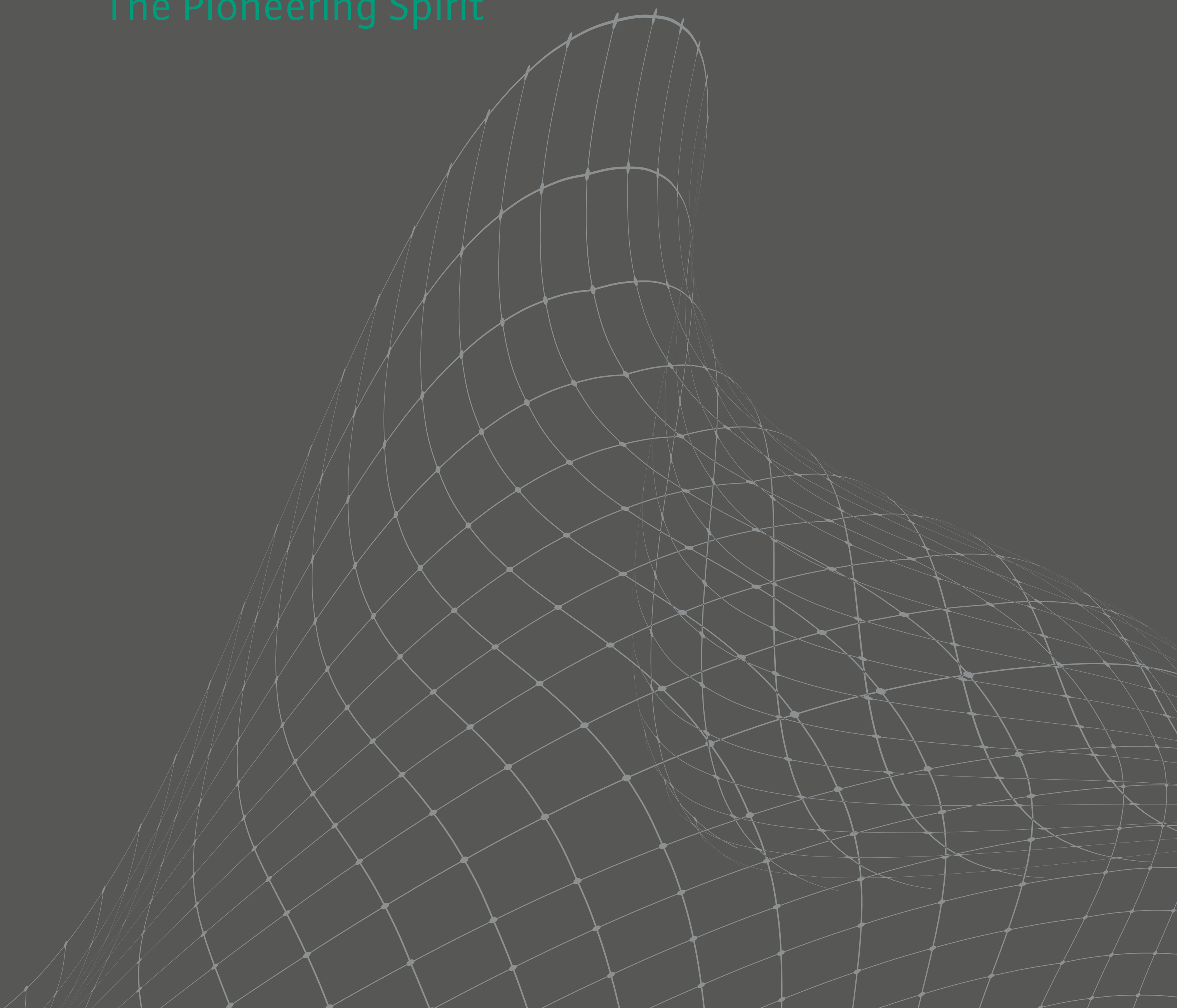
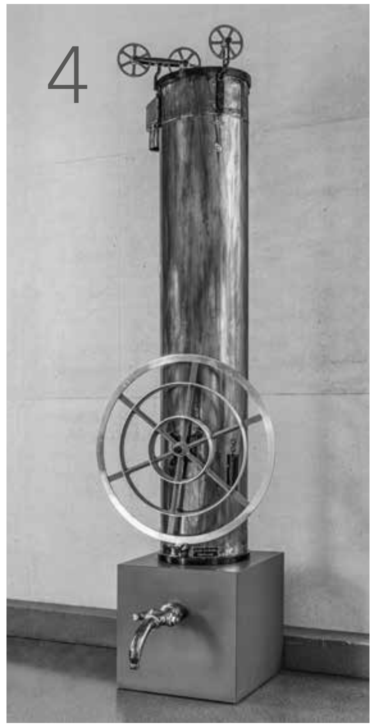
Loving Traditions.
Living Innovations.

The Pioneering Spirit



150 years of Wilo

Engineering ingenuity and inventiveness have been the drivers of Wilo's success for 150 years. Customer satisfaction is our most valuable currency. To enable us to meet our customers' needs, technological development at Wilo is geared towards the basic principles of reliability, efficiency, comfort and resource conservation. Building on these principles, Wilo's products, systems and services set global standards.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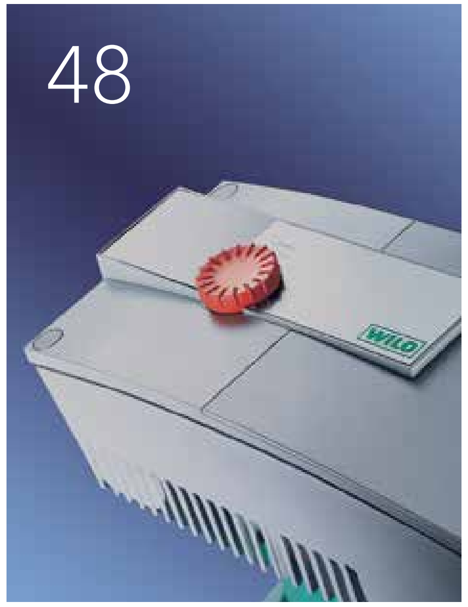
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The first years

The barrel volume measuring device, invented in 1908.

1872–1909

The first years

Ingenuity with a strong technical foundation, a sense for market opportunities, spirits and beer – these were the ingredients of the early success of the copper and brass factory "Kupfer- und Messingwaren-Fabrik Louis Opländer".

Caspar Ludwig Opländer had his professional roots in trade. He was a trained master coppersmith and had already gained a great deal of experience with building distillation apparatuses when he founded "Kupfer- und Messingwaren-Fabrik Louis Opländer" in Dortmund in 1872. There was a large market for these apparatuses at that time, as everyone who wanted to was still allowed to distil their own spirits. Many of his first customers were local farmers.

These were soon joined by breweries. Back then, beer was still tapped fresh without carbon dioxide, was extremely popular and Germany enjoyed great international success in this sector: In the 1890s, Germany replaced England as the global market leader for beer, and German breweries generated more sales than hard coal extraction and the iron and steel industry around the turn of the century. The first patent for which Caspar Ludwig Opländer applied was entered under "dispensing systems" in 1884 and was a precursor to the modern-day beer tap.

The demand for distillation apparatuses dwindled when the tax on spirits was introduced in the German Reich in 1887, but Opländer had already started to diversify the company. The economy was booming at that time, and the Ruhr region was experiencing rapid growth, which was accompanied by an increase in the number of homes. In the course of this development, the water supply was changed over from domestic wells to pipe networks that now conducted fresh water into the homes directly via water taps. The long inlet and drain pipes required for this purpose were exactly what Caspar Ludwig Opländer produced.

The company founder died in 1891 at the age of just 46. His widow, Wilhelmine Opländer, was determined to keep going. She took over the company together with her eldest son, Louis, who was only 18 at the time. Fortunately, he turned out to be a natural engineer, and on top of that, he had a good instinct for new markets.

Caspar Ludwig Opländer

Better heating

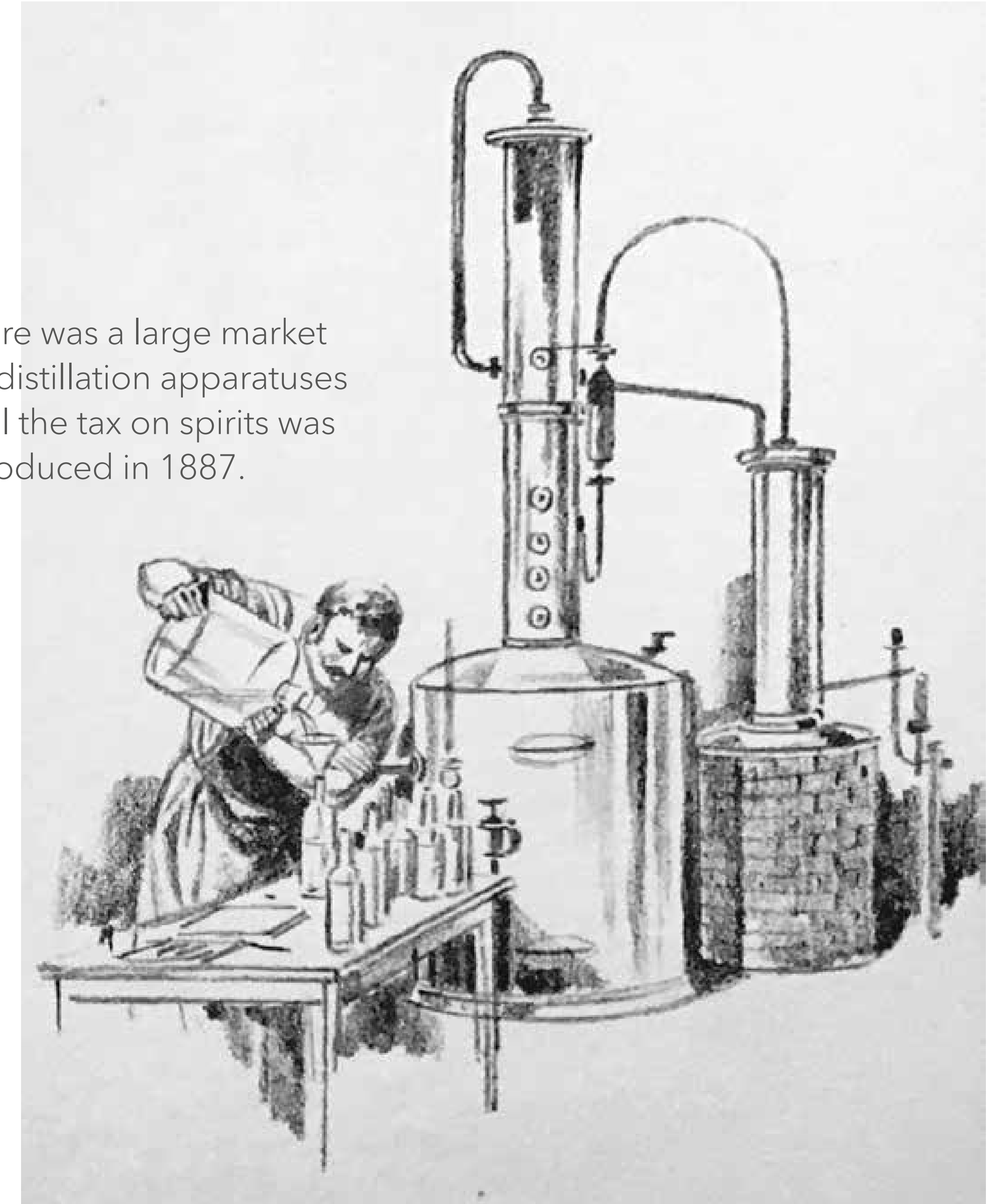
The triumph of central heating coincided with the start of young Louis Opländer's productive period. Individual heating in the form of coal furnaces was still dominant then. Starting in the mid-1890s, more and more components that were needed for a central heating system – boilers, pipes and radiators in particular – were produced industrially. This made them both more affordable and more available.

Together with loyal and experienced employees, young Louis Opländer set out to refine the central heating system. In 1899, he applied for a patent for a draught regulator in which the draught limiter and bleed air control device form a structural unit. He developed a steam heater. The new construction was a sight to behold: Steam was generated in a boiler and then spread out in the radiators, where it gave off heat. Once it had returned to water, it was drained off into the sewer system, provided there was one. However, this first and simple technical solution did not satisfy the pioneers of central heating for very long. Shortly afterwards, they developed single-pipe steam heating. With this system, the condensation water was no longer lost, but flowed back into the same pipe in which the steam from the boiler rose at the same time. But this solution was not ideal either, and the twin-pipe steam heater was designed shortly afterwards. Here, the condensation water had its own return pipe and no longer flowed opposite to the steam.

Various other improvements were developed in addition, especially ones for better regulating the temperature – or rather ones with which the developers hoped to better regulate the temperature. Temperature control for steam heaters was not quite as accurate as intended yet. This did not change until the hot-water heating system was introduced in 1905 and gradually replaced steam heating. Under normal circumstances, steam is not generated below a temperature of 100 degrees Celsius. Water, however, could be heated at will and run through piping and radiators at the desired temperature. Another advantage was that the pipes of the hot-water heating system did not corrode as quickly as those in the steam heating system.

Louis Opländer opened up a further field of activity with sanitary facilities for steel workers and miners. The boom of these two industries in the Ruhr region had created a large market for these sanitary systems. These included group lavatories, for which Opländer invented an automatic flushing device. The pithead baths, which were shared showering facilities for miners, were even more important. Up to 5,000 coal miners emerged from the shaft simultaneously at the end of a shift and wanted to get washed. This required a sufficient amount of hot water, roughly 100 litres at 40 degrees per person. The waste heat from the pits was often used to heat the water. Opländer made further use of this waste heat and built sophisticated heating systems that also

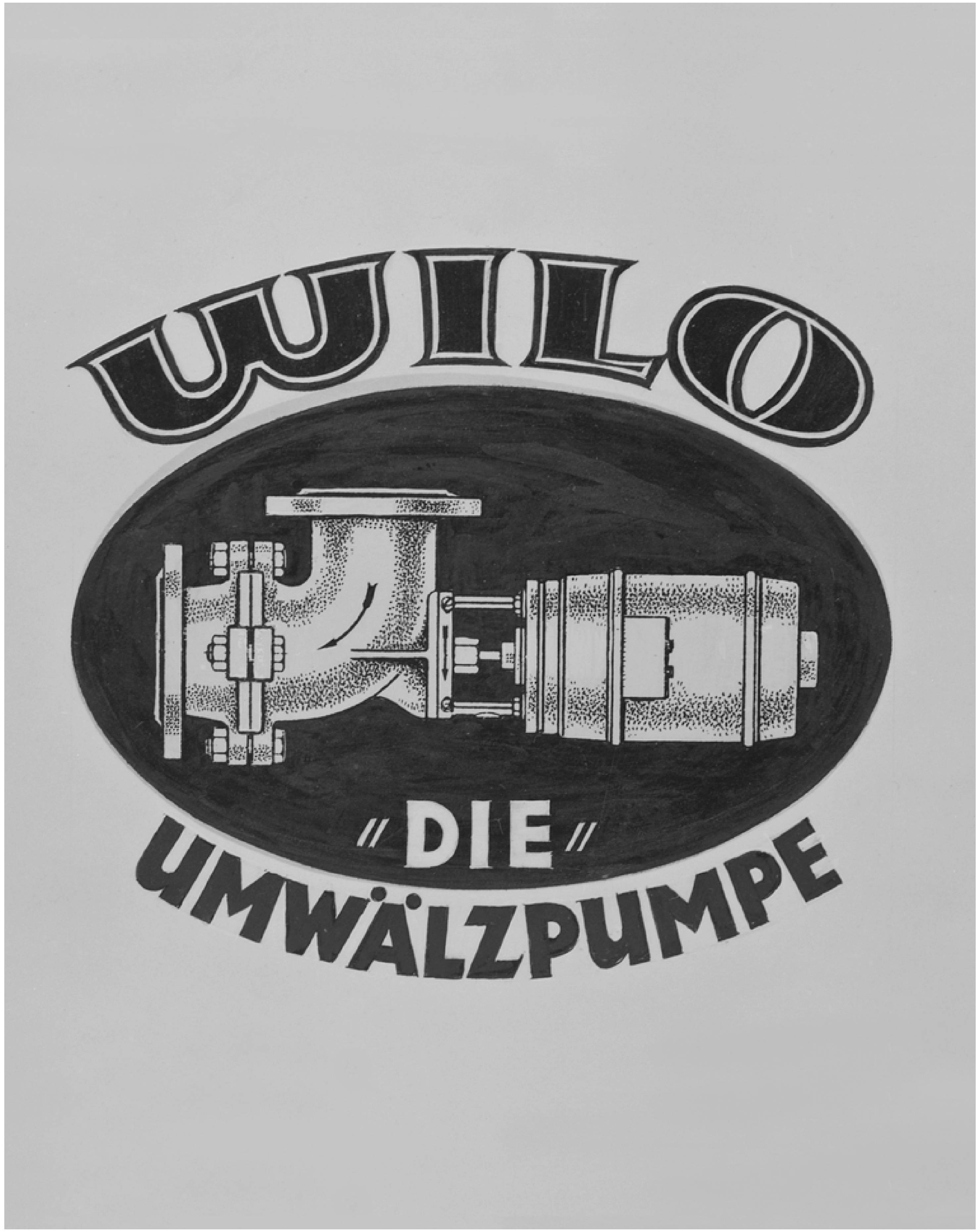
There was a large market for distillation apparatuses until the tax on spirits was introduced in 1887.



used the waste steam to heat office and administration buildings, shaft buildings, refining plants, workshops and other buildings.

The barrel volume measuring device was another good example of Opländer's engineering ingenuity. The weights and measures act was introduced in Germany in 1908. From then on, all barrels had to be provided with a content specification and bear a gauger's stamp. In order to determine the content, Opländer designed barrel volume measuring devices that evolved into an important source of revenue for the company and even enjoyed a second heyday after the Second World war. These devices could determine the content of a barrel down to the tenth of a litre irrespective of the temperature of the liquid. "Kupfer- und Messingwaren-Fabrik Louis Opländer" had a broad technical portfolio at the beginning of the 20th century. Inspired by his ingenuity and as an exceptionally talented engineer, Louis Opländer had diversified the business. The company built pithead baths, calibrators, vacuum cleaners, clothes hoists, sprinkler systems, washout points for locomotives and along the way, Opländer had also invented air filters and intake silencers for automobiles. But there was one area that was becoming increasingly important: heating systems.

1910–1948
Pump pioneers



1910–1948

Pump pioneers

Driven by the goal to improve people's quality of life, Louis and Wilhelm Opländer tackled one of the key technical challenges of heating systems and solved it. They invented the circulation accelerator, revolutionised heating systems and laid the foundation stone for the pump business of Wilo.

Heating and ventilation technology experienced a huge upswing at the beginning of the 20th century. Even before the First World War, Opländer used his expertise to carry out a number of major contracts in this field, for example for the head office of Hoesch in Dortmund, which opened in 1914. After the war, the production of technically sophisticated heating and ventilation systems for large buildings such as schools and hospitals became the company's most important business area. Typical representative projects included the Westfalenhalle in Dortmund, which was opened in 1925 and featured the technical finesse of being able to adjust the temperatures in the different rooms individually.

However, the war and the subsequent difficult economic circumstances created cost pressure that led the company to save material. For example, pipes with smaller cross-sections were installed in an effort to use less metal. This turned into a problem for the heating systems that worked according to the principle of gravity. They heated the water at the bottom, i.e. in the cellar, from where it rose up to the rooms to be heated, cooled off and flowed back down when it was cold. This required very large pipes. With smaller pipes, the frictional resistance of the pipes increased up to the point at which the system came to a standstill.

Louis Opländer

Early advertisement for the circulation accelerator

In need of a solution

As an engineer, Louis Opländer's goal was always to achieve the greatest possible benefit when using technology. He had a particular interest in people's quality of life. His work was driven by a desire to improve well-being and hygiene. People's living conditions played a special part in this endeavour. In contrast to the USA, for example, the predominant form of heating in 1920s Germany was the unhealthy coal-fired stove. At least the business with heating systems for residential buildings and the middle class had evolved increasingly after the First World War, and enormous progress had been made as compared to the time before the war. However, Louis Opländer was convinced that the triumph of central heating in private homes was yet to come. This opinion was contrary to wide sections of the heating sector that relied mainly on large scale industry. He was proved right.

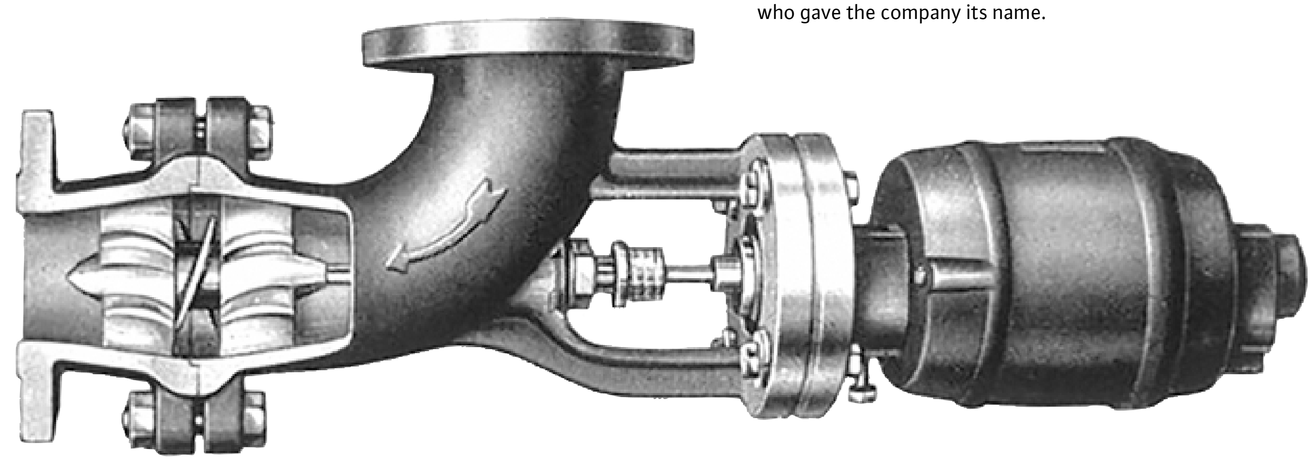
Inertia remained

The evolution from the steam heating to the hot-water heating system did not happen abruptly. It took years for the advantages of hot-water heating systems to ultimately prevail. But one challenge remained in the form of the inertia caused by the large quantity of water in the gravity system. In addition to the Opländer company, scientists were also searching for a solution to this problem.

At the "XI. Kongreß für Heizung und Lüftung" (11th heating and ventilation congress) in Berlin in 1924, Dr Melchior Wirtz gave a lecture on the topic of "accelerated circulation". Wirtz was a distinguished private lecturer whose scientific focus was on the physics of heating systems. He would certainly have discussed the problem of accelerated circulation with Louis Opländer. Another company had built an axial pump as a circulation accelerator, but its crucial disadvantage was that the pump was powered by a water jet that acted on a Pelton wheel. Since the costs for water increased even more than the circulation speed in the system, this solution was not economical.

This was the state of development when Wilhelm Opländer joined his father's company in 1926. Father and son worked together to tackle the challenge of developing a functional, economical circulation accelerator – a pump. They had realised that this required electricity, the cost of which had become reasonably affordable in the meantime. The pump was to be as small and light as possible in order to install it in existing pipe networks. The Opländers identified the pipe elbow as a suitable installation location. And so they welded on the first prototypes in this location and conducted trials with pumps that were operated by electric motors. In 1928, Wilhelm Opländer finally succeeded in developing the circulation accelerator. One year later, he was granted a patent on a "circulation accelerator consisting of a propeller in the lines of a hot-water heating system".

This invention was a milestone for heating technology and the birth of Wilo. The pump simultaneously increased the level of comfort and reduced material consumption, as considerably smaller pipe cross-sections could now be used. It opened up entirely new possibilities in heating systems. However, these possibilities were hardly used in the beginning.



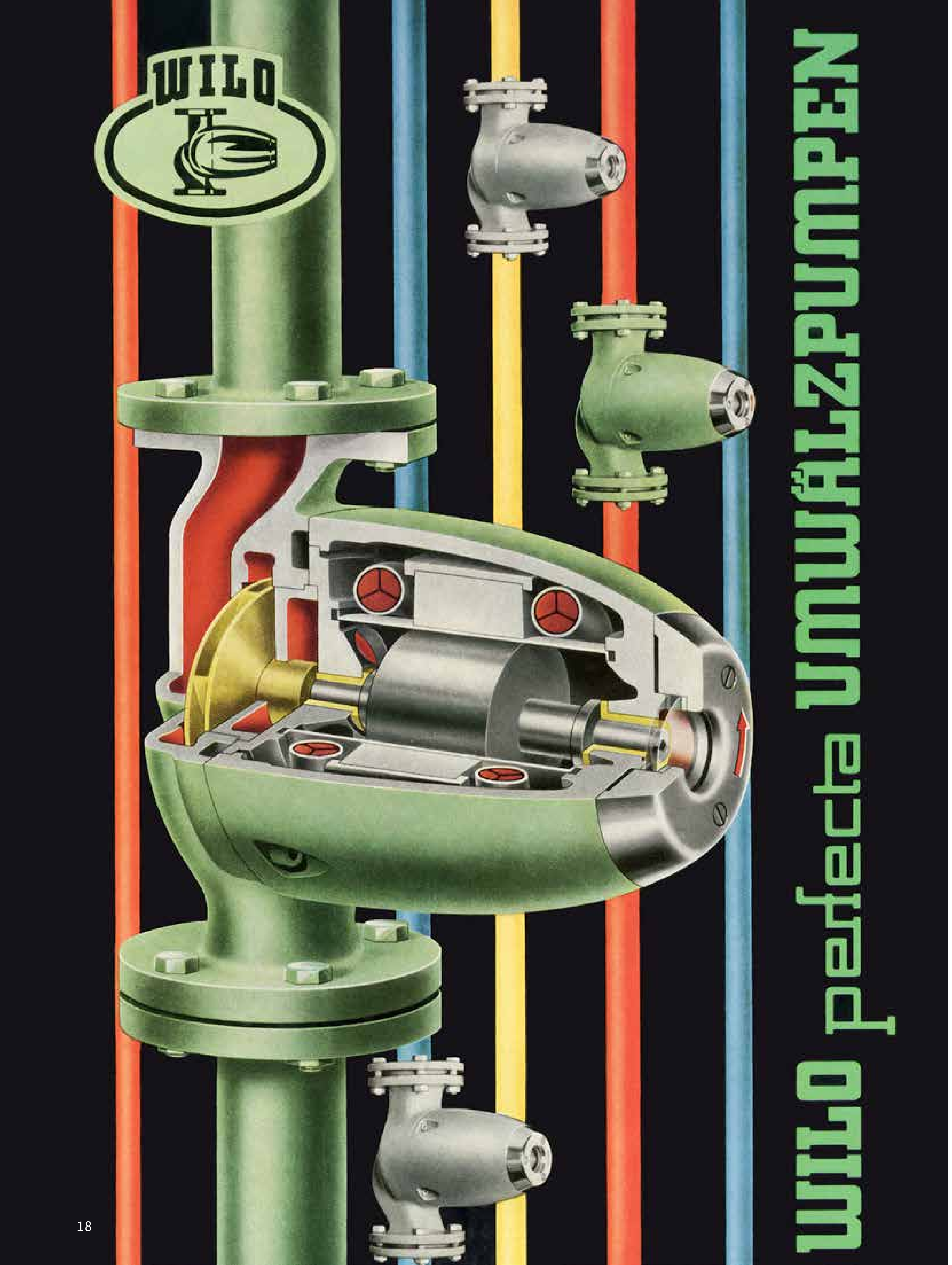
A milestone for heating technology and the birth of Wilo: the circulation accelerator was invented in 1928 by Wilhelm Opländer, who gave the company its name.

The breakthrough was imminent

Following the Great Depression, during which the Opländer family also had to fight for the survival of their business, little was being built, and money was more than tight. This was exacerbated by a widespread mistrust in innovations. What if there was a power failure and the pump could no longer work? Would this cause damage to the entire system? As a result, the heating systems were still designed in such a way that they could also function according to the principle of gravity at first.

Nevertheless, by 1934, there were already eight different types of the "Wilo pump" that were operated with either three-phase current, alternating current or direct current. The simplest model, the S25, weighed 12 kilogrammes, the motor had a power consumption of 33 watts, and the pump could move up to 300 litres of water per hour. The most powerful pump, the N 156, with the pressure of a 100 centimetre water column, weighed 70 kilogrammes and was able to transport up to 45,000 litres of water per hour with its output of 900 watts. Despite the variety of models, only around 400 pumps had been installed at this time. But the breakthrough was imminent. The reservations about the new technology decreased with every year that it functioned reliably and efficiently. Great efficiency, smooth running, very low power consumption for the time and therefore minimum operating costs, easy installation – it was a revolution. Not a revolution that came overnight, but one that required some time. Soon, the company was no longer selling hundreds, but thousands, of "Wilo pumps".

1949–1956
Everything is Perfecta



1949–1956

Everything is Perfecta

It was a revolution on the heating market and a milestone for the company: The Wilo-Perfecta heralded the era of glandless pumps in 1953 and became a cornerstone of Wilo's success for decades to come.

Since the invention of the circulation accelerator in 1928, Wilo had focused increasingly and with great success on the production of pumps in addition to building heating systems. In an effort to make the new development on the heating market even more efficient and reliable, Louis and Wilhelm Opländer had worked tirelessly on improvements and technical innovations. For although the circulation accelerator was a pioneering piece of technology, it did have some minor disadvantages.
The circulation accelerator was equipped with a stuffing box whose bearing had to be lubricated with oil and therefore required a great deal of maintenance. While the circulation accelerator was relatively quiet thanks to the oil lubrication, the dry-running electric motor still generated noise. In addition, the stuffing box was not hermetically sealed, as a result of which the system lost water that had to be refilled frequently.

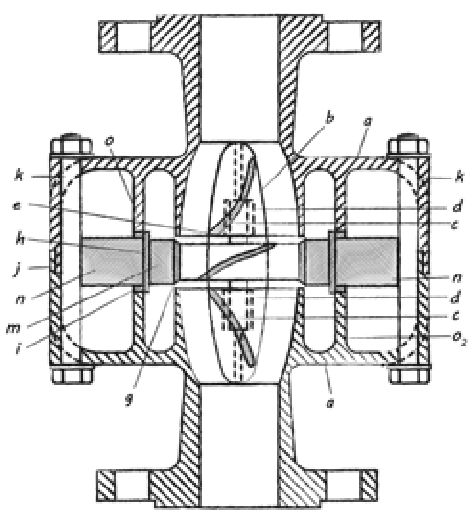
The patent of 1949

Louis Opländer had already been considering designing an electric motor with a water-lubricated rotor since the 1930s in order to alleviate the disadvantages described above. There were a number of drafts for a glandless pump (in contrast to the glanded pump) where the engine was to be lubricated not with oil, but with the water that was present anyway.
Over the coming years, Wilhelm Opländer used these ideas as a basis for his own deliberations. In his patent from 1949, he described a first water-based circulation accelerator with a glandless motor. What makes this design special is that the rotor of the motor is located and moves in the water to be conveyed.
The rotor chamber is separated from the current-carrying part of the motor (stator) by a watertight can. The wet and dry chambers are separated by an extremely thin wall measuring just a few tenths of a millimetre –

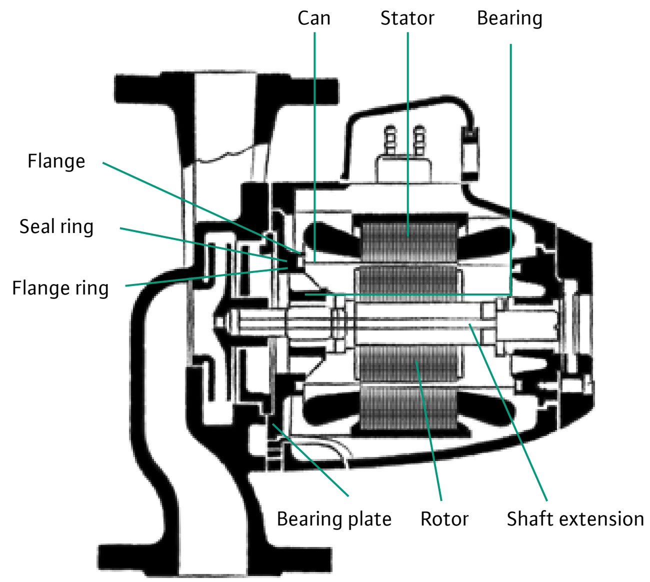
1949 Circulation accelerator with glandless pump

Patent DE 807589 A, 19 March 1949
Wilhelm Opländer
Water circulation accelerator for heating and cooling systems. Issue of patent **DE 807589 C, 19 April 1951**

Patent claims:
1. Electrically operated circulation accelerator to be installed in the piping, especially in heating systems in which a propeller arm moves the water, characterised by the fact that the drive motor (m, n) is installed in the piping itself in such a way that the motor armature (m) surrounds the propeller arm (f) in the form of a ring and circulates in the water with it while the stator (n) of the motor is installed in a chamber that is sealed off from the water.



Wilhelm Opländer

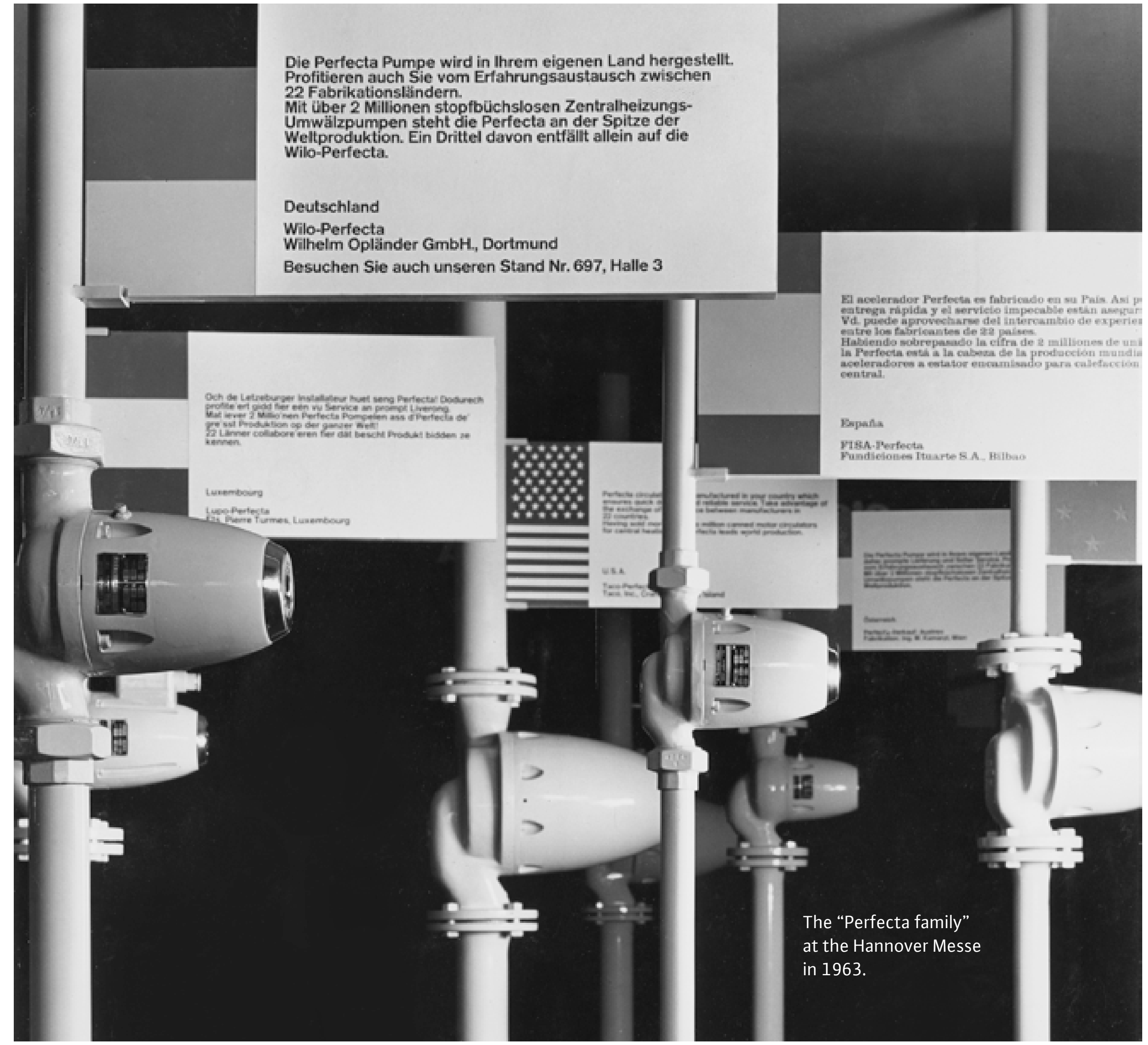


Cross-section of the Wilo-Perfecta: without stuffing box, with gauge glass motor.

an idea that has been used since the introduction of the Wilo-Perfecta in 1953 and is still used successfully in pump production today. While a thin metal foil was used at the beginning, plastic is the material used for this sophisticated technology today. This reduces eddy-current losses and increases the efficiency of the pump considerably.
The development of the glandless pump was a milestone, and not only for the Dortmund-based company. Its basic functional principle is still relevant for heating technology all over Europe and many countries of the world today.

The Rütschi license

During the first years after the war, the demand for heating systems for newly built homes increased dramatically. It took a great deal of effort to ramp up production and satisfy the market need despite the lack of materials.
While tackling these challenges, Wilhelm Opländer worked on refining the glandless pump technology protected by his patent. He found a partner in Switzerland who was able to contribute his expertise.
While Europe was fighting a war between 1939 and 1945, neutral Switzerland had made some technical advancements. Dr Karl Rütschi from pump manufacturer Pumpenbau Brugg had already introduced a similar idea for a maintenance-free heating pump without a stuffing box in his home country. It was a small, yet powerful, pump that required no maintenance after installation because it was lubricated by the heating water to be conveyed.



The "Perfecta family" at the Hannover Messe in 1963.

Furthermore, it was very quiet and experienced hardly any difficulties with signs of wear. Wilhelm Opländer saw its potential and, as in earlier years, the company demonstrated an instinct for the needs of times to come.

Wilo-Perfecta – the first glandless circulator

In 1952, the company run by Louis and Wilhelm Opländer split into two independent branches: heating company Louis Opländer and pump manufacturer Wilo. That same year, Wilhelm Opländer took over the license from Dr Karl Rütschi for his maintenance-free circulation pump without a stuffing box. In combination with Opländer's own technical solutions, the company was now on the cutting edge of technology. As a licensee, Wilo was the only company in Germany permitted to produce and sell this innovative glandless technology. While Wilo had acquired the expertise from Rütschi, it was by no means a matter of just putting together finished parts. In addition, the pump had been introduced in Switzerland only shortly before, and there was hardly any practical experience. The company had to gain that in Germany itself.
Prior to starting production for the German heating market, Opländer needed a further partner for the production of the complicated and fragile motor part. This innovative, pioneering heating circulator required a canned motor that was little known in Germany and had to be separated by an extremely thin wall measuring just 0.1 to 0.3 millimetres. To produce the canned

The gauge glass was the trademark of the Wilo-Perfecta. It was installed on the motor side of the pump and provided a very easy way to monitor operation and the direction of rotation.

motor, Wilo had teamed up with Bauknecht, who were experienced with these types of motors.
The pump part with the housing, impeller and cover plate was the least of their worries. The can, however, which had to hermetically separate the rotor running in the water from the stator in order to keep it dry, was a challenge.
Despite the challenging design, Bauknecht had developed five motor types with differing performances after just six months. In the meantime, Wilhelm Opländer and his employees had completed the pump housings so that the first Wilo-Perfecta was ready to be built at the beginning of 1953. The introduction of this series heralded the end of the circulation accelerator that had been patented in 1929.

The gauge glass

Wilo had already demonstrated its customer friendliness with its maintenance and service offers for many decades. The gauge glass of the Perfecta pump was a further milestone on this path. As the company's trademark, it was installed on the motor side of the pump.
This interesting unique feature made the circulator particularly attractive, and not just visually. The gauge glass also provided a very easy way to monitor operation and the direction of rotation. It could be removed during operation for the purpose of cleaning or checking the ease of movement of the pump shaft without draining the system.

Closed system

Customers were sceptical at first and had reservations about the new heating circulator technology. They preferred to trust in Wilo's tried and tested circulation accelerator. They even had trouble saying goodbye to the predominant hot-air and gravity heaters.
The introduction of oil heating since the beginning of

As in earlier years, the company demonstrated an instinct for the needs of times to come.

the 1950s finally encouraged trust in the pump-powered hot-water heating system and the innovative glandless technology of the Wilo-Perfecta. The reliability of this innovative heating technology had been demonstrated in practice in the meantime. The hot-air and gravity heaters were increasingly replaced by modern hot-water central heaters.
Around the same time, the transition from open to closed heating systems was being promoted, and pressure distribution in the heating system was becoming more efficient. The expansion tank that had been common in open heating systems until then was replaced with what was known as a membrane expansion tank in a closed system.
This enabled a massive reduction of the disadvantages of open systems, such as the high level of oxygen entry followed by corrosion of the piping and signs of wear on the pump, as well as the maintenance required for refilling the water.

The start of a new era

From the mid-1950s onward, Wilo generated its greatest sales with the more-efficient circulators. At the same time, reservations about the modern hot-water heating system were decreasing, and central heating systems with hot-air or gravity circulation were gradually becoming less important.
The improved agitation force – in contrast to the uplift and downforce movement of the water in the hot-air and gravity heaters – allowed a great deal of energy to be saved thanks to lower temperatures.
The small apparatus received the IF Design Award for its innovative design in 1964.
Thanks to its being maintenance-free, the long service life, low-wearing operation and low noise level, the Wilo-Perfecta had enough advantages not only to shape Wilo's pump business for decades, but to function as the centrepiece of the heating system in millions of households.

1957–1979
Full speed ahead

1957–1979

Full speed ahead

The development of the Wilo-Perfecta was so successful that the demand increased continuously over the coming years. Production at the existing company building soon reached its limits. The decision was made to expand and construct a new building. To cope with the large demand, the new factory hall was equipped with a modern production line. The new factory hall, which was made of prefabricated sections, was opened in 1958.

Despite the major success, Wilo did not rest on its laurels. The company's engineers continued to tinker with contemporary improvements. Unfortunately, it occurred time and again that individual pumps did not function reliably. The can of the pump, which separated the rotating part of the motor running in the water from the stator, created many difficulties. Since the wall of the pipe was just a few tenths of a millimetre thick, it was very fragile, but still had to be extremely strong in order to withstand the high system pressure. In addition, it had to be non-rusting and anti-magnetic. The material of the gaskets between the can and the electric motor underwent continuous refinement as it had to withstand temperature fluctuations between 20 and 115 degrees Celsius. With its goal to create individual components of long-lasting and consistent quality, the company had once again demonstrated that quality assurance and perfection of the products was taken extremely seriously. After all, the patent from Rütschi alone did not guarantee success. Only in the context of practical application were the Wilo employees able to gain important insights on the pumps.

Modern factory with assembly line production

Meanwhile, production continued to run at full speed. The company's annex became too small once again after just a few years. However, there was no available space for a further new building on the factory prem-

New construction of the Wilo factory on Nortkirchenstraße in 1961.

ises on Hohe Straße. Instead, a new complex was built on a plot on Nortkirchenstraße in the Hörde district of Dortmund. The building was equipped with state-of-the-art standards and progressive assembly-line production. The equipment included an automatic paint spraying system and a separate packaging department. Louis Opländer did not see the implementation of his ultra-modern planning in 1963. He passed away on 18 May 1962 at the age of 90.

Development of large heating, ventilation and air-conditioning systems

Pump production set new records in the 1960s, since oil-fired heating and having your own bathroom had since become the standard for the affluent German society. Hot-water heating systems were installed not only in newly built homes, but also when old buildings were renovated. The production of heating systems was making good progress. Complete heating, ventilation and air conditioning systems were now being built all over the city. While the heating systems business area at Louis Opländer had become larger and more complex overall, it was now restricted to the catchment area of Dortmund, where the focus was now on improving the production and working methods.

On the other hand, this enabled the new developments of pump products to be tested and optimised on the company's own heating systems. The good understanding of the system gave rise to many important innovations that remain an integral part of pump technology to this day.

One key problem with the system, especially in heating supply units, but also in cooling and water-supply units, is providing not only the right quantity of water but also the appropriate pressure to ensure smooth operation of the system.

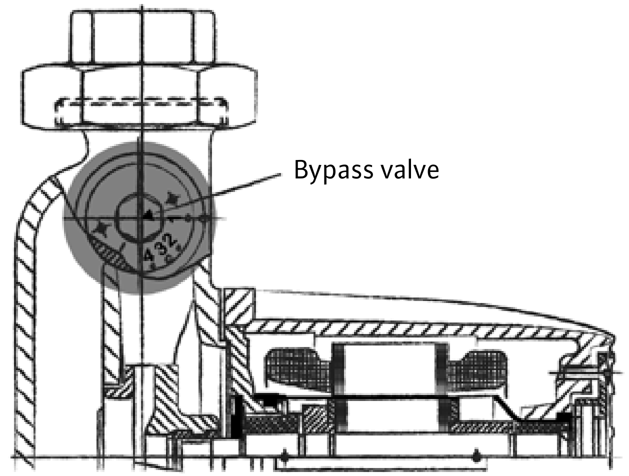
Too-little pump pressure leads to inadequate supply in the whole system or to individual consumers. Excessive pump pressure can cause annoying noises in the system. During the first years of modern hot-water heating technology in particular, the tendency went towards overdimensioning the system and therefore the pumps in line with the principle of "better too much than too little".

To this day, the company is concerning itself with the question of how a pump can be adjusted to optimum operating pressure, thereby ensuring optimum supply to the system on the one hand and not causing any noise on the other hand, while also requiring as little energy as possible.

Contemporary customer retention

The good understanding of the system was also always an important aspect with regard to successful customer retention. Even in the early years, Louis Opländer offered high-quality customer service including maintenance and service in addition to the construction of complete heating systems. Wilhelm Opländer even had his telephone number embossed on the pumps in the 1930s to ensure that customers could always reach him in the case of an emergency. This was, of course, no longer possible in light of the increasing pump sales in the 1960s. When Dr Jochen Opländer joined the management in 1963, he took on the task of finding new and contemporary means of sufficient customer retention.

The best possible customer service: Ever since the 1930s, Wilo embossed telephone numbers on its pumps so that customers did not have to search for the number in case of an emergency, but could call the company immediately.



A bypass for the pump

The development of a bypass valve was a further milestone on the path to the ideal pump. This differential pressure valve is installed in the heating circuit between the feed and return lines to ensure mechanical influence of the hydraulics. If, for example, the pressure of the moving water becomes too high, the bypass valve is activated to compensate the pressure. In the early days of central heating systems, the circulators were not yet adjusted optimally. At that time, the precise dimensioning of the heating system was still very time-consuming and costly. Oversized pumps were therefore used in many cases in order to ensure sufficient heat requirements. The unpleasant noises created by the delivery head were reduced considerably after the introduction of the bypass valve in 1968. Opening the new component lowered the delivery head in the heating system and reduced the noise. The delivery volume of the pump could be adjusted continuously to 0, depending on the user's needs. A low value was usually sufficient for ensuring the performance of the heating. In the event that the circulator did not transport enough hot water from the boiler to the radiators and the rooms did not reach the desired temperature, the delivery volume could be readjusted by setting the bypass valve to a higher value. This mechanical approach was also a good solution for reducing heating costs. Until then, the heating pumps did not only operate independently of the actual need, but even when the heating was not even in operation, which was unnecessary.

Limerick, Ireland: Start of series production of complete canned motors

In-house development and production of motors

In the 1970s, Wilo decided to produce motors in-house. The company conducted extensive research into hydrodynamics, mechanics, electrical control and control technology. Production planning and methods as well as quality control were expanded. A branch in Limerick, Ireland, was founded in 1979. Complete canned motors with outputs of 20 and 40 watts, including the stator and rotor motor components, were manufactured in-house. Starting to produce motors in-house was an important change to the company's course.

Dr Jochen Opländer

The more needs-based supply of the radiators by means of a bypass valve ensured the improved heat use of the rooms while also reducing the waste of resources. Since the bypass valve barely reduced the power consumption of the pump, this offered only a limited savings potential. Other solutions had to be developed in order to achieve an energy-efficient power adjustment. However, roughly another decade was to pass, during which Wilo initially concentrated on new business areas, before the multi-speed switch for the further optimisation of pump technology was introduced.

Twins: Dr Jochen Opländer was granted a patent for the twin pump on 13 November 1968.

Domestic hot water and swimming pool technology

In 1968, Wilo introduced a refined version of the heating circulators for use in domestic hot water systems and also established an entirely new department for swimming pool technology.
Using the heating circulator as a basis, Wilo designed a glandless pump for domestic hot water supply. This circulator is responsible for transporting the hot water to the extraction point such as the shower, washbasin or sink.
In order for the pump to generate a benefit here, it is necessary to build what is known as a circulation system for the domestic hot water. Similar to the heating system, this is a pipe ring that must be routed as closely as possible past the extraction points. The pump then circulates the (hot) drinking water stored in a reservoir in this circuit to ensure that hot water is available as closely – and therefore as quickly – as possible to the extraction points. This reduces water consumption while increasing comfort at the same time.
The pH-value of the water is an important parameter when it comes to selecting the piping and pump parts that come into contact with the water. Insufficient water hardness leads to corrosion in metallic conduit pipes and the mechanical components of the pump. Very hard water can cause lime scale in the pump's storage system and cause a blockage. The pH-value of drinking water lies in the neutral to slightly alkaline range between 7.0 and 8.5 pH. The developers at Wilo therefore had the task of finding optimum materials for this pH value in order to prevent the above types of damage.

Booth at the ISH in Frankfurt in 1971

Also in 1968, Wilo once again reacted with foresight to an emerging trend. Many affluent Germans now wanted to build a swimming pool for their newly constructed homes. With Wilo Swimming Pool Technology, the company established a new department that was adjusted to the people's needs. This department produced and sold high-performance filter systems for public and private swimming pools as well as accessories such as heaters, pool equipment, valves and water treatment products until 1996. Wilo insisted on continuing to work on innovative technology and developed a self-priming, low-noise swimming pool filter pump with a glandless motor in 1988. The novel unit featured a plastic pump housing with an integrated filter.

High-performance filter systems for swimming pools

Development tendencies for pump drives

Consistent-speed drives	< 1970
Multi-speed drives	1970–1980
Electronically controlled continuous drives	1980–1990
Communication-capable drives with diagnostic system	1900–2000
New energy-saving drives	> 2000

Pump type with consistent-speed drive

Pump type with multi-speed drive (min/max switch)

Pump type with manual multi-speed switch and interface for automatic mode

Communication-capable pump with connection to switchbox

Multi-speed switch with 4-stage switchgear for 3-phase glandless motors, automatically controlled via a time switch, e.g. for night setback or adjustment to heat requirements.

Multi-speed switch

As mentioned in the section on the bypass valve, this component was indeed able to decrease the pressure in the heating system and thereby reduce annoying noises, but it saved only a small amount of energy because power was needed to continuously pump the water. It was only the development of a two-stage electrical multi-speed switch for glandless motors in 1977 that replaced the manually adjustable hydraulic bypass valve and was accompanied by significant energy savings. The aim was once again to adjust the Wilo pump to the power requirement of the system in the best possible way and thereby also reduce noises. Furthermore, this solution was accompanied by energy savings and the possibility of adjustment to the heat requirements of the heating circuit. In the case of 3-phase motors, the switchover was performed either manually or automatically via a time switch. Variable speed control for glanded pumps with high motor outputs was first made possible by means of an electronic frequency converter at the beginning of the 1980s. Speed control had undergone development from mechanical to electric and all the way to an electronic application within the space of a few years.

1980–1995
Energised

1980–1995

Energised

A next crucial step on the way to the optimal and particularly energy-efficient pump was the refinement of electronic speed control.

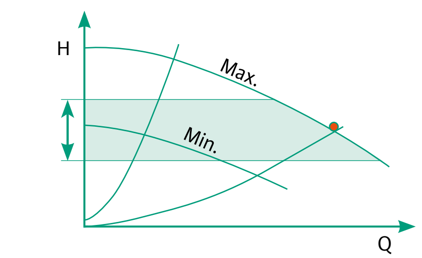
At the end of the 1970s, it became apparent that the mechanical and electric switchover of the motor speed reached its limits when there was a larger number of speed stages. A control system for 3-phase glandless motors was implemented as the first technological new development to explore electronic multi-speed switches and introduced under the name "AS-System" in 1982. In the case of this control system, the first step towards the development of variable speed control was taken by means of a phase angle. This refers to the quick angling of 220 and 380 volt AC voltage with 50 hertz. This is known as phase angle control and was initially implemented only for the AS08 electronic switchgear with a 3-phase glandless motor and for an output below 1.5 kilowatts.

Due to the higher efficiency and easier handling, the speed variations of "phased and continuous" increasingly prevailed on the market when it came to the power adjustment of circulators – especially in the low- and medium-performance range. This is a varied procedure that offers a high degree of flexibility. The performance parameters, i.e. volume flow, delivery head and performance, can be influenced immediately by changing the speed, as shown by the physical correlations below.

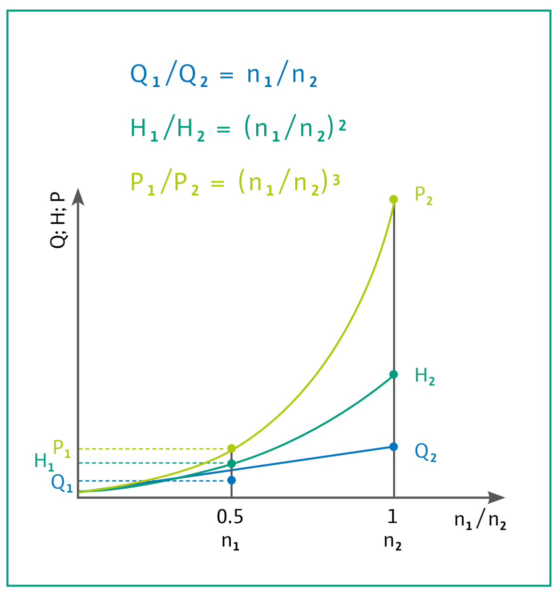
The development of the switchgear

Within the space of just a few years, the team of technicians designed ever-more sophisticated generations of switchgear – from the simple switch on and off function to the adjustment from two to four speed stages (from left to right).

AS08/1.5 µP system



Wilo's first electronic variable speed control for 3-phase glandless motors was already controlled by a microprocessor. The new technology helped reduce the speed by 30 to 40 per cent.



The performance refers to the hydraulic output (Q x H), i.e. the output of the pump. If the speed of the pump is cut in half, i.e. it operates at only 50 per cent:

- the flow is also reduced to 50 per cent,
- the delivery head is reduced to 25 per cent, i.e. one quarter,
- and the hydraulic output is reduced to 12.5 per cent and is thus eight times less.

These examples illustrate the high energy-saving potential of speed control. As illustrated by the diagram on the left, the hydraulic output of a pump was provided by three components:
the hydraulics of the pump (impeller and pump housing), the motor and the electronics. All three components have their own efficiency, and the overall efficiency is the product of the three individual efficiencies.

However, the energy efficiency of a pump is just one aspect that is always a point of focus for optimisation at Wilo. Ever since the company was founded, quality awareness has been the top priority. In order to achieve this goal, pioneering solutions and the leading technology of the respective era have been an inherent element of the company philosophy since the earliest days.

1988.
THE TURNING POINT

Wilo-Star, the world's first electronically controlled heating circulator, was introduced on the market in 1988.

Wilo-Star-E

The first step towards the electronic age was the development of the electronic multi-speed switch and the introduction of the AS control system at the beginning of the 1980s. However, one disadvantage of this electronic switchgear was the external switchbox that housed the control electronics. This led to additional expense during assembly and commissioning because the switchgear and any sensors had to be wired with the pump. In addition, there was a risk of making mistakes with the wiring. And so the developers searched for a solution where the control electronics are integrated in the pump, and no additional wiring is necessary.
Multiple technological challenges had to be resolved in the course of development:

- The electronics had to be small enough to fit into a housing on the pump. A frequency converter for a motor with roughly 4 kilowatts required as much space as a linen chest and also had to be cooled using oil. Since it was impossible to attach these electronics to a pump, Wilo initially concentrated on pumps with a much lower output. The miniaturisation of electronics had progressed far enough in the mid-1980s that the control and power electronics could be integrated in a housing on the pump.
- The electronics mustn't cause any additional noise. The insight gained from the AS08 electronic switchgear was that the phase angle control used for it was not entirely noise-free. In some systems, the humming noises could be transmitted throughout the entire building. The developers needed a solution that operated as quietly as possible.
- In order to control the pump in a sensible way, the hydraulic variables of the pump, differential pressure and/or volume flow had to be known. In order to regulate the differential pressure of a pump to a desired value, you need to know the differential pressure. It's similar to a car. If you want to drive 50 km/h in the city, you have to know the current speed of the vehicle in order to assess whether you are driving too fast or too slow. With the AS08 switchgear, this task was solved by means of an external differential pressure sensor. However, it was expensive and also had to be wired on-site.

After conducting extensive research and overcoming the last difficulties, Wilo succeeded in developing a continuous pump with fully electronic control in 1987. Wilo-Star-E*, the world's first electronically controlled heating circulator, was introduced on the market in 1988. Thanks to the electronic control, this innovation in pump technology offers not only greater convenience, but also energy savings of up to 50 per cent.

* At this time, the series name was given before the company name, e.g. Star-Wilo.

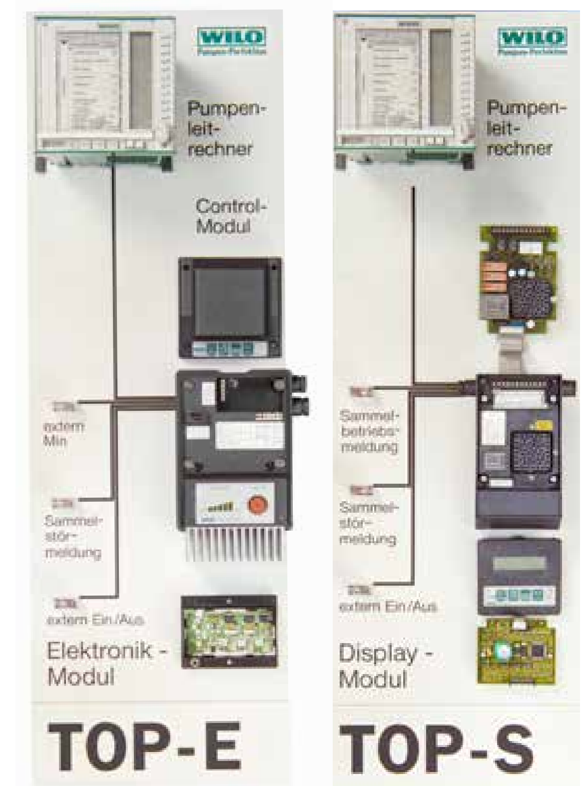
The electronic control technology for Wilo pumps was refined continuously. An entire series of pumps with differing motor outputs was available on the market.

Wilo-TOP-S and TOP-E

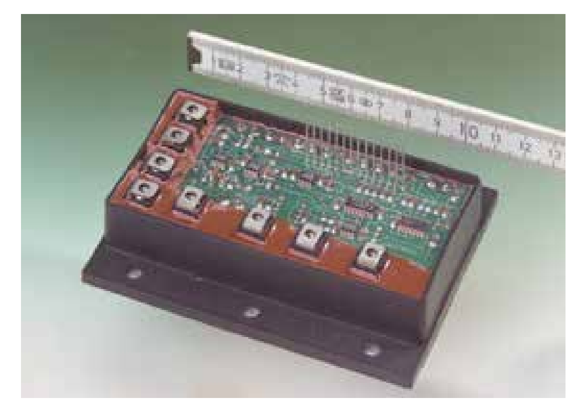
Following the successful introduction of the Wilo-Star-E, the focus was immediately shifted to refining it. The Wilo-Star-E is an electronically controlled pump with a relatively low output. It is installed in single- and two-family houses. The aim was to expand the pump's performance spectrum for use in multi-family houses, office buildings, universities, schools or hospitals. With the introduction of in-house motor development and production, the foundations for a flexible modular pump and motor concept had been established. Building up in-house motor expertise created an excellent understanding of the physical and technical details of the motors, which was an important basis for developing electronically controlled pumps. The modular concept allowed a broad range of pumps with a motor output of between roughly 100 and 1,500 watts to be developed, including the Wilo-TOP-S and TOP-E.

Electronics

A plug-in interface for the motor connection was designed for the modular concept. In addition, Wilo used displays for the first time on the Wilo-TOP-S. The corresponding module could be plugged directly into the module on the pump and was used to display operating and diagnostic messages of the Wilo-TOP-S.
The electronic control of the Wilo-TOP-E series with the slightly higher outputs as from 500 watts, on the other hand, required a new performance electronics technology. A frequency converter was developed for this purpose. The great development of heat inside the electronics was also a particular challenge in the development of performance electronics modules. Active and passive cooling concepts therefore had to be developed right from the start to protect the electronics from overheating.



Wilo-TOP-E: pump for outputs as from 500 watts (top left).
Look at the electronics and heat sink (bottom left).



Power semiconductor module of a micro frequency converter (partially open)

Further development steps for electronically controlled pumps were taken in the direction of communications technology. The pumps were increasingly equipped with extensive communications and diagnostics capabilities. This allowed the pumps to be connected to various communication and monitoring devices. A variety of communication standards had become established in building services in the meantime, so that the task was to find a solution for communicating with as many of these devices as possible. This task was solved with what are known as IF modules (interface modules) in the Wilo-TOP-E and IP-E series.
In the field of diagnostics, the Wilo-TOP-E 25, which was introduced in the mid-nineties, was able to detect and display various warning and error conditions.
The design of the Wilo-TOP-E series comprised multiple outstanding and innovative solutions:

- The first operating concept with a display and single-button operation: “turn and push”.
- An infrared monitor that could operate and diagnose the pump from a distance of a few metres. This was an advantage with pumps that were difficult to access, and in addition, the information that could be displayed on the IR-Monitor extended far beyond the (limited) display on the pump.
- The introduction of an interface module, as mentioned above.

The electronics area had undergone rapid development since the 1980s. From the first electronic control of the multi-speed switch to the world’s first fully electronic heating circulator, the Wilo-Star-E, a continuous refinement of various pumps and pump parts had taken place and improved the quality and efficiency in the company’s electronics department. Meanwhile, Wilo had also advanced its geographical expansion. Following the first subsidiaries and associated companies in Belgium, the Netherlands, Greece, Switzerland and Ireland, Austria, France, Italy, the UK and Sweden had been added since 1980.


Display and rotor button

IR-Monitor


IF module

Presentation of the extensive portfolio of high-pressure centrifugal pumps at the ISH in Frankfurt in 1997


Rainwater utilisation system RWN 1100

Competence centre for cold water pump systems

A new Wilo factory equipped with state-of-the-art technology was opened in Oschersleben in 1995. Self-controlling work groups produced in accordance with innovative working methods and with flexible working hours depending on the demand. In addition, the production building could be adapted for various types of use.
The factory in Oschersleben was expanded into a competence centre for cold-water pump systems. The range of products included switchgear, systems for rainwater utilisation, fire-extinguishing systems and pressure-boosting systems for the drinking water supply in buildings, waterworks, industry and trade.


Pressure-boosting system with switchgear, Wilo-CO-System

1995.
THE WINNER

The first three-blade, low-speed, high-efficiency mixer came from Hof in 1995.

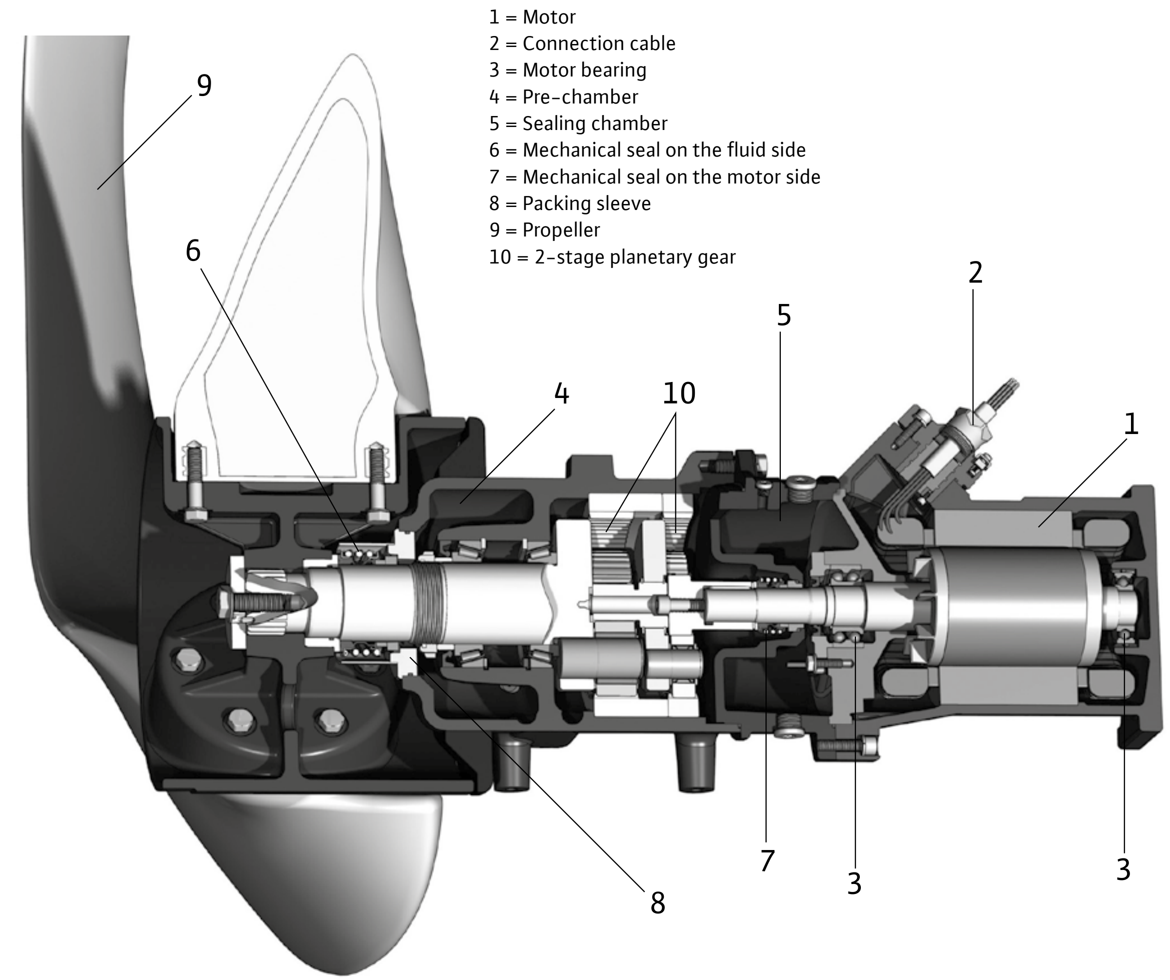
In the context of the biological treatment process, the task of Wilo submersible mixers is to provide optimum support with the microbiological processes.

Acquisition of EMU Unterwasserpumpen GmbH
In 2003, Wilo acquired EMU Unterwasserpumpen GmbH in Hof and EMU Anlagenbau GmbH in Roth and expanded its activities in sewage treatment technology and – in an effort to expand its pump portfolio – in the field of water supply and sewage disposal.

Wilo-EMU TRE
Given the growing demand for sustainable and resource-conserving solutions in water and sewage management in the 1980s and 90s, Wilo once again saw an opportunity to distinguish itself in another area with future-oriented ideas and as a reliable specialist. Various pumps and apparatuses for sewage disposal were developed, for example the TP pump series. The Wilo-EMU TRE*, the first three-blade, low-speed submersible mixer, was introduced on the market in 1995.

In the context of the biological treatment process of sewage, the task of submersible mixers is to provide optimum support with the microbiological processes. In the Wilo-EMU TRE, a low-speed propeller creates the necessary consistent current in the basin to keep the sewage sludge moving continuously and preventing deposits from forming at the bottom of the basin. Aeration is required in order to maintain the biological processes. The airflow acts like a wall. Good interaction

*Current model name



between aeration and the mixing process is needed for the sludge to be distributed evenly in the sewage collection basin even in the case of unfavourable inflow conditions.
The energy required per cubic metre of sludge moved in the basin is minimised through the use of a highly efficient asynchronous motor, a very efficient gear and balanced hydraulics in these special machines. Optimum dimensioning is extremely important here. Wilo introduced a dimensioning software to calculate the perfect number and position of the individual mixers in the basin as well as further important functions.

Given that mixers are in continuous operation, it was important to us to keep the required maintenance to a minimum and guarantee a long service life. To do this, we identified various technical solutions:

- The motor and gear housings were made from cast iron with a specially patented Ceram coating designed to hinder corrosion caused by the constant contact between the submersible mixer and the water.
- The geometry of the plastic blades was designed such that they were energy efficient on the one hand but could also prevent clogging, that is the accumulation of fibrous material that sticks together in the sewage and forms strands that clog the mixer, thanks to their shape. In addition, smaller elements from the clarifier could not adhere to the blades so easily.
- Clogging was also to be prevented by switching the mixer on and off in a targeted manner.
- The mixers could also be delivered with a lowering device made of stainless steel that allowed the mixer to be lowered and lifted quickly and easily for maintenance purposes.

1996–2009
More than efficient

1996–2009

More than efficient

The company's engineers first considered rethinking the principle of the motor technology used so far in the mid-1990s.

Controlling the pumps electronically did indeed enable a considerable savings potential of roughly 40 to 50 per cent as compared to uncontrolled pumps. Many lucrative development steps had been achieved in this way. However, the accomplishment of further extensive energy savings required a fundamental change of the motors.
The key to this was to change the motor technology from asynchronous motors to electronically commutated direct-current motors, which are often also referred to as brushless direct-current motors.

Automobile pump in BMWs

Multiple technological steps towards testing the new motor technology had taken place since the beginning of the 1990s. Another seven years went by before the world's first high-efficiency pump for heating, air conditioning and cooling applications, the Wilo-Stratos, was equipped with perfect technology and was introduced on the market in 2001.
After the first innovative development steps on the way to more efficient motor technology had been taken, a new field of application opened up in 1995. At the same time, Wilo had been working on an electronically controlled coolant pump with a PM canned motor and integrated electronics.

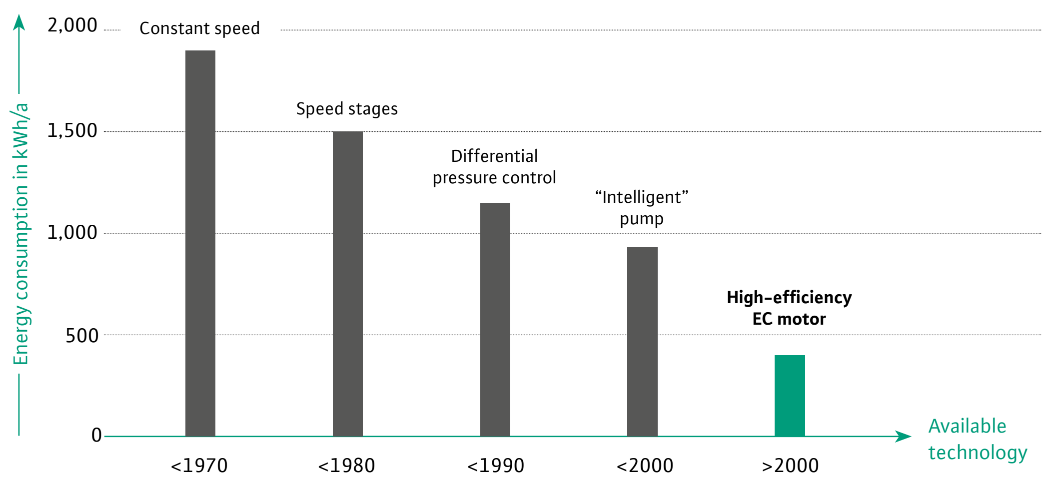
The idea had arisen because the first prototypes for pumps with a low-voltage winding had been designed with 24 volts. While all pumps with asynchronous motors required a mains voltage of 230 volts or 400 volts to operate, entirely different fields of application opened up for this new design. The task and idea was now to develop a pump with an electronically commutated direct-current motor for a car battery voltage of 12 volts. This idea was advanced thanks to a cooperation with Mercedes. The first prototype was developed in 1996.
In 1997, BMW asked Wilo and six renowned automotive suppliers, including Bosch and Siemens, to participate in a concept competition for a coolant pump. Once again, Wilo was able to demonstrate its technical excellence, and although the company had no experience as an automotive supplier, Wilo won the competition.
In 1997, the first prototype with integrated electronics

Cooling water pumps without a shaft seal for BMW six-cylinder engines; motor technology: PM can, electronically controlled, 160 watts, 12 volts.

on a ceramic substrate (hybrid) for cooling a car engine was presented at BMW, and a patent application was filed. This prototype resembled the coolant pumps later produced in series by Pierburg very closely.
In 1998, Wilo received the order from BMW to develop the coolant pump. Using a Wilo glandless pump instead of the mechanical coolant pump used otherwise could save between 0.3 and 0.6 litres of petrol per 100 kilometres.

In 2000, Wilo sold the development of the project "electronically controlled coolant pump" with PM canned motor and integrated electronics to Pierburg GmbH. This newly developed pump that Wilo had transferred from the heating to the automotive field was used as standard in the automotive industry for cooling a six-cylinder engine for the first time in 2004.

Energy consumption of heating pumps with various technologies



Pumps with asynchronous motor optimised to the maximum

2001. A QUANTUM LEAP

The world's first high-efficiency pump for heating, air-conditioning and cooling applications from Wilo was presented in 2001. The "Wilo-Stratos" consumed up to 80% less electricity than uncontrolled circulators. When the European energy label for heating pumps was introduced in 2005, this pump series was the reference for energy efficiency class A.

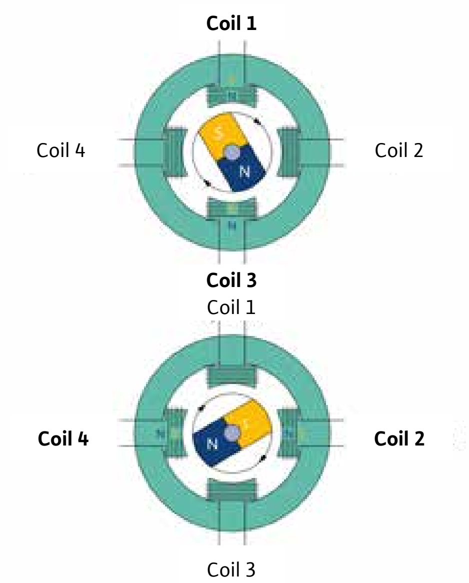
Highly efficient Wilo-Stratos

After the broad development of prototypes and the first samples for BMW, the technology of the Wilo-Stratos, the first high-efficiency pump for heating, air conditioning and cooling applications, was developed before the pump was introduced on the market in 2001. Key technological ideas, for example the arrangement of the copper coils in the stator, were taken over from this concept. However, the technology of the coolant motor, which was designed for 12 volts, had to be refined for operation with 230 volts or 400 volts.

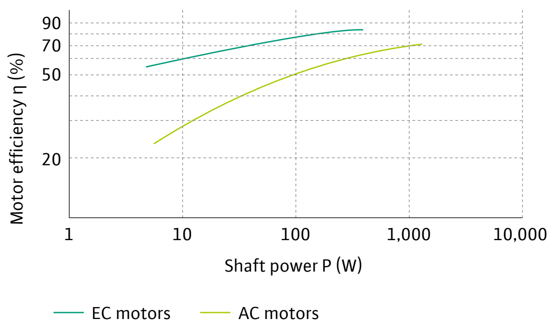
High-efficiency motors

The operating principle of an electronically commutated direct-current motor is fundamentally different from that of an asynchronous machine. The now-common term EC motor is derived from the English description: electronically commutated motor. While an asynchronous machine can be operated directly on a single-phase or three-phase alternating current network, the operation of a brushless direct-current motor requires control electronics.
The rotor of the brushless direct-current motor consists of a magnet. This magnet can be rotated by generating an external magnetic field that matches the alignment of the magnet and lets it rotate around the rotor. To achieve this, copper coils that can be energised individually are installed in the stator. A copper coil with a current flowing through it also generates a magnetic field. By making sure that the copper coils are energised one after the other in a certain direction of

Operating principle of an electronically commutated direct-current motor
Since the brushless electronically commutated synchronous motor is equipped with a permanent magnet motor, it does not require any energy for the magnetisation. The torque is generated through the alternating power supply to the split pair coils in the stator, which is known as "electronic commutation". The actuating electronics determine the position of the rotor and therefore the rotor speed either via sensors or by analysing the induced voltage or phase displacement, thereby enabling continuous control of the motor.



Comparison of the efficiency of asynchronous and EC motors for glandless pumps



The lower the motor output (shaft power, x axis), the greater the efficiency advantage of the EC motor. Example of a pump for a single-family house: A 20-watt EC motor is twice as efficient as a 20-watt asynchronous motor.

rotation, a magnetic field that rotates around the rotor is generated. This magnetic field pulls the rotor along and causes it to rotate.
The targeted energisation of the copper coils that generate the revolving magnetic field in the stator is promoted by means of an electronic control, which is known as the commutation electronics. The major energy advantage of the EC motor results from the permanent magnet motor. In contrast to other motors, these magnets do not require any energy for magnetisation.
The idea of the Wilo engineers to use EC motors for pumps was driven by the following superior properties of this motor:
- considerably greater energy efficiency than asynchronous motors due to lower power consumption
- greater power density, i.e. a more compact design (a motor with the same output is smaller)

From a technological perspective, the idea to use EC motors for pumps involved a number of challenges that had to be solved gradually over the course of multi-year technological development. These included:

Achieving minimum power consumption of the pump in real-life operation
A compromise had to be found in order to achieve the highest possible efficiency and compactness while keeping the noise and load levels acceptable. Following extensive analyses and development steps, Wilo specified a maximum speed of 4,500–5,000 rpm (revolutions per minute) for most glandless EC drives. Entirely new hydraulics concepts with 3D impellers in both the radial and axial directions were designed for the high speeds. This new shape of the impeller presented a particular challenge for the production technology, in this case plastic die-casting. The design of the can (the component that separates the wet-running rotor from the dry stator) was also changed. A hybrid plastic can was now used instead of stainless steel in an effort to prevent eddy-current losses of more than 10 per cent and achieve greater compressive strength.

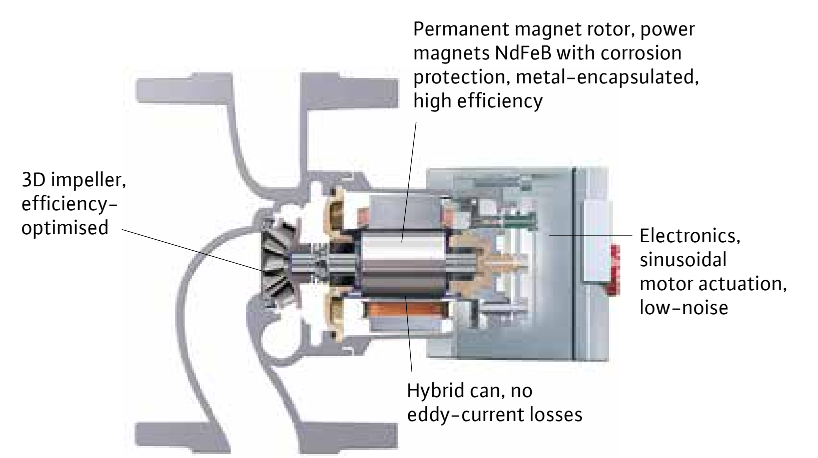
Ensuring low-noise operation at the level of the quiet asynchronous drives
The noises of the EC motor that are inherent to their principle of operation constituted a key challenge in the development of glandless pumps. The permanent magnet motor is rotated by a rotating magnetic field in the stator. The fact that the magnetic field surrounding the rotor is not entirely homogeneous creates what is known as detent torque during the rotation. This detent torque is clearly noticeable as commutation noise. The pitch of the noise is correlated with the speed. The higher the speed, the higher the sound/noises created. The Wilo engineers implemented many different measures to optimise the noises of the EC machines and make this pump as quiet as its predecessors. This was achieved, for example, by a specific design of the stator windings, the yoke ring and the sophisticated sensorless sinusoidal actuation of the commutation electronics.

Ensuring the high reliability and quality standards of a Wilo pump
At the outset of development, it was entirely unclear whether pumps with EC motors could meet the quality requirements that are so important to Wilo. Until the Stratos was introduced on the market in 2001, EC motors were used only in dry-running designs, for example in fans, CD players, copying machines or other dry-running applications. By conducting extensive simulations, laboratory tests, service-life tests and field tests, all critical elements were checked and approved one after the other.

The first high-efficiency pump for heating, air-conditioning and cooling applications, the Wilo-Stratos, was an important milestone for the company. Using a high-efficiency direct-current motor allows it to achieve pioneering levels of efficiency and offer a huge power saving potential of up to 80 per cent as compared to uncontrolled heating pumps. The term "high efficiency" was unknown prior to the market introduction of the Wilo-Stratos in 2001. Thanks to the outstanding technology and a successful marketing campaign, Wilo shaped this now-common generic term for extremely efficient pumps.
The greatest possible performance is achieved by using the smallest amount of energy possible. This conserves resources and protects the environment in the long term. Back in 2005, Wilo voluntarily introduced the energy label of the European Ecodesign Directive (ErP directive). This binding law led to the ultimate breakthrough of the Wilo-Stratos on the market in 2013.

Display with "red-button technology" that can be adjusted independently of the location

Continuously modular bus concept



Some prominent technological steps can be seen in the cross-section of the Wilo-Stratos

Universal possible applications in heating, cooling and air-conditioning systems from −10 °C to +110 °C

2001.
THE PIONEER

The Wilo-EMU FA with an HC motor was equipped with the world's first submersible sewage motor with a hermetically sealed cooling system in 2001.

The areas of application of the EMU FA include pumping wastewater, sewage with faeces and pre-treated sewage.

Submersible sewage pump Wilo-EMU FA

Since the 1980s, the requirements for efficient and environmentally conscious solutions for wastewater and sewage technology had also increased. Water shortage and a growing demand for fresh water in the urban areas had caused a considerable rise in demand.
With its highly efficient submersible mixer, Wilo had developed a powerful apparatus for treating sewage and sludge in 1995. A few years later, in 2001, the Wilo-EMU FA with an HC motor was introduced on the market – the world's first submersible sewage motor with a hermetically sealed cooling system. In this case, the coolant is impelled by an impeller that is driven via a magnetic coupling. This material is structured such that the drive torque of the driver is transmitted synchronously and asynchronously, which ensures the permanent drive of the cooling impeller. The Wilo-EMU FA demonstrates its strengths in the context of pumping sewage. The risk of clogging increases due to the increasing occurrence of solid and fibrous material in the water. This results in an elevated risk of malfunction. In extreme cases, this also means higher servicing costs for the operator. Wilo introduced the solution to the market in 2009: the low-clogging impeller technology called SOLID (Safe Operation Logic Impeller Design). It was developed specially for untreated sewage and is highly efficient. Equipped with this impeller technology, Wilo-EMU FA pumps ensure greater operational reliability while reducing the operating costs at the same time. Thanks to the great bandwidth of different motorisations and hydraulics, the Wilo-EMU FA series offers the performance-based solution for any requirement, including with regard to consistency. For the purpose of pumping abrasive or corrosive fluids, the standard 2K coating of the pump can be replaced with the Wilo-Ceram coating. It displays excellent adhesion and is extremely resistant to aggressive fluids thanks to the aluminium oxide elements.

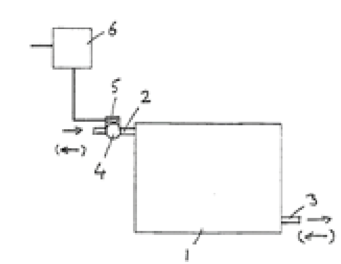
The development of very small yet powerful and reliable miniature pumps that are no bigger than a conventional thermostatic valve was a crucial technological leap on the path to "Geniax".

Decentralised pump system Wilo-Geniax

The topics of sustainability and conserving resources played an increasingly important role in the company, including in the field of heating technology. While Wilo had focused on making the technology of the heating pump even more efficient and energy-saving by way of various possibilities in the past, the company now took an entirely new approach and revolutionised heating technology with the world's first decentralised pump system, the Wilo-Geniax, in 2009.
The conventional supply-oriented heating was replaced by a demand-oriented heating system that used a decentralised heating pump, the Wilo-Geniax. Instead of thermostatic valves, multiple miniature pumps are used on the heating surfaces or heating circuits. The speed of these miniature pumps is controlled by a central server, and they supply the radiator with exactly the amount of heat required in each room. Water is pumped only when heat is really needed, and the heating system remains in energy-efficient optimum condition at all times.

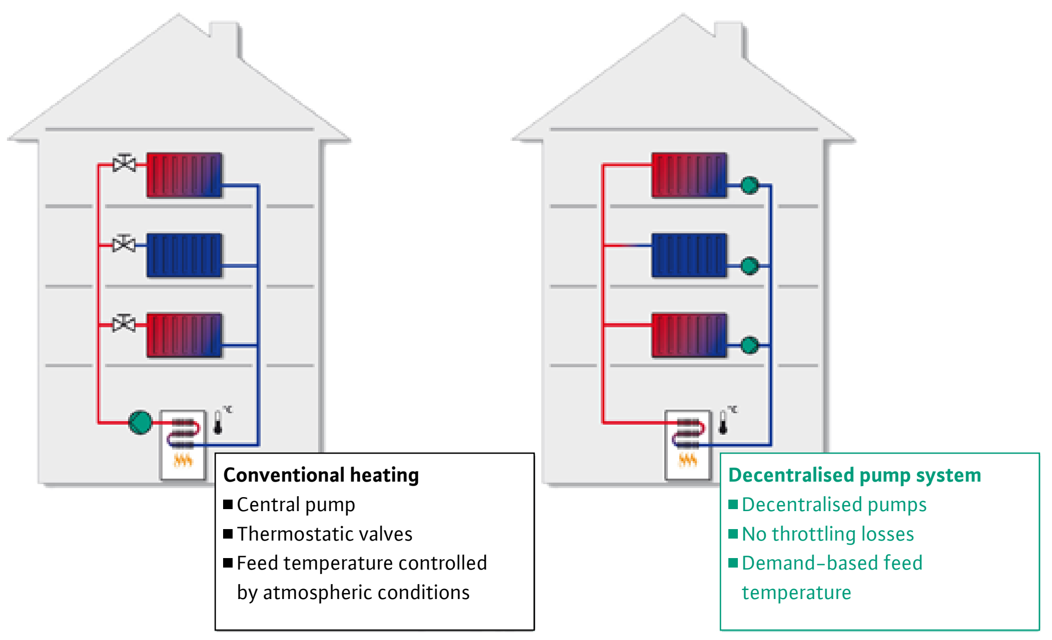
From supply-oriented to demand-oriented heating

In 1997, a small Wilo team had started to address the question of how the principle of the hot-water heating system could be fundamentally changed. The members of the team were bothered by the fact that the boiler constantly provides heat and the pump constantly provides pressure in the heating system, irrespective of the actual need. In times of a growing demand for greater sustainability, the fact that the central pump permanently provides differential pressure and volume flow that is then reduced or prevented entirely by thermostatic valves in particular was met with scepticism.
The question arose as to whether it would be possible to design a system in which the thermostatic valves that regulate the temperature in the rooms could be replaced with small pumps. The pumps were then to control the temperature in the rooms and pump just as much water as necessary, so that there would be no more losses caused by throttling the thermostatic valves. A further aspect of this sustainable and resource-conserving method was to operate the boiler in such a way that it provides only as much heat as the building needs.



From the patent application "pump in hot-water circuit of a central heating system" (1 – radiator, 2 – inflow, 3 – run-out, 4 – motor centrifugal pump, 5 – display, 6 – central computer)

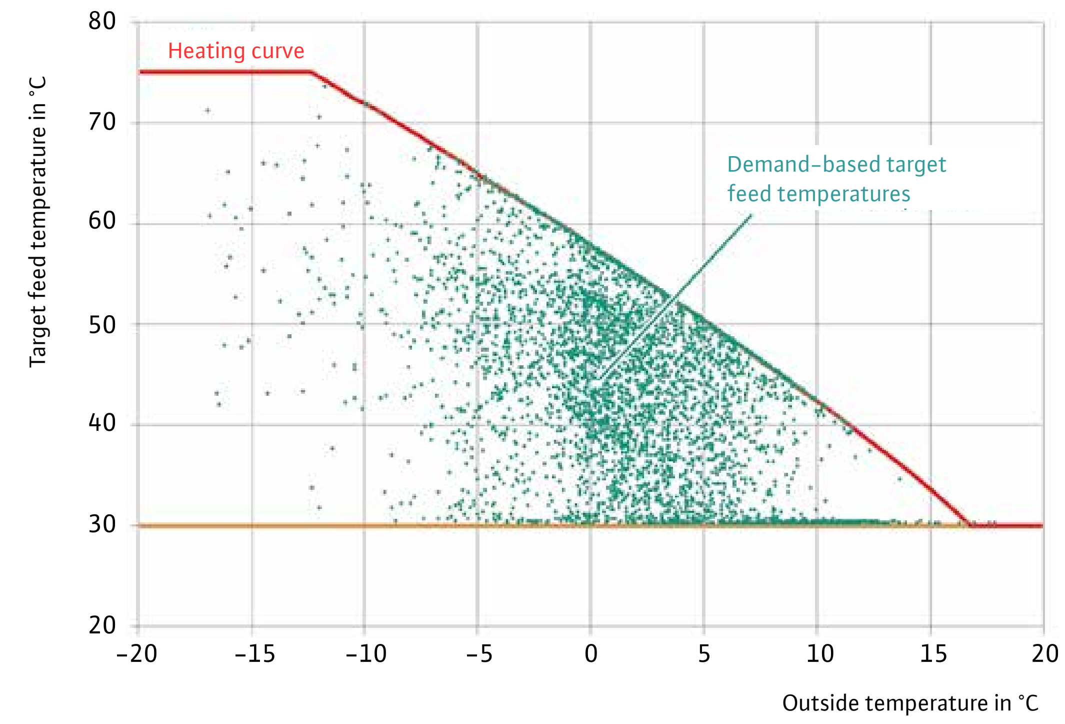
The transition from supply-oriented to demand-oriented



“Geniax” is a technical revolution in the field of heating technology. The conventional supply-oriented heating with a central heating pump was replaced by a demand-oriented heating system. It pumps water only when heat is needed.

This requirement was solved by means of a demand-based feed temperature. Until then, the boiler was controlled depending on the outside temperature. This involved measuring the outside temperature and then selecting and providing a feed temperature that “matched” the outside temperature. However, practical experience showed that indoor heat sources (people, electrical devices, etc.) or outdoor heat sources (such as sunlight, more or less wind) had a dynamic effect.
The outside temperature-based control cannot take these random and unforeseeable heat sources into account. As a result, this type of heating control always provides as much heat as would be needed in the worst case.
For example, at an outside temperature of minus 10 degrees, there may indeed be periods during which a feed temperature of 20 degrees would be entirely sufficient as opposed to the 70 degrees used before. This can be due to a low demand, for example during the night, or additional heat sources such as those mentioned above.
With this sustainable new idea of demand-based feed-temperature control, the heating requirement in each room of the building is measured, and a feed temperature to suit this need is determined. This prevents the unnecessary waste of heating energy.

A patent for the ingenious basic idea of the decentralised Wilo-Geniax pump system was filed in 1997 (DE 19711178). The Wilo-Geniax was one of the award winners in the category “environment and energy” distinguished by the “Deutschland – Land der Ideen” (Germany – the land of ideas) initiative at the ISH 2009, the world’s foremost trade fair for water and HVAC.



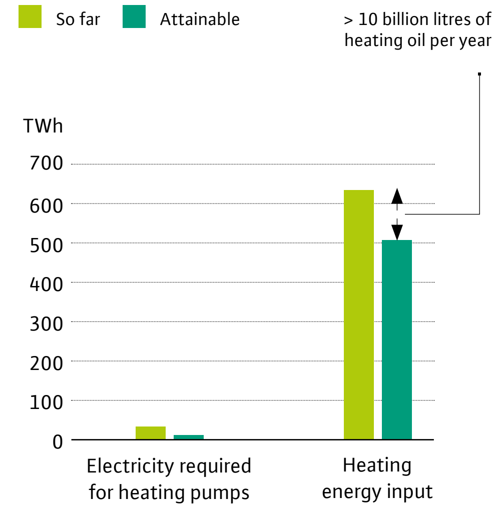
Comparison of conventional outside temperature-based control and demand-based feed temperature control – the considerably lower average feed temperatures help save significant amounts of energy.

This system transition from supply-oriented to demand-oriented heating resulted in the following key advantages:
- No more energy lost due to throttling.
- Needs-based hydraulic supply of the consumers and dynamic hydronic balancing are achieved in the partial-load range of the heating circuits as well.
- Dynamic control mode is enabled by the quick heating-up feature and precise room temperature control.
- Around 20 per cent of pump operation and heating energy is saved.

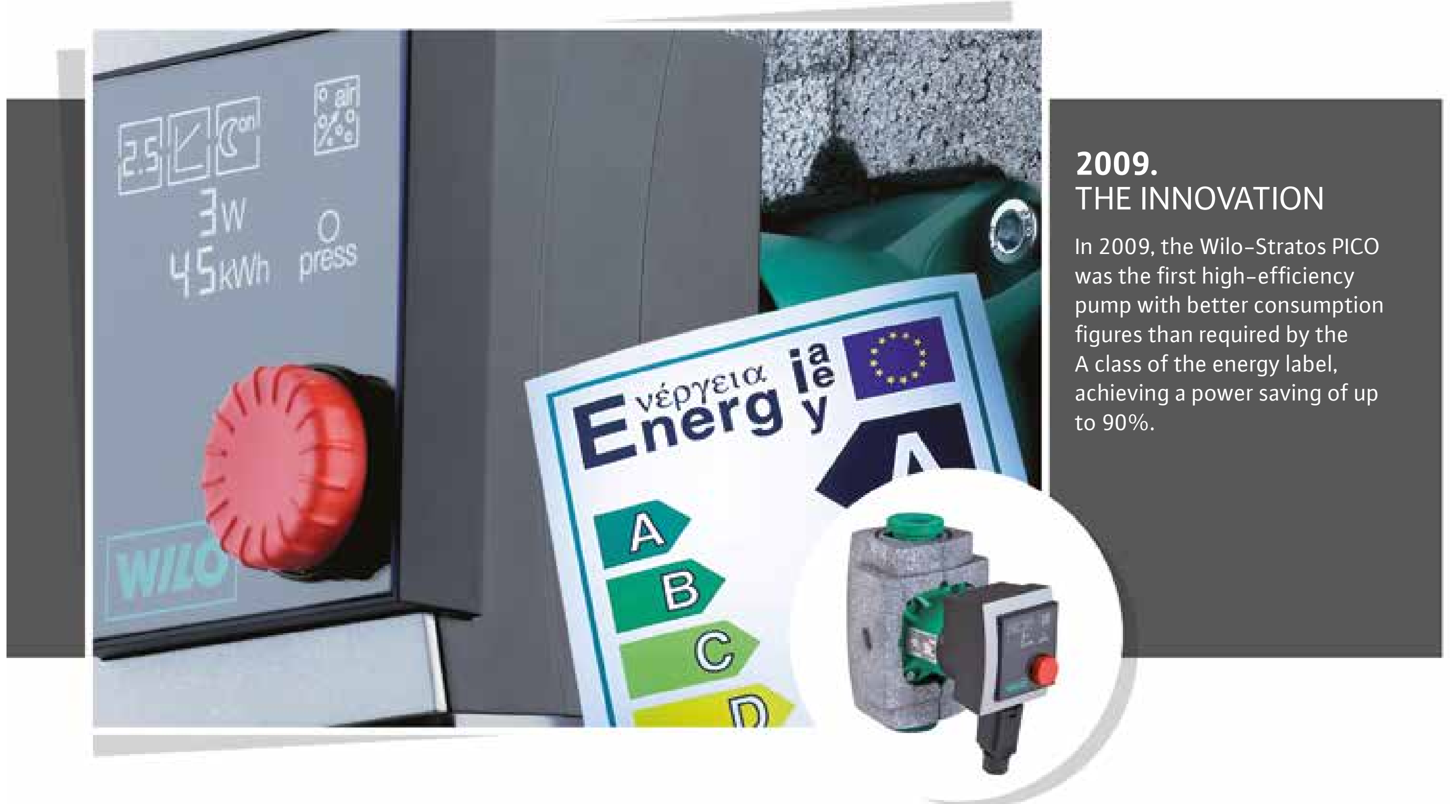
The possible savings potential of the centralised Wilo-Geniax has climate policy-relevant dimensions and was studied by Dresden University.

Despite their relevance in terms of energy policy, the revolutionary technology of the Wilo-Geniax and the associated changes to systems planning and installation have not yet been broadly accepted by the market. However, the solution is used successfully in special applications such as underfloor heating distributors.

Determined energy savings potential for heating oil in Germany in case of wide-scale use of the Geniax technology



If you lined up the fuel tankers needed to transport 10 billion litres of heating oil, they would create a traffic jam from Hamburg to Lisbon and back again.



2009.
THE INNOVATION

In 2009, the Wilo-Stratos PICO was the first high-efficiency pump with better consumption figures than required by the A class of the energy label, achieving a power saving of up to 90%.

Wilo-Stratos PICO

Between 1994 and 1998, various concepts and prototypes for EC motor pumps in the performance range of 20 and 40 watts were tested. Following multiple test versions, the first series pump with an EC motor in the field of small circulators was introduced on the market in 2003, the Wilo-Stratos ECO.

But shortly after the market introduction, the need arose for a redevelopment of the small circulators. This was caused by three key factors:

- Customers on the market showed an interest in a display on the pump that could display the current power consumption (electricity consumption) of the pump as well as the annual power consumption. In contrast to the big circulators, where displays had been a common feature since 1997, small circulators did not have a display unit until this time.
- Due to the rapid development in the field of electronics, the components used became outdated and therefore far too expensive and large just a few years after they were introduced on the market. The Wilo-Stratos ECO had an electronics housing that was relatively large as compared to the pump and protruded beyond the motor considerably.
- European lawmakers were working on a law that was to specify stricter requirements regarding the energy efficiency of glandless pumps, the Ecodesign Directive (ErP directive). This challenge for the pump industry, entitled “Eco-Design Requirements for Energy-Using Products”, aims at achieving more conscious energy management during the entire service life of a product, from production to disposal.

The refinement resulted in the Wilo-Stratos PICO, which was introduced at the ISH in 2009. It is characterised by an extremely large performance range from 3 to 60 watts. The Wilo-Stratos PICO has a modern display and operating concept and a very compact design. It is used mainly as a heating pump for single- and two-family houses and can also be used for air conditioning and drinking water applications.
When the new generation of small circulators entered the market, it was already well below the energy requirements that would come into effect with the European Ecodesign Directive (ErP directive) in 2013 and 2015 and held a leading position in terms of technology. It set new standards with regard to energy efficiency and recorded enormous energy savings. The Wilo-Stratos PICO reduced the electricity requirement by up to 90 per cent as compared to the electricity requirement that was typical for heating pumps up until then. This sensational energy efficiency was also certified by German inspection association TÜV SÜD.

ErP READY
APPLIES TO EUROPEAN DIRECTIVE FOR ENERGY RELATED PRODUCTS

Over the past fifteen years, Wilo had concentrated increasingly on matters such as sustainability and resource conservation and provided new food for thought and pioneering ideas. The company had once again embarked on very special paths for the production of highly efficient pumps and apparatuses. This trend continued throughout the first decade of the new millennium. Once again, Wilo embarked on a journey with its reliable pioneering spirit and the latest innovation technology – this time, into the digital era.


TÜV SÜD GEPRÜFTE ANLAGE • TÜV SÜD GEPRÜFTE ANLAGE • TÜV SÜD GEPRÜFTE ANLAGE

TÜV SÜD
Industrie Service

ZERTIFIKAT

Die Heizungsumwälzpumpe
WILO-Stratos PICO 25/1-4

WILO SE
Nortkirchenstrasse 100,
44263 Dortmund

wurde durch den

TÜV SÜD Industrie Service GmbH
Region Nordost, Referat Energiesysteme

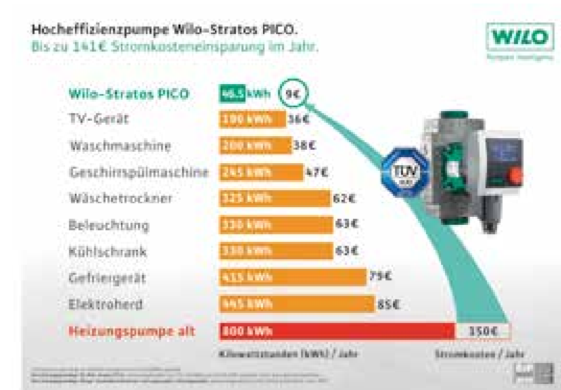
geprüft und folgendermaßen bewertet:

Jahresenergieverbrauch: 46,5 kWh

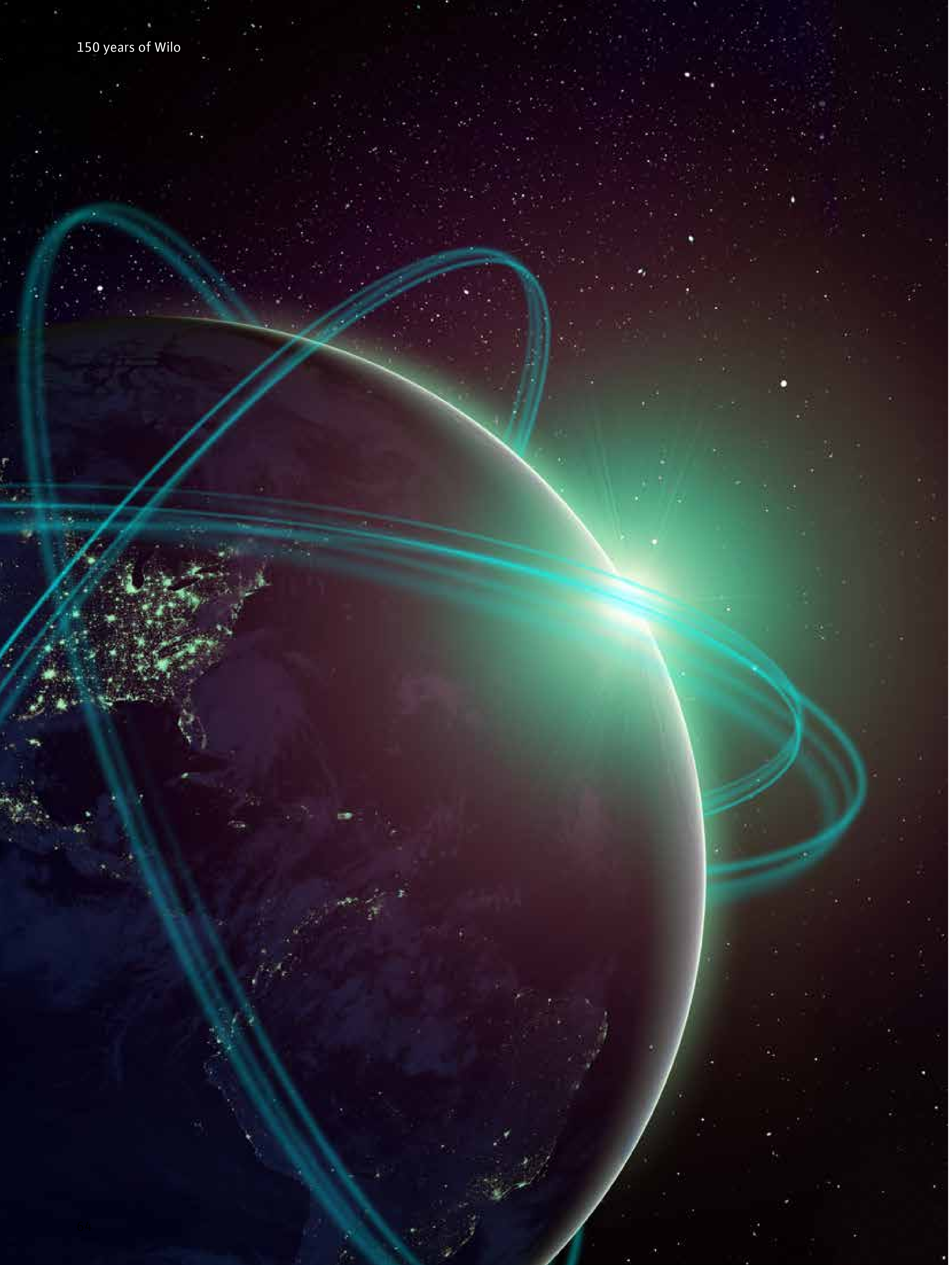
Ermittlung nach Industry Commitment,
Europäische Vereinigung der Pumpenhersteller

Datenbasis Messung 2009
Prüfbericht IS-ATC2-DRE/Fschr 05.08.2009

06.08.2009
Dresden



Since 2010
Going digital



Since 2010

Going digital

Ever since Caspar Ludwig Opländer founded his company in 1872, energy efficiency in particular has been an important topic in the production of the products.

Wilo-Helix EXCEL

Due to the increasing shortage of water and resources since the turn of the millennium, it has become increasingly necessary to address these challenges when developing products and system solutions. Since Wilo embarked on its journey to the digital era, the company has developed numerous high-efficiency pumps and other exceedingly resource-conserving apparatuses and systems.

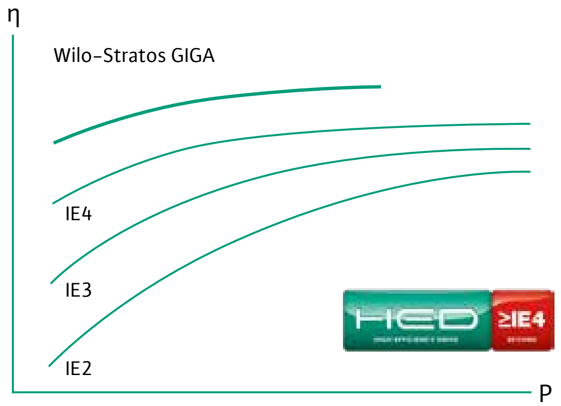
Wilo-Helix EXCEL

The novel Wilo-Helix EXCEL pump for pressure boosting, which is particularly environmentally friendly, has a long service life and is easy to maintain, was introduced on the market in 2011. Thanks to its top control performance, the non self-priming, highly efficient high-pressure multistage centrifugal pump ensures demand-based water supply and the right pressure at every extraction point.

Aside from the highly efficient EC motor, it features a patented 3D design for the hydraulics. The high-performance hydraulics are manufactured with the utmost precision from special corrosion-resistant stainless steel and allow higher pressure per stage while maintaining a high degree of efficiency. The Wilo-Helix EXCEL thus exceeds international standards. It consumes 15 per cent less energy than conventional pumps.

Thanks to innovative materials and methods, all components are optimised for greatest efficiency.

The Wilo-Stratos GIGA is entirely ErP-compliant, and its motor efficiency is already above the highest efficiency class.



The Wilo-Stratos GIGA in figures:
– up to 70% less energy consumption as compared to conventional uncontrolled pumps
– up to 40% less energy consumption as compared to conventional controlled pumps
– up to 8,000 kg CO_2 per year saved per Wilo-Stratos GIGA

Wilo-Stratos GIGA

Wilo-Stratos GIGA
With the Wilo-Stratos, the first high-efficiency pump for heating, air-conditioning and cooling applications, the company accomplished a product innovation that had set new technological and product-related standards for resource-conserving and even more energy-efficient pumps in 2001. In a further step, the technological innovations of these glandless pumps were transferred to dry-running devices. To this end, the Wilo Stratos GIGA was introduced on the market for use in complex buildings where large quantities of water have to be transported across high delivery heads.
This ideal high-efficiency pump has a particularly high overall efficiency and a high-efficiency EC motor with efficiency class IE5. Thanks to its high-efficiency drive, it requires roughly 40 per cent less energy than its predecessor, which was also electronically controlled, and has such a compact design that it consists of just 50 per cent of the material required before.
The glanded pump with its inline design offers many interfaces for integration in building automation, operating data collection and contemporary options for mobile access via Wilo-Smart Connect using the Smart IF module. It features what is known as the “red-button technology”. In combination with a large display, it enables simple and intuitive operation.

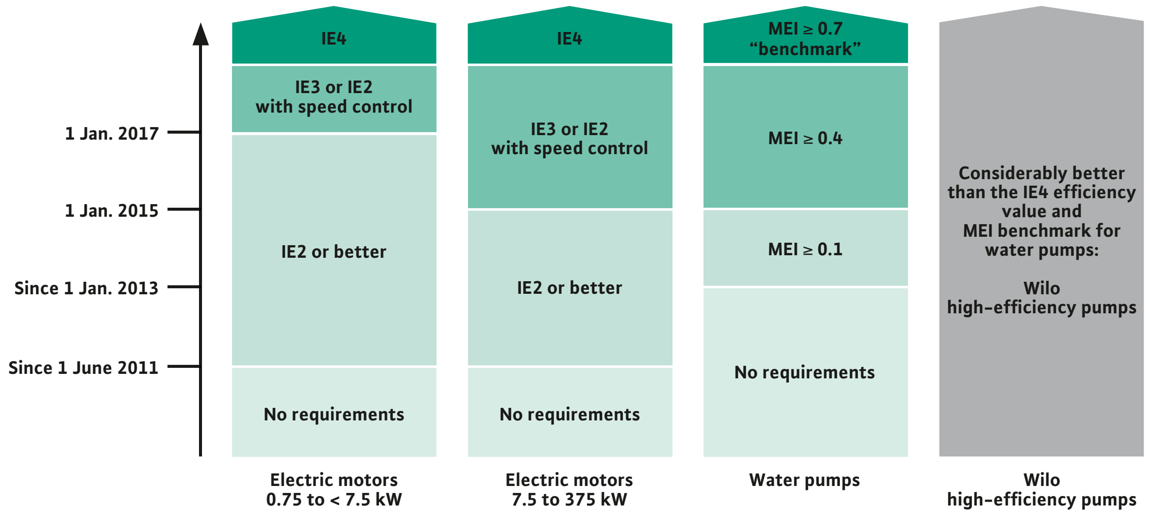
The latest generation, the Wilo-Stratos GIGA 2.0, was put on the market in 2021. It builds upon the concept of the smart Wilo-Stratos MAXO and also features innovative energy-saving functions and control modes, maximum system efficiency and contemporary intelligent communications interfaces. It can be actuated via Bluetooth using the Wilo-Assistant app on mobile devices. Since it is connected to the Wilo Net, it also features multi-pump control.

The tried and tested “red-button technology” enables quick and easy commissioning.

Flexible integration into building automation via optional integrable interface modules.

Wilo-Stratos GIGA 2.0

The ErP directive on electric motors (Directive (EC) 640/2009) and the ErP directive on hydraulic efficiency (Directive (EU) 547/2012) stipulate ever-stricter efficiency limit values. Wilo high-efficiency pumps meet all of them in one step.



IE2, IE3 = motor efficiency classes in accordance with IEC 60034-30, mandatory as per Directive (EC) 640/2009 of the EU Commission as from the effective dates specified

IE4 = motor efficiency class intended for the future and which will then be the best (as per IEC/TS 60034-31 Ed. 1)

Ecodesign Directive (ErP directive)

Just over ten years after the first high-efficiency pump was introduced, the Stratos series underwent a fundamental revision starting in 2012. This became necessary firstly because of the rapid development of the electronic components. The market requirements for state-of-the-art communications concepts were increasing. They included communication options via Bluetooth, an option for Internet communication and the use of cloud services. Another considerable reason was the commencement of the ErP directive for glandless pumps in January 2013.

The new Ecodesign Directive stipulated significantly stricter requirements for the energy efficiency of heating circulators for the coming years. From 2013 onwards, 95 per cent of the models could no longer be sold. Until 2020, the ErP directive specified gradually more strict efficiency limits for glandless circulators, electric motors of glandless pumps and the hydraulics of water pumps.

While Wilo already offered high-efficiency pumps before 2013 which met the standards that applied as from 2013 and 2015, some of the existing Stratos series fell just slightly short of the required limit values of 0.23 specified in the ErP directive. With its claim of being a technological leader and the "inventor" of high-efficiency pumps, the company once again wanted to make considerable improvements to its pumps in terms of energy efficiency. The aim was to reduce the required EEI value from 0.23 to 0.2. This allowed a further reduction of the energy requirement by roughly 13 per cent, and even by 22 per cent at an EEI value of 0.18. It also further strengthened and expanded the company's technological position. Accordingly, the company invested in product developments and production facilities over the following years.

2017.
SIMPLY SMART

The Wilo-Stratos MAXO marked Wilo's arrival in the future of pump technology in 2017 – it is the world's first smart-pump*. With innovative energy-saving functions and control modes, it achieves maximum system efficiency. Highest compatibility and direct pump connection with existing systems are also a matter of course for the world's first smart pump.

Wilo-Stratos MAXO

Meanwhile, the Stratos series was advanced to the Wilo-Stratos MAXO, the world's first smart-pump*. Smart-pumps are a new pump category that goes far beyond high-efficiency pumps or pumps with pump intelligence. It is as highly efficient as it is flexible, as user-friendly as it is connected. The Wilo-Stratos MAXO offers greater efficiency, connectivity and comfort than any Wilo pump ever has – it was the next milestone on Wilo's path to becoming an innovative technological leader of the digital age.

From simple installation and user-friendly configuration, maximum system efficiency and all the way to progressive interconnection options, Wilo-Stratos MAXO set new standards in 2017.

The concept of the Wilo-Stratos MAXO unites the following fundamentally novel features:

– excellent convenience of electrical installation thanks to a clear and easily accessible terminal room and the optimised Wilo-Connector (for easily connecting the pump to the power grid without using tools)
– intuitive operation thanks to application-guided adjustment with the Setup Guide combined with a new clear display and an operating concept with green button technology
– highest levels of energy efficiency thanks to the interaction between optimised and innovative energy-saving pumps (for example, the No-Flow Stop switches the pump off automatically when there is no flow)
– optimum system efficiency thanks to new and intelligent innovative control functions, such as Dynamic Adapt plus and Multi-Flow Adaptation (see section "Patent application for Multi-Flow Adaptation")
– state-of-the-art communications interfaces such as Bluetooth for connecting to mobile devices and direct pump connection via Wilo Net for controlling multiple pumps

* We define smart pumps as an entirely new pump category that goes far beyond our high-efficiency pumps or pumps with pump intelligence. Only the combination of the latest sensor technology and innovative control functions (e.g. Dynamic Adapt plus and Multi-Flow Adaptation), bidirectional connectivity (e.g. Bluetooth, integrated analogue inputs, binary inputs and outputs, Wilo Net interface), software updates and excellent usability (e.g. thanks to the Setup Guide, the preview principle for predictive navigation and the tried and tested Green Button Technology) make this pump a smart-pump.

Commissioning assistant: Setup Guide

– one-click commissioning with factory settings (heating – radiator – Dynamic Adapt plus)
– date and time are already preset
– setup assistant for the application-specific setup of the pump function (guided selection of the correct control function)
– one-click commissioning with factory settings for the Stratos MAXO-Z with T-const temperature (application: drinking water – circulation)

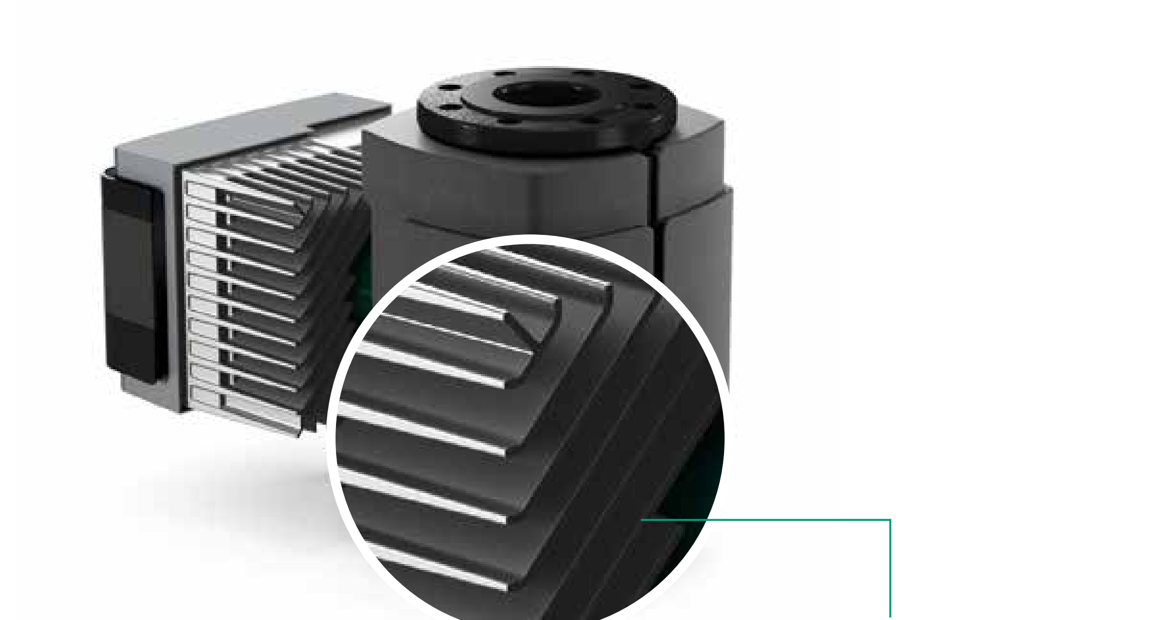
A large colour display assists with intuitive operation.

The numerous technical innovations resulted in 27 patent applications. The following three are particularly noteworthy:

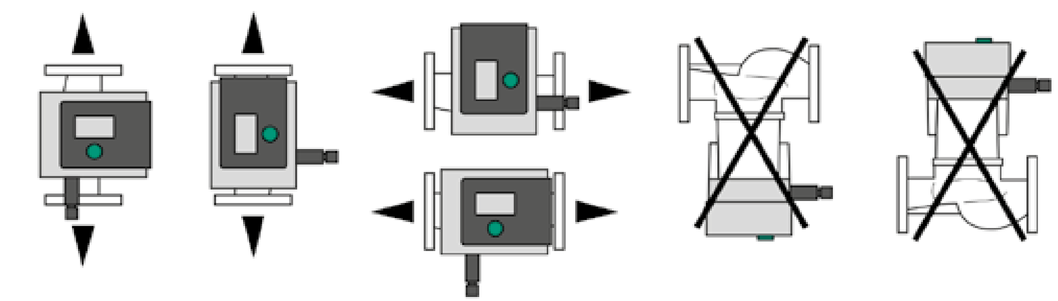
Patent application for a novel operating concept: Setup Guide

In order to adjust a pump, the specialist had to know a number of key properties of the system on the basis of which they had to calculate or estimate which type of control to select and to which setpoint they had to set the pump. This was a real challenge in the case of existing systems in particular because there was no sufficient documentation in most cases, for example on the pipe lengths and cross-sections. As a result, the fitter was often not able to solve this task properly. The Wilo-Stratos MAXO provided a different approach to the issue in the form of the Setup Guide.
It guides the user through the commissioning process with questions such as "Is the pump used in a system for heating or for cooling?" or "Is the system in question radiator heating or underfloor heating?". The pump uses this information to calculate the optimum control type and a suitable setpoint. The special feature of this procedure is that the dynamic control parameters, i.e. how quickly or slowly the controller responds to changes, can be preset properly.

For example, the pump must react much more quickly in cooling applications than in heating applications. The user need not worry about all this any more because the pump makes these presettings, some of which are highly complex. Wilo engineers were able to create this solution because the company had built up the corresponding application expertise over many years. The insights regarding how the pump should be adjusted in different applications resulted from numerous building simulations. This procedure allows Wilo to use a computer to simulate all types of buildings and systems and conduct several hundred series of simulations to find the optimum solution.



Heat dissipation via cooling fins tilted by 45°



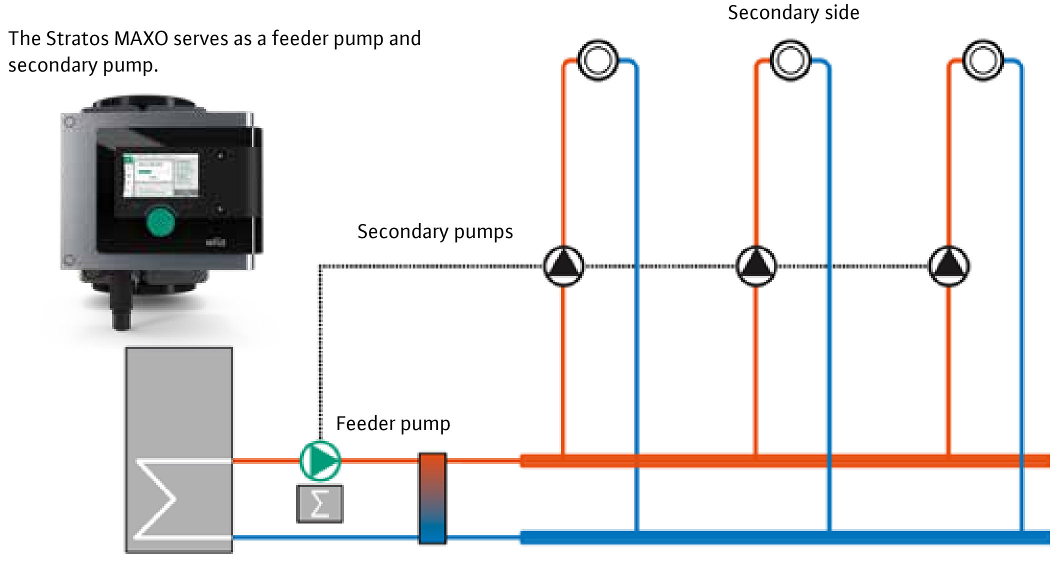
Permitted installation situation of the pump

Patent application for cooling fin design

Installing the pump vertically or horizontally has been possible – and necessary, depending on the installation situation – for many years. The previous designs (Wilo-TOP-E, Wilo-Stratos) encountered a problem with cooling the electronic module in the case of horizontal installation.
Since the cooling fins were previously arranged vertically, cooling was excellent in the case of vertical installation, but limited in the case of horizontal installation. This is a result of the stack effect that was utilised, which causes the hot air to rise upwards through the cooling fins. This air transport was blocked in the case of horizontal cooling fins.

With the Wilo-Stratos MAXO, this challenge was solved by tilting the cooling fins by 45 degrees. This trick ensured that the electronics were cooled in every installation position.

Principle of Multi-Flow Adaptation



The feeder pump supplies the sum of the **volume flows** of the secondary pumps.

Savings Electric pump energy + **Savings** Primary building energy = **High system efficiency**

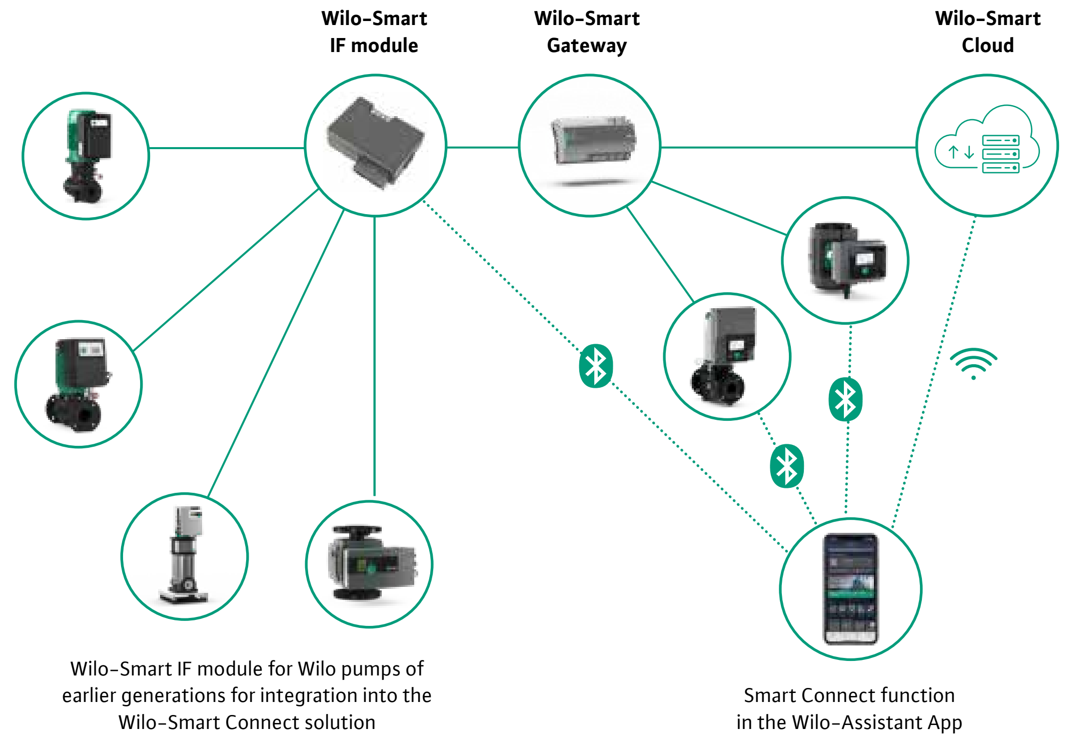
Patent application for Multi-Flow Adaptation

Systems in larger buildings are often designed with a primary and a secondary circuit. The primary circuit is very often operated with one pump (feeder pump), whereas the secondary circuit is frequently operated with multiple pumps.
For energy-related reasons, it is particularly beneficial if the primary pump pumps as much water as all secondary pumps combined. This is connected with what is known as the hydraulic shunt, which is usually used to separate the primary and secondary circuits.
Up to now, extensive sensor systems and control technology from the system manufacturer had to be used in order to achieve energy optimisation. The Wilo-Stratos MAXO is the first pump that can solve this task with control intelligence integrated in the pump and without additional sensor systems.
To this end, the pumps are connected via data link. The pumps then exchange information on the volume flows at short intervals. The feeder pump then supplies a volume flow that corresponds to the sum of all volume flows of the secondary circuit pumps. This novel energy-saving solution is appreciated by consultants in particular and is a truly unique feature of the Wilo-Stratos MAXO.

Wilo-Smart Connect

In line with the modern trend of digitalisation, there was an increasing demand for cloud-based solutions and the corresponding Internet communication in connection with the convenient connectivity and control of the Wilo pumps. The predecessor pumps of the Wilo-Stratos MAXO were already able to exchange information with a building management system. However, the disadvantage was that, depending on the type of building management system, not all data and evaluations that the pump could provide were used and available. To ensure maximum operational reliability by way of contemporary Internet communication, the

The elements of the Wilo-Smart Connect solution



technology team developed Wilo-Smart Connect, a pioneering cloud-based solution. It consists of the following key components:
The **Wilo-Smart Gateway** establishes the connection between the pumps and the cloud. Up to ten pumps can be connected to a gateway.

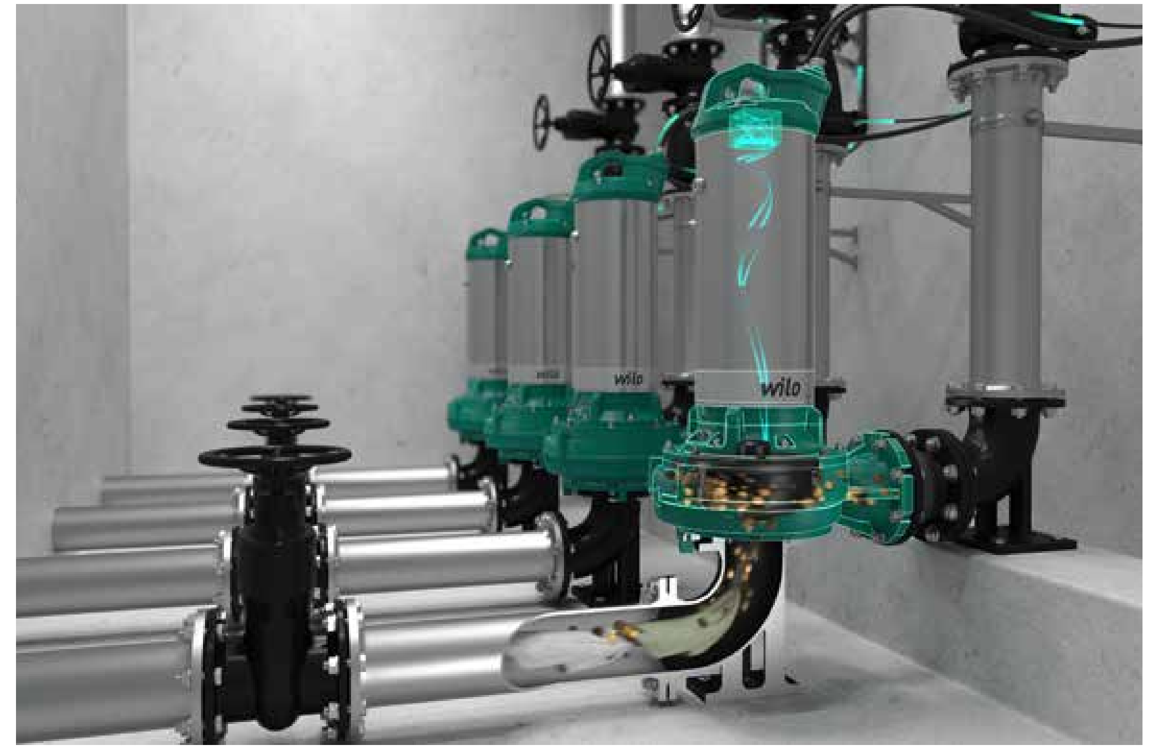
The **Wilo-Smart Cloud** can store and process the data from the pumps and further data from the system or property. Energy-optimised and reliable operation can be achieved by means of powerful algorithms. In addition, the systems can be diagnosed and possible errors can be detected at an early stage. The user also receives tips on how to optimise fault repair if needed.

The **Wilo-Assistant App** is a powerful user interface that offers the following application options:

- fast local and remote access to Wilo products via the Wilo-Assistant App for configuration, control and fine adjustment
- local access even to pumps that are difficult to access via Bluetooth functions of mobile devices
- authentication process as protection against third-party access
- easy commissioning and operation thanks to intuitive user guidance
- immediate read-out, storage and transmission of parameters with the possibility of creating commissioning logs, for example
- increased future-proofness of Wilo pumps thanks to optional software updates

2018.
WITH INTELLIGENCE

Since the introduction of the Wilo-Rexa SOLID-Q in 2018, Wilo has been offering an intelligent system solution for smart sewage pumping stations. The integrated Nexos Intelligence accounts for digitalisation and automation by identifying clogging and starting flushing cycles automatically.



Integrated Nexos Intelligence provides great operational reliability. It detects the threat of clogging due to solids and sets a self-cleaning mechanism in motion.

System intelligence for the digital transformation in water management

In times of limited natural resources, companies are constantly faced with new challenges, including responsible management of the dwindling resource of water. As an internationally positioned company, Wilo presented the Wilo-Actun OPTI-MS, a submersible motor pump that pumps ground water from wells and shafts, at the world's foremost trade fair for water management, IFAT, in 2018. It is designed to create a self-sufficient water supply system with the help of photovoltaic systems. Aside from pumping drinking water to supply small settlements in countries suffering from water shortage, it ensures reliable irrigation for agriculture and livestock farming.

The Wilo-Rexa SOLID-Q with Nexos Intelligence was presented as a further technological innovation at the IFAT that same year. With this intelligent system solution for a smart sewage pumping station, Wilo is making use of its digital technology expertise to make the work of consultants, operators and system manufacturers worldwide easier and create innovations for more-effective water management.

Wilo-Rexa SOLID-Q with Nexos Intelligence

Pumping untreated wastewater is an important task that is becoming increasingly demanding due to the growing prevalence of solids and the retention time in the network. The medium to be pumped is also becoming increasingly aggressive and problematic. Sewage, the treatment of sludge and sludge liquor, abrasive or fibrous media require pumps and pump systems with great operational reliability and a long service life as well as intelligent control and connectivity.

The Wilo-Rexa SOLID-Q with Nexos Intelligence is such an intelligent system solution for a smart sewage pumping station. It is characterised by a high level of energy efficiency and connectivity in combination with digital interfaces and customisable functions, as demonstrated in the following three lists:

Greater operational reliability

The new Wilo-Rexa SOLID-Q with Nexos Intelligence is a holistic and future-proof system solution for smart sewage pumping stations and has the following properties:

– dynamic adaptation to changing requirements thanks to novel integrated Nexos Intelligence
– highest operational reliability and reduced service requirements thanks to self-cleaning feature
– corrosion protection thanks to optional Ceram coating to promote a long service life in aggressive fluids
– increased operational reliability in the event of a fault thanks to the redundant design of the integrated pump control

Greater energy efficiency

The energy consumption of a pumping station is crucial for its economic efficiency. The new Wilo-Rexa SOLID-Q with Nexos Intelligence provides active support to operators:

– reduction of energy costs thanks to high hydraulic efficiency and up to IE5 motor technology in wet and dry well installation (based on IEC60034-30-2)
– maximum system efficiency thanks to automatic determination of the optimum duty point and intelligent speed control
– reduction of operating costs by avoiding cost-intensive maintenance work at night or at weekends
– lower energy costs thanks to automatic controls for the optimum mode of operation for the specific system

An integrated energy efficiency algorithm ensures maximum system efficiency and intelligent speed control.

Greater connectivity

Thanks to its high level of connectivity and the greatest possible compatibility of the digital interface, the Wilo-Rexa SOLID-Q with Nexos Intelligence makes the operators' day-to-day work more convenient:

– optional digital data interface (DDI) with vibration monitor, data logger, web server and digital rating plate for convenient monitoring and system integration

State-of-the-art connectivity ensures convenient monitoring of the pump system.

– control and connectivity with the communication network via a web server and Ethernet interface with standard network protocols
– integrated control electronics for identifying and rectifying clogging independently

In addition to advancing the topic of energy efficiency, Wilo is also a climate change and digital pioneer. Wilo firmly believes that the smartest and most digital products are the most intelligent, and therefore energy-efficient, products. Solutions such as the new Wilo-Rexa SOLID-Q with Nexos Intelligence provide highly efficient, optimised processes. This is an important contribution to climate protection, as pumps consume an estimated 10 per cent of the electricity generated worldwide. This means there is a clear correlation between digital transformation, energy efficiency and climate protection.

In addition to highly efficient and smart pumps, Wilo also offers digital services that support specialists and operators with their work.

WiloCare

The concept of WiloCare is one of these customer-friendly and convenient service offers. It involves a combination of professional maintenance and digital systems monitoring. To this end, the system is equipped with additional sensors that transmit the system parameters to the Wilo cloud via a communications box. From there, the requested information, such as current fill levels or the number of operating hours, is visualised directly on a digital device. This way, customers can always keep an eye on their systems regardless of where they are. In combination with the regular maintenance intervals, this increases the operational and cost reliability of the system in the long term.

The advantages at a glance:
– always up to date: remote monitoring of the system's performance in real time
– digital: visualisation of the desired system parameters on a customised user dashboard
– reliable: complete operational and cost reliability
– connected: quick fault repair in the event of malfunctions thanks to connective interfaces

With WiloCare and the Wilo-Live Assistant, Wilo offers its customers extensive and digital services.

Wilo-Live Assistant

Another service offer, the Wilo-Live Assistant, was developed during the coronavirus crisis. This offer allows the WiloLine experts to provide direct live assistance via immediate help and video chat in the event of problems with heating, water supply or sewage disposal systems. The customer can show the installation situation in the utility room via their smartphone while the Wilo employee follows via their own screen. They can see the components and other details and provide tips and advice. In addition, the Wilo expert can sketch helpful drawings onto the picture that the customer can then see on their smartphone's display. This allows Wilo to assist its customers with troubleshooting as quickly as possible.

To use the Wilo-Live Assistant, customers need an up-to-date iOS or Android smartphone with an Internet browser (Safari, Google Chrome, Opera, Microsoft Edge) and an Internet connection. No app is needed. The data are, of course, protected at all times.

Production sites

Global manufacturer

With 15 main production sites and three headquarters in Dortmund, Cedarburg and Beijing in the future as well as numerous R&D departments worldwide, Wilo is excellently positioned on the global stage to conduct crisis-resistant and needs-based research and production.

The global economy is experiencing "globalisation 2.0". This is characterised by the more pronounced regionalisation of value chains in the three major economic centres of North America, Europe and Asia as well as by the strategic pursuit of sovereignty with regard to systemically important goods.

The Wilo Group is ideally prepared for this development with the "region for region" approach. The aim is to satisfy customer needs with regionally produced products. Wilo is designed to allow as much decentralisation as possible and only as much centralisation as necessary.

Wilo will increase the degree of vertical integration in future, i.e. produce more itself and further increase the internal vertical range of manufacture with future-proof and competitive production processes. This applies to critical components in particular. To this end, Wilo will open three further production sites in 2022 and 2023 alone: in Cedarburg, USA, Kesurdi, India, and Changzhou, China.

In an effort to defy technological "decoupling" and not innovate "around" regional standards for products, systems and solutions that are sure to evolve, Wilo is also diversifying its research and development areas and positioning them more strongly in the three economic centres.

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