer and Control Techniques, members of the Emerson Industrial Automation group, have worked together to innovate and create the new range of Unidrive M variable speed drives.

This offer is unique on the market, and provides even better motor control, a field in which Leroy-Somer is the absolute master! In terms of innovation, Emerson Industrial Automation's vision is to develop high-performance, user-friendly, reliable solutions which satisfy the most demanding applications.

Leroy-Somer is continuing to expand on the international market, with solutions for converting energy and driving machines. This edition of LS News illustrates perfectly Leroy-Somer's presence and areas of activity around the world. Browse through its pages and discover the many solutions Leroy-Somer has to offer its customers on every continent: from Asia to Africa and from Europe to the United States.



*Underground train station in Shanghai (China)*

Of course, Leroy-Somer is the undisputed leader on the drives for industrial machines market, but the company also offers high-performance solutions for business sectors such as infrastructure and renewable energy. In this issue you can read about several prestigious companies who have chosen our products.

Finally, the company is always keen to hear about our customers' latest needs. Our in-depth knowledge of their businesses and constraints has led, for example, to the development of a special range of geared motors particularly suited to the needs of the quarrying sector.

Happy reading!

*The LS News editorial team*

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### Managing editor

Philippe Faye - Moteurs Leroy-Somer  
Boulevard Marcellin Leroy - CS 10015 - 16015 Angoulême Cedex 9

### Coordination and page setting

Im'act

### Editorial committee

A. Escrig, P. Clifton, E. Dadda, Ph. Faye, Dr. R. Lamprecht, J.-M. Nys, C. Pegorier, O. Powis, G. T. Sørensen, V. Viccaro, T.D.L. Walters.

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### Leroy-Somer LTD

8, The Square Stockley Park - UB11 1FW UXBRIDGE, United Kingdom  
Tel.: (+44) 20 86 10 60 25 - E-mail: motorsalesuksouth.ials@emerson.com



# Unidrive M - MANUFACTURING AUTOMATION

Unidrive M, the most complete range of drives for automation. Consisting of seven models with well-targeted functions, it is a perfect solution to the needs of customers in the Manufacturing Automation sector, offering asynchronous and synchronous motor control solutions from 0.25 kW to 1.2 MW.



The Emerson Industrial Automation group can boast of its fantastic achievements in innovation, both in terms of products and the teams behind the design, manufacture and distribution of the new range of Unidrive M drives. With its customised design, this range includes functions that are ideally suited to any automation application, from the simplest to the most complex.

Unidrive M is the result of close collaboration between teams from Leroy-Somer and Control Techniques and in-depth market research focusing on the expectations of machine manufacturers and end users. Unidrive M now represents the new reference product for the automation market.

Consisting of seven models, Unidrive M100 to Unidrive M800, the range offers an increased number of innovative functions:

- Machine safety
- Universal motor control
- Software suite for intuitive development of automation applications
- Ethernet, open to all types of network architecture

"For a number of years, Leroy-Somer and Control Techniques have offered motor and drive ranges with optimised performance. The new Unidrive M drives help our variable speed drive systems achieve better performance than any of the solutions currently available on the automation market"

*confides Cédric Plasse, Director of Research and Development at Leroy-Somer.*

## A series of innovations

### Machine safety

The machine safety functions improve productivity while protecting equipment and users. They comply with ISO 13849-1 and IEC 62061. The different levels PLe or SIL3 can be used to adapt to the requirements of industrial sectors.

**NEW:** The two STO (Safe Torque Off) inputs provide more sophisticated and advanced safety functions which can reduce the number of external components and cut the costs of machinery.

### Universal motor control

The new range of Unidrive M drives guarantees maximum stability levels and bandwidths for all types of industrial motor, from asynchronous motors, linear motors with high dynamic performance, energy-efficient permanent magnet motors to high-performance servomotors. Users can thus optimise machine efficiency for each process, from the simplest such as pumping or ventilation, to the most complex such as position control or synchronised servo-control.

**NEW:** From Unidrive M600, the sensorless (open loop) control of permanent magnet motors uses current regulation. This mode offers remarkable dynamic performance and allows the use of more compact Dyneo® motor technologies with better efficiency.

**A software suite for intuitive development of automation applications**

• **Unidrive M Connect** is the brand new drive configuration tool for commissioning, optimising the performance of and monitoring drive systems. It is a sophisticated, intuitive tool for setting parameters, backing up configurations and communication with the automated environment. It meets the demands of innovation and is based on sound principles.

**NEW:** The Unidrive M Connect software provides access to "Wizards" for setting the motor, sensor and application parameters. The menu-based architecture, accessible via synoptic views or tables, makes setting the servo systems extremely simple. The sensing function means that drives can be automatically located on a network without the need to specify their address.

• **Machine Control Studio** is a program which provides a flexible environment for control system programming and sequential processing, and motion control. All these can be optimised with the CoDeSys environment, a leader in the sector, which offers programming languages defined by standard IEC 61131-3.

**NEW:** From the Unidrive M400, the programming integrated with CoDeSys can be used to develop simple control system functions.

The AMC (Advanced Motion Controller) native to the Unidrive M700 offers the full range of axis control functions.

Unidrive M800 has a second 32-bit micro-processor which enhances machine performance and offers a dedicated Motion Control network. It has real-time multi-tasking capability of 250 µs, ideal for applications which require axis control for dynamic processes and high-speed interfacing with other control devices such as PLCs (Programmable Logic Controllers), I/O, and HMIs (Human-Machine Interfaces).

**Ethernet, open to all types of network architecture**

The technologies used by the Unidrive M range rely on commonly-used open standards: Ethernet Modbus TCP, Ethernet IP and Profinet RT, simplifying integration into numerous types of automation equipment. Real-time exchanges are possible in accordance with standard IEEE 1588 V2, which guarantees very high automation and motion control performance thanks to a fast and flexible communication protocol. It offers digital lock with accuracy of less than 1 µs (Jitter), updating of data every 250 µs for an unlimited number of connection points. Thus, several models in the Unidrive M range set up direct dialogue with one another, avoiding overloads on industrial networks.

**NEW:** IEEE 1588 V2 for digital lock and deterministic exchanges in order to create high-performance standalone machine architectures.

Productivity gains are made, with data access at all levels of the company and reliability of processes using "Machine To Machine" access.

Thanks to this new Unidrive M range without parallel on the market, with its power range reaching as high as 1.2 MW at 690 VAC and its range of functions, Leroy-Somer offers Automation solutions for intelligent high-performance machines in the industrial and commercial sectors.

Moreover, the group has also put in place commercial and technical teams to support the customer in his projects. These teams work together on specific markets and applications and can thus define solutions based on standard products offering an open communicating architecture.







## Innovate with Unidrive M!

- Comprehensive group of drives up to 1.2 MW
- Universal control in open or closed loop mode of asynchronous motors, servomotors, linear motors and permanent magnet motors
- Built-in safety
- Real-time Ethernet communication
- Simplicity of installation and maintainability
- Software platform for automation development
- Environmentally-friendly design



- USA -

# DYNEO<sup>®</sup> versus NEMA Premium

## Presto Products Company

Who is not familiar with the reclosable bag? It is one of Presto Products Company's specialities. The company is a world-leading supplier on the retail and distribution plastic bag market and has five production sites in the United States.

## Extrusion, an energy-intensive process

The cost of electricity for the extrusion process, which is the core of Presto Products' business, represents almost 50% of the company's overall expenditure.

Not surprisingly, motors and drives constitute one of the key challenges in this struggle to improve the efficiency and performance of the production process! In order to compare existing solutions on the market, Presto Products decided to conduct a detailed in-house study and compare three types of drive system: two traditional configurations with AC motor, and the Emerson solution combining a Leroy-Somer Dyneo<sup>®</sup> LSRPM permanent magnet motor with a Control Techniques Unidrive SP drive.

## The Emerson solution

The Emerson solution was the clear winner of this battle!

The costed comparison between the Leroy-Somer permanent magnet motor and a Nema Premium motor shows that the Dyneo<sup>®</sup> LSRPM motor is more efficient over the whole speed range. This difference results in a payback period of just 9 to 12 months! The second advantage is that, being more compact than a conventional AC motor, the Dyneo<sup>®</sup> LSRPM motor takes up the same space as the original DC solution and needs very few mechanical alterations when being retrofitted. The original extrusion system configuration can be retained but with a massive improvement in efficiency.

## The keys to success

- Emerson global supply chain (Leroy-Somer – Control Techniques).
- The Dyneo<sup>®</sup> LSRPM solution is equally suitable for retrofitting (replacing motors on existing extruding machines) and installation on new extruding machines.

A manufacturer decides to conduct its own study in order to test the motor ranges available on the extrusion market in the United States.



“The costed comparison between the Leroy-Somer permanent magnet motor and a Nema Premium motor shows that the Dyneo<sup>®</sup> LSRPM motor is more efficient over the whole speed range”.

Speed%	Motor	NEMA Premium Induction Motor	Dyneo <sup>®</sup> Permanent Magnet Motor	Difference	
		Power	Power	(kW)	%
Set point	(RPM)	(kW)	(kW)	(kW)	
5	90	1.421	0.95	0.47	33
10	180	3.069	2.3	0.77	25
25	450	10.92	9.7	1.22	11
50	900	30.75	27.9	2.85	9
75	1350	52.22	48.5	3.72	7
100	1800	76.56	71	5.56	7

Source: Presto Products Company



- China -

## MASS-PRODUCED TUNNEL-BORING MACHINES for water-cooled motors

China is planning to construct 2500 km of underground train lines in 23 towns by 2016. Leroy-Somer has a foothold on this demanding market, equipping the drive system on the cutting head of tunnel-boring machines for the Huasuitong company.



« To drive the cutting head, the Huasuitong company has chosen Leroy-Somer's water-cooled SLSHR motors. ».

### High-performance motors to drive the cutting head

To drive the cutting head, the Huasuitong company has chosen Leroy-Somer's water-cooled SLSHR motors. Thanks to their robust design, SLSHR motors can cope with the demands of extreme environments. They have numerous advantages: compact size, reduced noise level and energy savings resulting from their high efficiency, not to mention the possibility of variable speed operation without derating or external fan.



### The Huasuitong company or the art of boring tunnels

The Huasuitong company, part of Tianye Tolian based in Qinhuangdao (300km east of Beijing), manufactures TBMs (Tunnel Boring Machines) with a round cross-section for different earth types. The machines used to construct tunnels for the various underground train lines in China (in Beijing, Wuxi and even Fuzhou) are EPB (Earth Pressure Balance) type. This type of TBM is designed to bore through earth with less

than 7 bars of pressure and is capable of containing the earth while balancing the earth and the pressure.

For the future underground train line in the town of Fuzhou running from Baihuting to Huluzhen over a distance of 1083 metres, the TBM is 6.3 metres in diameter and progresses at an average speed of 14 metres per day.

- Italy -

## An imaginative way to improve THE SITE CONFIGURATION

Alternators can ease restrictions on the existing site configuration! The successful design and installation of Leroy-Somer's alternators demonstrates an imaginative approach, regardless of the technical and logistic challenges involved in the refurbishment of hydroelectric power stations.

### Tirreno Power

Tirreno Power is a major electricity producer in Italy. It has a number of varied and flexible electric power stations (combined cycle power stations running on natural gas, conventional power stations, etc). Having a keen interest in environmental matters, Tirreno Power uses the most advanced technologies to reduce its CO2 emissions while improving the efficiency of its power stations.

Tirreno Power has a significant renewable energy production capacity, mainly consisting of hydroelectricity. In 2008, Tirreno Power launched a vast refurbishment programme of its 17 hydroelectric power stations, most of which are in Liguria.

### Size constraints

The existing hydroelectric power stations are, for the most part, old buildings with stylish architecture, with a fixed site configuration. Major constraints exist in relation to the building structure, such as road access, dimensions of the entrance door or hoisting capacity available on site.

For each of these projects, where flexibility and a "project" approach are obligatory, Leroy-Somer has been able to use its customised technical and logistics solutions, a world away from the approach of standard product ranges: customised dimensions and interfaces, specific handling tools, etc.

Leroy-Somer has taken responsibility for all phases of the project, from the preliminary design through to commissioning. These phases include a highly technical design study, obligatory rigorous checks on manufacturing and complex steps transporting some alternators as sub-assemblies for reassembly in-situ in the power stations.

### A vast refurbishment programme

Leroy-Somer was involved in refurbishing the first power station at Spigno Monferrato in 2008. With the benefit of



### Caroso power station

1. Special transportation to take components to the power station
2. Delicate entry into the power station
3. Reassembling the alternator in-situ on the Pelton turbine tank
4. Alternator during the global efficiency tests, with high-pressure pipe line in the background

this experience and having successfully executed the project, Leroy-Somer was considered to be a key partner for future refurbishments by Tirreno Power S.p.A.

### Exceptional know-how!

By the end of the refurbishment programme, Leroy-Somer had supplied 14 alternators in 8 different power stations.

Tirreno Power now has hydroelectric capacity of 73 MW, an extra 10 MW production after completion of this programme.

In the hydroelectric sector, Leroy-Somer can pride itself on its exceptional know-how. In just a few years, the company has built the equivalent of an electric power station of more than 3 GW!

- France -

# Watt & Sea HYDRO GENERATOR

## Victory bound!



For a participant in the Vendée Globe, the ultimate extreme race, reducing the weight of one's yacht by a few hundred kilos all adds to the chances of attaining the end goal: victory!

**T**his was Yannick Bestaven's reasoning, back in 2008, when he installed the first prototype hydro generator onboard his 60-footer before setting off on this legendary round-the-world sailing race.

Last time this race was staged, 19 of the 20 participants were using this 100% green energy source to produce their electricity and cut their fuel requirements. A comprehensive victory for this young company based in La Rochelle (France).

By using the yacht's speed to turn a submerged propeller, Watt&Sea provides a simple, high-performance and reliable solution to energy self-sufficiency. As a result, most



of the participants in last year's Vendée Globe reduced their fuel consumption from 400 L to 50 L. Less weight to carry, significant improvement in speed, but above all a guarantee of complete energy supply security during ocean racing!

For both the racing and cruiser versions, electricity production starts when the yacht reaches 3 knots (around 3.45 mph). The Watt&Sea hydro generator therefore produces up to 100% of a yacht's electrical needs (500 W or 40 A in 12 V). In comparison, wind turbines and solar panels only provide 20%!

Hydro generators are currently sold in more than 30 countries. The dynamic young company has just launched a new range aimed specifically at pleasure craft.

### An innovative hydro generator

In close collaboration with Leroy-Somer, Watt&Sea developed a generator based on synchronous technology with a variable pitch propeller for the hydro part, with the aim of converting ocean energy into electricity.

"In the last race, 19 of the 20 participants were using this 100% green energy source to produce their electricity and cut their fuel requirements".

Using components supplied by Watt&Sea, Leroy-Somer delivered two subassemblies, the rotating part (rotor) and the fixed part (stator) which Watt&Sea integrated into its end product.

With compact dimensions and high specific output power, this solution has the advantage of producing a maximum amount of electricity while barely affecting the yacht's performance.

With such a strong partnership, Watt&Sea is on course to win many more trophies!

Website: [www.wattandsea.com](http://www.wattandsea.com)





## Optimising the design of ONSHORE and OFFSHORE GENERATORS



Leroy-Somer offers innovative solutions in order to optimise the design of onshore and offshore Diesel generators. To publicise these innovations, the company is organising a series of seminars in Asia with various partners, mainly in countries with floating equipment construction centres for the oil industry.

During the seminars, the managers of oil & gas projects have the opportunity to find out about the latest technical developments in Leroy-Somer alternators, especially in terms of insulation class and safety margins for passive technologies, but also in terms of field excitation (AREP + PMI) and monitoring (LAM) for active technologies.

This series of seminars, which started at the end of 2012, will be visiting a number of different Asian countries (Indonesia, Malaysia, Singapore, etc) throughout 2013.

## - Africa - A new service centre in Burkina Faso

The Leroy-Somer service network continues to expand and is now reaching out to end users in Burkina Faso. PPS Sarl, under the direction of Emmanuel Kabore, is able to sell, repair and maintain Leroy-Somer's main products for local firms. It has a large stock of IE2 high-efficiency motors, for example. This dynamic company is an accredited energy expert, and offers its services to customers to help them significantly reduce their electricity bills.

As Emmanuel Kabore says: "In collaboration with Leroy-Somer, PPS will be able to meet the needs of manufacturers and mining companies in the region by supplying equipment for production, consultancy and equipment monitoring".



## - USA -

## The new Precedent™ from THERMO KING



To comply with the Tier 4 standard (USA) on gas emissions for non-road Diesel engines, Thermo King has developed a new cooling system for refrigerated trucks which uses less fuel and is called "Precedent™".

For more than 75 years, Thermo King has supplied high-quality, reliable products with excellent performance. With the Precedent™, Thermo King is introducing new standards for the whole refrigeration industry. After evaluation, the reliability of each component has improved by 5% compared to the previous requirements. The system has been tested for three years to ensure that it fully satisfies the profession's most stringent criteria.

Precedent™ cooling systems, produced in a new dedicated plant, are all equipped with a Leroy-Somer permanent magnet generator and three AC induction motors.

- Turkey -



## Regenerative solution and ENERGY SAVINGS

**G**üralp is a company in Izmir that produces 800 cranes annually. It is very active in Turkey and also on the export market, especially to Asia, Europe and Africa.

Always on the hunt for innovative solutions for its customers, Güralp designed a crane 300 metres high for constructing a hydroelectric power station. To make the most of this increased hoisting distance, Leroy-Somer has introduced the LSMV drive mechanism in combination with the Powerdrive FX drive with dynamic braking which offers an exceptionally compact regenerative solution. By sending energy back to the mains supply during dynamic braking, the Powerdrive FX drive can produce significant energy savings.

- USA -

**A** pair of side-by-side belt-driven KATO™ motor-generator sets (MGs) will be used by New York City's Metropolitan Transportation Authority (MTA) to provide signaling system power for a new Public Works project: East Side Access.

The single-phase MGs, which were purchased by Powell Electrical Systems Inc. of North Canton, Ohio, will convert 60 Hz grid power to the 91.6 Hertz power required by the signaling system.

The East Side Access project will connect two metro lines in Queens to a new terminal beneath Grand Central Terminal in adjacent Manhattan. Tunnels there are being excavated 120 feet below the city streets. The new connection will increase capacity into Manhattan and dramatically shorten travel time for Long Island and eastern Queens commuters traveling across the East River to the east side of Manhattan. Plans call for 24-trains-per-hour service to Grand Central during peak morning hours, with an estimated 162.000 passenger trips to and from Grand Central on an average weekday.

## Kato™ will provide New York SUBWAY SIGNAL POWER



*View of construction underneath the existing lower level of Grand Central Terminal, New York City. (Photo by Metropolitan Transportation Authority of the State of New York / Patrick Cashin).*

- Poland -

## Pellets for DOMESTIC HEATING

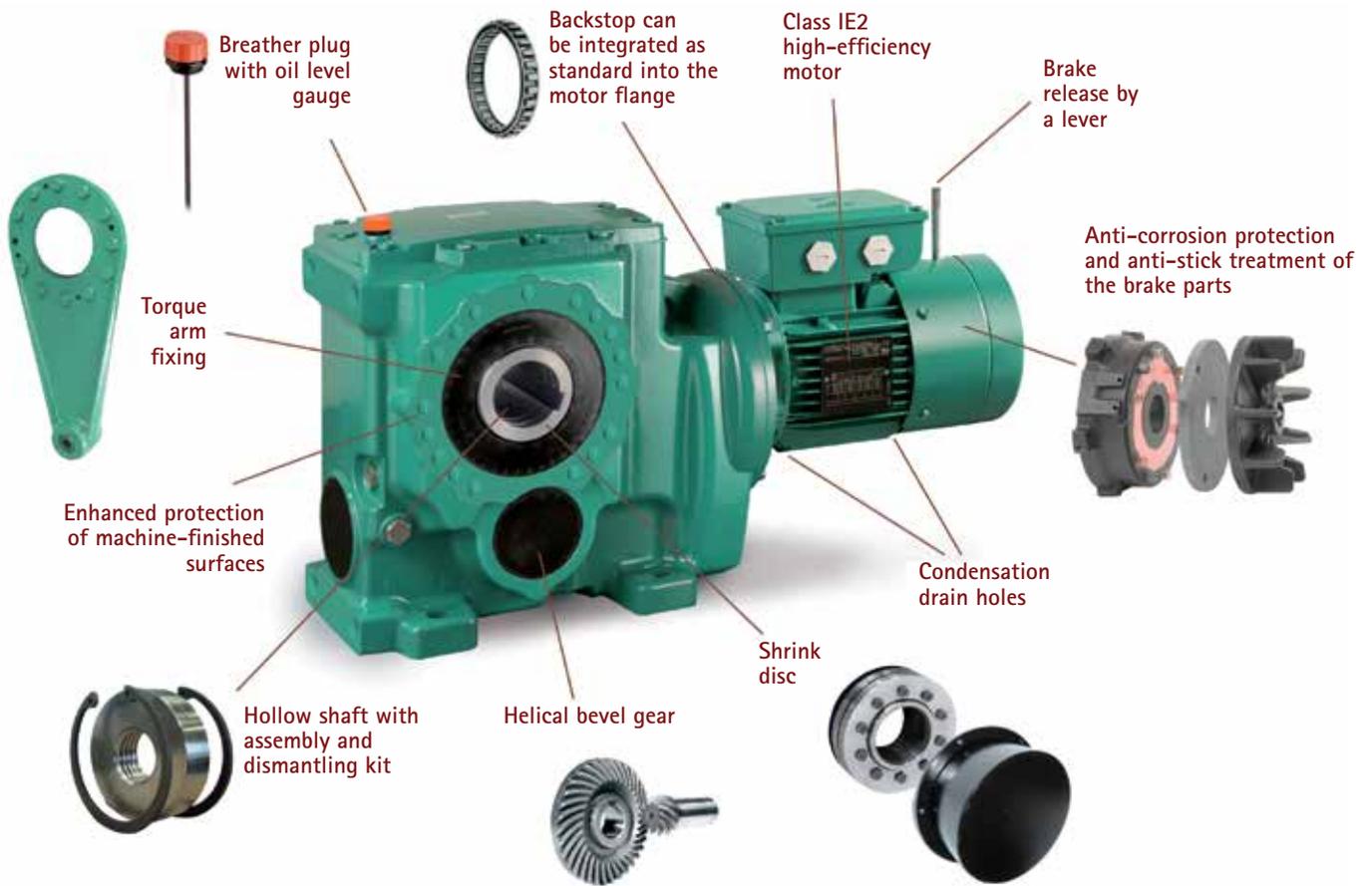
**I**n 2012, Mikrom, a company based near Poznan, developed an innovative machine to produce fuel in the form of granules for domestic heating, created from sawdust. This clean, simple and competitive



solution has much to recommend it over coal or coke, two materials that are still very commonly used in Poland.

During the design phases, Mikrom was particularly careful to optimise the machine's operating cost and chose Leroy-Somer as a partner because of the high efficiency of its proposed solutions. The pelletizer is equipped with a sturdy Compabloc helical geared motor with a 30 kW IE2 high-efficiency motor and universal mounting. The power is more than enough to compress the sawdust through the die, reduce its size and remove moisture. The complete kit also includes various geared motors for transporting the materials.

In Poland, Leroy-Somer offers high-efficiency energy solutions and solutions to improve productivity and the safety of processes in various business sectors: industrial refrigeration, quarries, machine-tools, etc.



## Mineral industry GEARING DOWN YOUR ENERGY BILLS

For owners of a quarry, drive systems can be part of a cost-cutting strategy! Leroy-Somer has created versions of its range of industrial gearboxes that are specifically adapted to the requirements of the “quarrying” sector. It offers a wide range of technical solutions which can cut electricity bills by as much as 50% compared to conventional solutions.

**D**id you know that it takes nearly 50,000 tonnes of aggregate to make one mile of motorway!

Some figures which demonstrate the importance of this business sector in Europe: 250,000 people are involved in the mineral extraction industry, resulting in an annual production of 3 billion tonnes and a turnover of 20 billion euro. To reduce transport costs and protect the environment, the production sites are usually based close to construction sites (50 km maximum).

### The most comprehensive range on the market

Quarrying imposes a high level of stress on machines in the form of dust, damp, shocks and vibrations. After conducting an in-depth audit of users, Leroy-Somer created versions of its geared motor range that are ideally suited to the conditions in quarries while offering new

technological advantages to machine manufacturers (transporters, conveyors and other stackers). The Leroy-Somer offer represents a total commitment to reliability and performance.



## A specially designed range for the mineral industry

### A range up to 23,000 Nm

The 3000 range of helical bevel geared motors comprises 9 sizes, goes up to 23,000 Nm and covers all the needs of an operating site.

### Unrivalled modularity of drive system components

All Leroy-Somer's motor technologies can be included on all three types of gearbox in the 3000 range (Compabloc, Manubloc and Orthobloc).

### Simplified mounting

The customer can choose the coupling formula best suited to his machine from a very wide fixing offer.

### Optimised sealing

The sealing system is particularly effective. It consists of an O ring seal between the motor and the gearbox, a flat seal under the housing end plate and double lipseals on the rotating parts.

### Reduce the load effects

The bearings are large enough to withstand the highest radial loads.

### Guaranteed withstand

The monobloc cast iron housing has been designed to ensure maximum shock and vibration resistance.

## Help with selecting geared motor technologies

The choice of motor technology is a determining factor in improving machine efficiency and cutting electricity bills. In direct contact with the operator, Leroy-Somer's experts identify sources of potential savings and calculate the return on investment before installation. The operator therefore has no hesitation in specifying Leroy-Somer to the machine manufacturer, to the great benefit of each party.

Depending on whether the application is fixed or variable speed operation, there are different technologies: IE2 or IE3 high-efficiency geared motors, high-efficiency asynchronous variable speed solutions or Dyneo® synchronous magnet solutions.

In addition to the energy savings offered by the Dyneo® technology, the gear technology based on helical teeth makes it possible to achieve mechanical efficiency in excess of 95% and facilitates integration as close

as possible to the transmission shaft, thus eliminating the need for any intermediate devices to produce additional savings of 15 to 20% on the efficiency of the operating mechanism.

## Innovations which improve operational performance

With the benefit of this experience in the field, Leroy-Somer is also making its expertise available to manufacturers, taking account of the whole customer system and offering them innovative solutions that will give them a competitive advantage in terms of performance and cost.

## Bespoke services, all around the world

### Committed to availability

Leroy-Somer undertakes to make available on short delivery a predefined list of customised quarrying products.

### An accessible service

Wherever you are based, Leroy-Somer can, through its partners, implement a service organisation adapted to your needs: installation, repair, maintenance, energy audit, etc.

Thanks to this complete range of products and services, Leroy-Somer is able to maintain its leading position.

"Wherever you are based, Leroy-Somer can, through its partners, implement a service organisation adapted to your needs: installation, repair, maintenance, energy audit, etc".

*Leroy-Somer is very active in numerous regions of the globe. For example, in Morocco, with the help of its local partner CIETEC and its assembly centre in Casablanca, Leroy-Somer geared motors are delivered to the AOC (Agregats Oued Cherrat) operating site in less than two hours. This makes it easy for the owner to optimise the level of service throughout his site.*





# Leroy-Somer's KEY ROLE IN the Olympic Torch Relay

A Leroy-Somer alternator played a leading role in supporting the Olympic torch on its tour of Britain prior to London 2012. The LSA 43.2 Series alternator was a key component in a custom-built generator on board the support vehicle for the Olympic Torch Relay. Over 8.000 torchbearers carried the Olympic flame through more than 1.000 cities, towns and villages across the UK prior to the games.



The London 2012 support vehicle in action during the Olympic torch relay for London 2012. The vehicle contained a LSA 43.2 Series alternator to provide power for the on-board facilities.

Ian Webb Engineering supplied the generator to the London 2012 support vehicle. The engineering company chose the LSA 43.2 Series alternator because of its high levels of engineering and reliability. The London 2012 support vehicle featured television screens, promotional equipment and a hospitality area. With frequent stops across the UK, the generator was used every day to provide power for the facilities on board.

Ian Webb, Managing Director of Ian Webb Engineering, said: "This was a prestigious job for us. We needed an alternator with a small footprint and one with low noise levels. Leroy-Somer did not disappoint and provided us with all we could ask for.

We have developed a strong relationship with Leroy-Somer over nearly 20 years and this has advantages when working on high profile projects like this."

Xavier Trenchant, President of Leroy-Somer Electric Power Generation, said: "Leroy-Somer was delighted to play a role behind the scenes in the run-up to the Olympics. It is always a pleasure for me to see that our products meet customer needs."

The LSA 43.2 4-pole alternator is suitable for typical generator applications, such as backup, standard production, co-generation, marine applications, rental and telecommunications. The LSA 43.2 4-pole alternator offers top of the range

performance with standard 12-wire re-connectable winding. It features the Leroy-Somer AREP brushless system – the only system on the market capable of providing short circuit capability without the need for an additional permanent magnet generator at the rear.

Mr Webb concluded: "It was important that we had an efficient and reliable alternator for the job. The support vehicle covered a lot of miles. The Olympic Torch Relay was a key event in the run-up to the games and we were very pleased that with the help of Leroy-Somer we were able to support it in this way.

# The new revolution in ELECTRIC MOTORS

The permanent magnet motor tells the story of a

revolution for which Leroy-Somer is responsible. A technological development that has been subjected to every possible test: simulations, design studies and performance testing, and has established itself as the reference energy-efficient product.

## An original patented technology

The main distinguishing feature of the permanent magnet motor is that the magnetic field is concentrated on the field poles and the special shape of the magnets results in very efficient locking due to centrifugal force. This structure avoids the demagnetisation problems associated with high-temperature polymerisation, as no glue or shrink disc is used. It therefore simplifies the manufacturing process.

Leroy-Somer has registered a number of patents and created a series of models. The key feature, calculating the induction in the air gap, required the use of a sophisticated thermal model due to the impact of temperature not only on the motor materials but in particular on the performance of the permanent magnets.

## Significant optimisation

On this basis, the motor has been optimised in a number of different ways. As a result, Leroy-Somer's teams have managed to increase the torque by up to 32% for an identical amount of raw material without adversely affecting the initial efficiency. Another advantage is that a smaller drive is needed to obtain the required power (improved power factor), opening up the possibility of further energy savings.

Following other studies designed to maximise the torque and efficiency for a fixed quantity of raw materials, the 8-pole rotor/72-slot stator combination has been determined to be the most suitable.

## A necessary compromise

From a conceptual point of view, progress is still possible but carries a cost. Is the market capable of absorbing these costs given the additional savings? This is a pivotal question for a manufacturer like Leroy-Somer who needs to find the right balance between cost and performance. The price, efficiency, compact size, and weight are without doubt essential factors in competitiveness.

"Leroy-Somer's teams have managed to increase the torque by up to 32% for an identical amount of raw material without adversely affecting the initial efficiency."

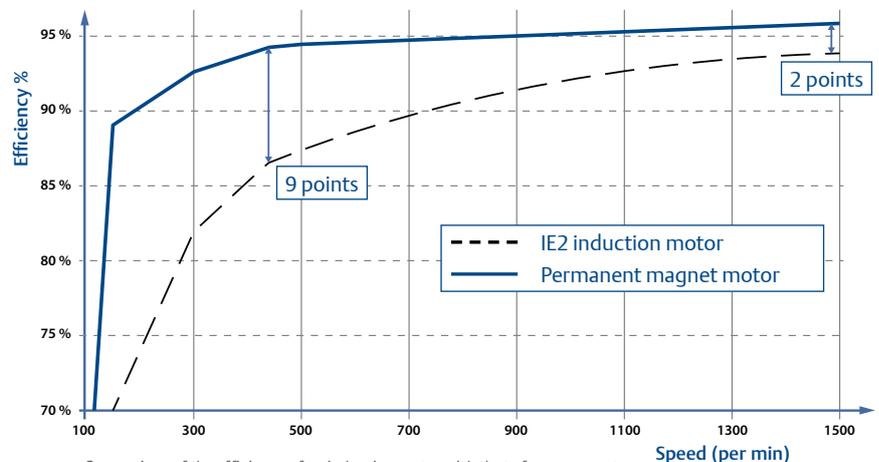
## After the design studies, the practical tests

Data needs to be collected in the field to confirm these corroborating design studies. Following exhaustive tests, it has been established that the permanent magnet motor offers, depending on the speed, an increase in efficiency from two to nine points compared with the IE2 asynchro-

solutions which vary in terms of operating characteristics and market trends.

In addition to better efficiency, the permanent magnet motor offers advantages such as compact size, reduced weight, and even drive size. All these improvements can help create a compressor chassis which is simpler and takes up less space.

For other applications such as air compressors and onboard equipment for vehicles and boats, the specific output power may be the overriding criterion. In this type of application, permanent magnet motors lead to significantly smaller dimensions compared with using asynchronous motors.



Comparison of the efficiency of an induction motor with that of a permanent magnet motor at different loads (55 kW motors).

nous motor (see diagram). This increase is mainly due to the minimal losses in the rotor whereas for an induction motor, the rotor losses represent 20 to 25% of the total losses.

## Numerous applications

For some markets, such as the refrigeration market, energy costs represent much of the cost of the finished product. In this context, improving electricity consumption represents a key issue, the answer to which may come in the form of technological

Finally, the remarkable performance of permanent magnet motors helps shorten the payback period for the majority of applications.

The many companies worldwide who use the Dyneo® range of permanent magnet motors attest to the success achieved with this technology.



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