As the global need for improved pipe systems across infrastructure, industry, agriculture and households continues to grow, SABIC is putting increasing efforts into providing its suppliers and customers in the pipe extrusion industry with more cost-effective and sustainable solutions. The establishment of a new business unit dedicated to the pipes industry is part of a transformation program to accelerate implementation of its strategy to become the preferred world leader in the chemical industry by 2025.

The need for more, better, infrastructure
Global investments in infrastructure are expected to grow on average at close to 4% per year between now and 2025. Everywhere, consumers are looking for sustainable products that ensure their health and safety; and specifiers want high performance, reliable solutions with low total cost and extended lifetimes.

There are several drivers behind this growth, led by the overall increase in the world’s population and by movements from the countryside into towns and cities. According to a study by the United Nations, today around 54% of the world’s population lives in urban areas. By 2050, that figure is likely to have risen to 66%. That means over two billion more people will be living in large towns and cities than today. This trend will be particularly strong in the developing nations of Asia, the Middle East and Africa.

Water management to cater for this massive growth is increasingly critical. Today, too much water is being lost on its way to dwellings, factories and fields. New solutions are needed for supplying fresh water and carrying away and treating waste water. Gas distribution networks will need to be extended to supply energy. Agricultural irrigation systems also need to be improved in order to increase productivity from arable land. More smart solutions such as hydroponics and aquaculture are required.

The sustainability of pipe networks needs to be improved. Plastics pipe systems will be an important part of that improvement, as they continue to replace more traditional materials (iron, concrete, clay) that are more expensive to produce and install, and more costly to maintain once in the ground. Energy can be much more efficiently used to make plastics pipes than steel and even concrete pipes. Plastics provide the best combination of resistance to corrosion, chemicals and abrasion, their low weight and high mechanical...
robustness makes them easier to install, and their smooth inner surfaces enable high flow rates, cutting energy consumption for fluid transmission. In summary, the use plastics piping can add considerable value and increase system reliability.

**SABIC’s vision**
As part of its overall vision of reinforcing its position in the chemical industry as a whole, SABIC intends to be the preferred supplier of solutions across the pipes industry. Its strength lies in its leading combination of materials and technologies, its cooperative efforts with suppliers and customers along the value chain, and its global supply network across the major continents.

To extend the focus from the converters to the entire value chain, SABIC has put in place dedicated marketing and sales teams, together with technical and compliance experts, to get insight on its customers’ customized applications and solutions with the most added value. These teams will link with technical institutions, machine manufacturers, and additive suppliers, with the aim of enabling customers throughout the whole value chain to understand their needs and faster implementation of new developments.

Supported by a comprehensive technology network that incorporates more than 19 research centers around the world. SABIC is working on translating challenges into plastic pipe innovations. SABIC’s customers have reported that such innovations have led to improved reliability, quality and reduced production cost at their plants.

**Solutions available now and in the pipeline:**
SABIC is focussing on its customers which are active in the following four main areas in the pipes industry: domestic (water, gas, conduit, ventilation); infrastructure (for transport of clean and waste water and gas, as well as cable conduits); industrial (including large diameter pipe for oil & gas); and agriculture & aquaculture.

**Hot and cold water pipes**
SABIC is introducing special grades of polyethylene called PE-RT (polyethylene with raised temperature resistance) with improved high temperature resistance, which may be excellent candidates for hot and cold water pipes. These materials have a unique crystalline microstructure and stabilization package, which provides excellent long-term hydrostatic strength at high temperatures without the need for cross-linking.

Advantages of PE-RT include:
- Better high temperature performance than standard PE;
- Better low temperature impact resistance than standard polypropylene random copolymer (PP-R);
- No need for pre-compounding;
- Ability to weld and recycle.

For hot and cold water pipes in high-rise buildings, SABIC’s customers consider PP-R as the preferred material, and SABIC has already established an important position with its SABIC® VESTOLEN™ P grades in
this market. SABIC’s customers have been using these grades in hot water installations worldwide for over 35 years—an acknowledgement of the material’s high quality and dependability. SABIC sees PE-RT as a complement to PP-R, for applications where flexibility and higher impact resistance at low temperature is required. For radiator connectors, where both steel and various plastics are used, PE-RT II should be able to take share from both metal, PEX and also polybutylene on cost grounds.

**Infrastructure pipes**

SABIC® HDPE grades are typically used for pipes which should safeguard the distribution of water and gas. SABIC® PP RELY grades are typically being used to offer safe handling for urban sewage and rainwater. To address a diverse set of challenges, SABIC has developed an ‘integral innovation approach’, with the main focus on the overall solution.

The introduction of the SABIC® PE and PP RELY family is an example of the success of this approach. This technology enables the production of a special polymer design in PE100 grades with excellent low sag properties which SABIC’s customers typically use for producing the most challenging pipe dimensions and with enhanced resistance to slow crack growth.

An impressive example of the use of SABIC® PE100 on a major scale is the South-to-North Water Diversion Project—China’s largest-ever river diversion project. This involves diverting water from the country’s southern rivers to population centers in the drier north. Planned for completion in 2050, it will eventually divert 44.8 billion cubic meters of water annually. One of the key requirements for the project is a reliable piping system which will allow water to be safely transported while preserving clean water resources.

Hebei Quan’en High-tech Piping Co., part of JM Eagle, the world’s largest manufacturer of plastics piping, is using SABIC® P6006 for 2.5 km of pipe up to 900 mm in diameter for the project. It meets stringent quality standards required for large diameter pipes used for the project. Compared with ductile iron pipes and reinforced concrete pipes, PE pipe systems are virtually leak-free, have the lowest failure rate of all water pipe systems, and require low maintenance.

**Superior crack resistant solutions**

A method that SABIC developed for assessing the long-term behavioural properties of plastics recently became a recognised industry standard, ISO 18488. This so-called “strain hardening test” method reduces the time and cost taken to test the slow crack growth (SCG) resistance of high density polyethylene (HDPE), with particular relevance for pressure pipes. The method is easy to implement in laboratories, is used in the development of new grades by researchers, and may also very valuable as a batch release test for resin suppliers.

Traditional methods to evaluate environmental stress crack resistance (ESCR) in pressure pipe materials, such as the full notch creep test, can more than a year to complete, while the new method reduces this to just a few
days. Obtaining reliable data on the long-term behaviour of plastics has always been difficult, and this innovation is an important development for the market.

Pipes made from most recent grades of HDPE from SABIC can be produced more energy-efficiently, and, according to SABIC’s customers, they can be laid in more adverse conditions - using trenchless systems, for example, which cause less disruption to above-ground traffic and have less environmental impact, but which require pipes with improved scratch resistance. The matter has achieved increased urgency in recent years, as an increasing number of countries in Europe have begun adopting tougher requirements for pressure pipe. The move comes as a result of the gathering pace of adoption of new trenchless pipe installation methods such as slip lining and horizontal directional drilling.

SABIC is the first company to implement this method at its production site. New pipe materials with an enhanced SCG resistance, such as SABIC® VESTOLEN™ A RELY 5922R, were developed specifically for and can be used in applications employing the latest trenchless pipe laying installation methods. Apart from their good mechanical properties, SABIC® VESTOLEN™ A RELY 5924R and 5922R have a further convincing advantage: their unique rheological and morphological properties could provide processors with considerable energy savings and help them reduce their carbon footprint.

Solutions for agriculture and aquaculture
With conventional methods of farming and fishing already reaching their limits, SABIC has developed a number of alternatives for such techniques as pressure and drip irrigation. SABIC® LLDPE 0132HS00 is a hexene-1 copolymer that provides high mechanical toughness and stress crack resistance is typically used for advanced drip irrigation systems. SABIC® VESTOLEN™ A 5061R is typically used for pressure irrigation of arable land. SABIC® VESTOLEN™ A and SABIC® PE100 are typically used for the construction of large on- and offshore fish cages. SABIC® VESTOLEN™ P is typically used for heating and cooling of farms and larger agricultural complexes.

Industrial pipes
Chemical plants, mines, oil & gas and process industries need to transport aggressive and dangerous fluids and waste in a safe and economical way. Purpose-formulated SABIC® HDPE and PP are increasingly used for pipes that must also be able to withstand high pressures and temperatures.

Geothermal pipes made with SABIC® VESTOLEN™ RELY PE100-RC may provide additional safety and protection of ground water resources. Grades used for mining and slurry pipes can reduce the total cost of ownership by offering a long service life due to their high resistance to abrasion and corrosion. For chemical plants, SABIC® PP is typically used for the transport of chemical waste.
In the food industry SABIC® VESTOLEN™ P is a durable substitution for steel pipe systems for the transport of various fluids at low and elevated temperatures.
SABIC is also active in the area of HDPE coatings which are typically used for steel pipes. These may extend the lifetime of the pipe by preventing corrosion. In laboratory tests, SABIC grades have been shown to enable higher line speeds than rival products, with lower necking at the extruder die head.

A new co-operation with Arkema, a leading supplier of high performance materials, represents SABIC’s strengthened focus on this market. It has kick-started the development of a package of raw materials which are typically used by the steel pipe coating industry. For example, a new polyethylene (PE) grade offers manufacturers favourable processing characteristics and long-term protection against corrosion of metal pipes used in the oil and gas industry. First trials have delivered excellent extrusion results, with higher output and better surface finish versus a benchmark product.

SABIC also sees strong potential for its customers using HDPE in larger diameter composite pipes in combination with glass reinforced thermosetting plastics. Such pipes combine very good internal pressure resistance and chemical resistance with much lower weight than all-steel pipes in such applications as long-range transport of oil and gas. Development work is ongoing.

**Engineering thermoplastics**

In addition to its extensive portfolio of polyolefins and PVC, SABIC also offers a wide range of engineering thermoplastics which can be used for pipes. SABIC’s NORYL™ polyphenylene ether/polystyrene blends provide a wide variety of solutions for specific application requirements, particularly for molded components. They have best-in-class hydrolytic stability and very good heat resistance, enabling them to perform well in both hot and cold water applications. ULTEM™ polyetherimide resin has excellent mechanical performance in high heat and chemically challenging environments. CYCOLAC™ and CYCOLOY™ plateable ABS and ABS/polycarbonate resins, with their resistance to cleaning chemicals and ability to create parts with a smooth finish, are considered by our customers as ideal for use in components such as taps and spouts. LNP compounds, based on a wide range of polymers provide exceptional mechanical performance in highly demanding applications such as submersible pump housings.

**Solutions around the world**

SABIC believes it has an important role to play in the provision of pipe systems for a world that is rapidly urbanizing and in need of sustainable pipework networks to transport water and energy in all its forms. With an already long and successful history in pipe systems across infrastructure, SABIC is now expanding its position with new solutions, some examples of which are described here, provided by world-scale production assets around the world, supported by global technology centers, and optimized through close cooperation with partners along the value chain.
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ABOUT SABIC

SABIC is a global leader in diversified chemicals headquartered in Riyadh, Saudi Arabia. We manufacture on a global scale in the Americas, Europe, Middle East and Asia Pacific, making distinctly different kinds of products: Chemicals, Plastics, Agri-Nutrients, Metals, and Specialties.

We support our customers in identifying and developing opportunities in key end markets such as Construction, Medical Devices, Packaging, Agri-Nutrients, Electrical and Electronics, Transportation, and Clean Energy.


SABIC has more than 40,000 employees worldwide and operates in more than 50 countries. Fostering innovation and a spirit of ingenuity, we have filed more than 10,960 patents, and have significant research resources with innovation hubs in five key geographies – USA, Europe, Middle East, South East Asia and North East Asia.

The Saudi Arabian government owns 70 percent of SABIC shares with the remaining 30 percent publicly traded on the Saudi stock exchange.

At SABIC, we combine a rich track record of doing what others said couldn’t be done, with a deep understanding of our customers. But our true impact is as a partner who can help our customers achieve their ambitions by finding solutions to their challenges. We call this ‘Chemistry that Matters™’.
As the global need for improved pipe systems across infrastructure, industry, agriculture and households continues to grow, SABIC is putting increasing efforts into providing its suppliers and customers in the pipe extrusion industry with more cost-effective and sustainable solutions. The establishment of a new business unit dedicated to the pipes industry is part of a transformation program to accelerate implementation of its strategy to become the preferred world leader in the chemical industry by 2025.