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A compendium of articles
from *Power&Motion* and *igus*

Sustainability Technologies and Trends





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SUSTAINABILITY has become increasingly more important to the design of fluid power and electro-mechanical technologies as well as to the business practices of those developing these solutions.



*Sara Jensen,
Executive Editor,
Power & Motion*

A desire to reduce one's carbon footprint and government regulations are key drivers for the focus on sustainability. This is presenting opportunities for companies to be more innovative such as through use of new materials made from renewable sources as well as creation of more efficient hydraulics and pneumatics.

Within this eBook you'll find articles which look at how sustainability is impacting fluid power designs, methods being employed to aid decarbonization efforts and more to help enhance your understanding of what being more sustainable can entail and how it can be achieved.

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CHAPTER 1:

The Rising Influence of Sustainability on Hydraulics and Pneumatics

SARA JENSEN, Executive Editor, *Power & Motion*

Sustainability is becoming a larger driver for the design and use of fluid power technologies.

A greater emphasis is being placed on sustainability within the fluid power industry as manufacturers and their customers look to reduce their environmental impact while at the same time achieving performance improvements.

Government regulations being enacted around the world are a driver for the creation and use of more sustainable fluid power technologies as well as companies' own desire to reduce emissions, material use and more.

In a recent reader survey conducted by *Power & Motion*, 78% of respondents said sustainability is influencing their design and use of hydraulics and pneumatics.

Christopher Parisse, Senior Controls Product Engineer, [Bosch Rexroth](#), told *Power & Motion* that sustainability is one of the company's pillars on which it designs systems. "From a component standpoint, we're designing our latest generation of pumps and valves to be more efficient which allows our customers to reap these benefits just by swapping parts out," he said.

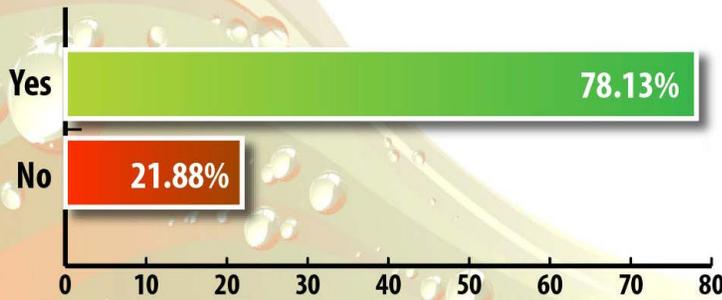
In addition, the company is developing technologies for the production and use of hydrogen such as its new A4VZA pump to perform hydrogen compression, aiding with the transition to diesel fuel alternatives.

Frank Langro, Director – Product Market Management, Pneumatic Automation, North America at [Festo Corp.](#), said that as a company Festo is committed to supporting the [Sustainable Development Goals of the United Nations](#) which sets out targets for helping people and the planet.

As such, he said Festo places "a significant focus on the impact of our products on energy usage, both via operation and in [their] production." In conjunction with this, the

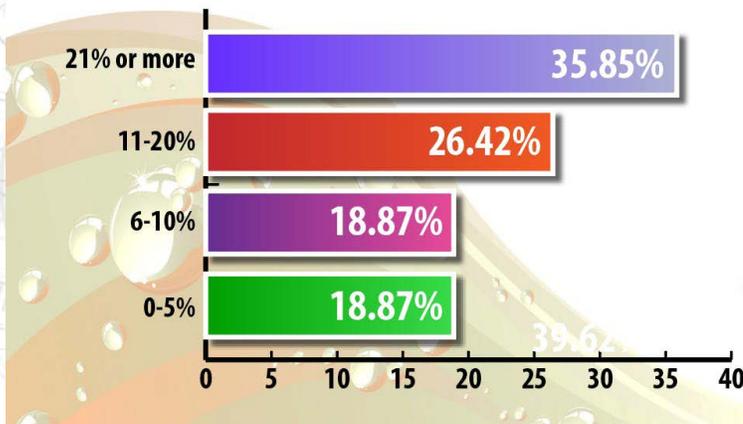
company takes into consideration the impact a product will have on sustainability during the product design specification phase.

Is sustainability influencing your design or use of hydraulics and pneumatics?



A large number of respondents to Power & Motion’s survey see sustainability influencing their design and use of hydraulics and pneumatics. © Endeavor Business Media

What percentage of your hydraulic and pneumatic designs or use of these technologies are being influenced by sustainability?



Almost 36% of respondents to a Power & Motion survey indicated that 21% or more of their fluid power technologies, or use of them, are being influenced by sustainability.

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How Sustainability is Influencing Fluid Power Designs

When asked what percentage of their hydraulic and pneumatic system designs, or use of these technologies, are being influenced by sustainability, almost 36% of respondents said 21% or more are being impacted.

The ways sustainability is impacting the fluid power sector are varied. Some respondents said maximizing the lifespan of their products and easing maintenance are how they are incorporating sustainability into their designs. By enabling products to work longer there is less waste created and materials required to produce a new component.

One respondent noted sustainability is influencing their designs through the use of systems with variable flow pumps, electronic control, and electro-hydraulic proportional valves. These can lead to more precise and efficient operation, helping to minimize energy use and emissions.

Several other respondents noted the development of leak-free systems. This ensures not only efficient operation but also prevents harmful substances, such as hydraulic fluid, from getting into the environment.

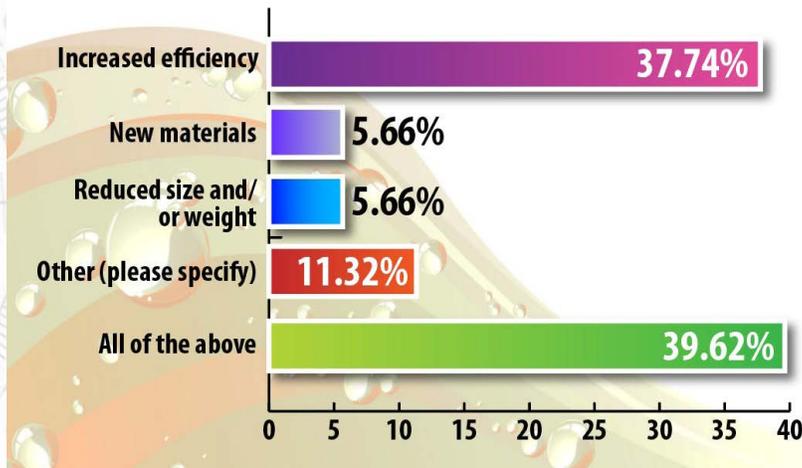
Use of sensors to monitor pneumatic air consumption and selection of raw materials and performance validation processes were additional methods noted by respondents.

A number of respondents also noted the growing interest from customers in wanting information on the sustainability practices of manufacturers and their suppliers and general interest from customers in utilizing products considered to be more sustainable.

[READ MORE: Sustainability Emerging as Key Trend for Tribology Industry](#)

Of the design changes being made to hydraulics and pneumatics to meet sustainability goals, increasing efficiency was the top choice for sur-

What changes are being made to hydraulics and pneumatics to meet sustainability goals?



Increasing efficiency is one of the biggest changes being made to hydraulics and pneumatics to meet sustainability goals.

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vey respondents.

Some additional design changes respondents said they are making include incorporating sensors, better engineering their products and improving oil purifying solutions.

Hydraulics are known to be a relatively inefficient, but powerful, technology. As such, this is an area in which many hydraulics manufacturers have been focusing their technology development efforts in recent years because of the energy and emissions savings which can be achieved. It is also becoming increasingly important to the transition to electrification to ensure battery power can last as long as possible between charges.

Parisse said that more and more Bosch Rexroth has customers asking how they can save energy to reduce their carbon footprint. “It’s therefore incumbent on us that our technologies serve as simple ways to integrate with existing machines to achieve substantial sustainability targets,” he said. “Companies are constantly looking for those solutions when they want to

make their processes more efficient.”

According to Dr. Andreas Schumacher, Senior Director, Head of Sustainability and Product Compliance at [Danfoss Power Solutions](#), the benefits of efficiency can be broken into three aspects — cost, performance and sustainability. Higher levels of efficiency lead to fewer losses, creating a more attractive system from a total cost of ownership perspective he said during a webinar with *Power & Motion* about efficiency.

In terms of performance, more efficient systems allow you to either do the same amount of work with less energy or you can do more work with the same amount of energy. For the sustainability aspect, he said fewer losses means fewer emissions “because you are not burning energy.”

[Register for the webinar “The Role Efficiency Plays in Achieving Sustainability Goals” to learn more about the interplay between efficiency and sustainability from Dr. Schumacher and Lucas Knapp Vice President of Product & Marketing at HARTING.](#)

There is also room for efficiency gains in pneumatics. Langro said Festo is bringing more intelligence into its products to enhance efficiency such as the company’s intelligent air prep series, the MS6E energy saving modules. “The unit can detect when the machine goes into an idle state and can then maintain a reduced pressure or shut down air to the machine or section of the machine, eliminating excess energy usage due to compressed air leaks,” he explained.

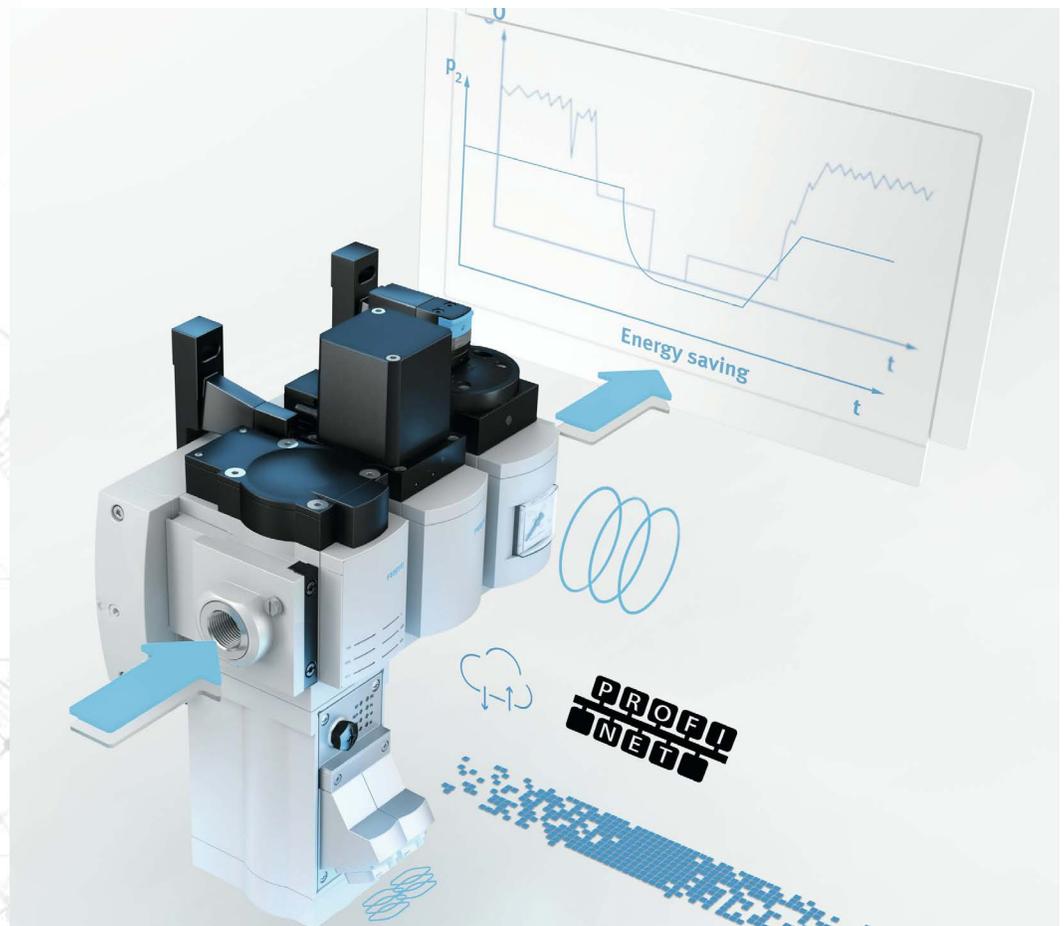
[READ MORE - Improve Pneumatic System Efficiency: Key Steps to Follow](#)

In recent years, Langro said Festo has released new products which are lighter in weight to aid with sustainability efforts as well, leading to a reduction in the amount of excess material that might otherwise be used in a product. He provided the example of the company's [compact cylinder ADN-S](#) offering a 48% weight reduction compared to the ISO standard ADN cylinder. "The two-fold advantage here being the lower carbon footprint of the product while meeting the market need of a space saving, compact footprint," he said.

The company has also increased use of re-melted aluminum in its products, to a point that it makes up 78% of annual aluminum usage, said Langro. This helps to reduce the number of raw materials required which can have several environmental impacts associated with them.

Sustainability Presents Challenges and Opportunities for Fluid Power

Costs were the most common response when asked about the challenges associated with taking sustainability into account for the design and use of fluid power technologies. Many noted the higher initial cost of newer, more sustainable products.



The MS6E energy saving modules from Festo can detect when a machine goes into an idle state and maintain a reduced pressure or shut down air to the machine to help reduce energy consumption. Festo Corp.

As one respondent pointed out, existing hydraulic and pneumatic components are getting outdated day by day and the present-day components are more advantageous. However, modifications required to replace older technologies with newer options can be difficult and expensive.

Parisse agreed that higher initial costs are typically associated with incorporating sustainability measures and this can pose challenging. “[Adding] extra devices that slow down pumps, monitor pressure feedback, and track insightful data, those all come with an added up-front cost,” he said. “However, when considering sustainability measures, we encourage customers to answer the question, ‘What is the return on the investment?’ ‘How important are these measures to them?’

“We make sure we’re having educated conversations about the positive impacts these solutions can have, including how they ultimately impact a company’s future bottom line.”

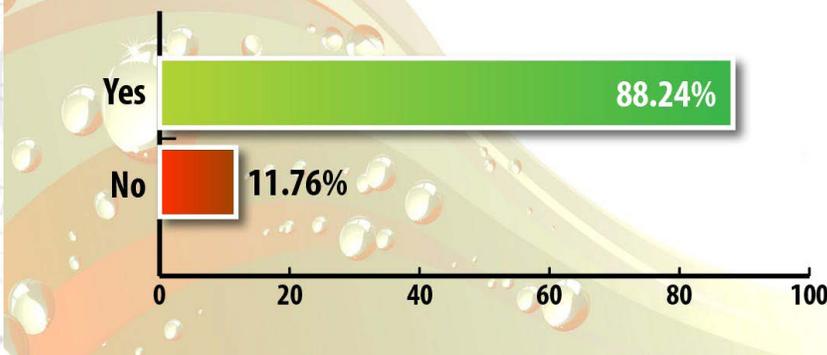
Survey respondents noted several other challenges presented by sustainability including:

- resistance from end customers,
- component availability,
- raw material selection and availability,
- compatibility with existing systems,
- considering the entire lifecycle of a product
- ensuring productivity, maintenance and other performance attributes.



The Festo ADN-S pneumatic cylinder weighs 48% less than the standard ISO version, reducing material use and space claim within machines. Festo Corp.

Do you see efforts to be more sustainable as an opportunity for the fluid power industry?



The majority of respondents to a Power & Motion survey said they see sustainability as an opportunity for the fluid power industry. © Endeavor Business Media

Langro said it is important to create a balance between employing sustainability and meeting desired performance specifications. In addition, looking at the full “cradle to grave” supply chain for a product is necessary to truly improve sustainability practices. For Festo, this includes an assessment of the most efficient ways to transport products as well as utilizing reusable materials for its product packaging.

The majority of survey respondents, 88%, said they see efforts to be more sustainable as an opportunity for the hydraulics and pneumatics industry.

Several respondents said sustainability provides the chance to create new products and integrate advanced technologies such as IoT (Internet of Things). There are also emerging market opportunities such as the production of hydrogen.

Many also noted the benefits that will be achieved through more sustainable fluid power solutions such as reducing energy consumption and service needs. One respondent noted that “hydraulics are still the most efficient way of transferring energy (in terms of power density). But in order to keep hydraulics alive we must keep [increasing the] overall efficiency of hydraulic systems.”

[READ MORE: Manufacturers Increase Sustainability Initiatives](#)



Bosch Rexroth's CytroPac and CytroBox incorporate its Sytronix technology comprised of a variable-speed pump drive which aids with energy savings and noise reductions.

Bosch Rexroth

Both Parisse and Langro agree that sustainability offers opportunities for the fluid power industry.

For Bosch Rexroth, this includes more solutions based on its Sytronix technology which utilizes variable-speed pump drives to save energy and reduce noise. Parisse said it enables pump efficiency to be optimized and provide energy on demand. “With eco-friendly solutions, every drop of energy that’s put in, you’ll get more out.”

Hydraulic circuit design will be an important aspect as well going forward as more solutions for sustainability will be considered from the ground up. This will lead to more efficient pumps, less throttling across valves and reduced oil use.

“We’ve seen that with our [CytroPac](#) and CytroBox — they use a quarter of the oil as a traditional power unit,” he said. “In general, the less oil that’s used in any solution, the better. We see that continuing in the future along with an increased use of electronics and greater incorporation of sustainability measures in the design of hydraulic circuits.”

“I believe that change always creates opportunity. As the users of fluid power request higher levels of sustainability in their machine operation and decreased carbon footprint of the items in their machines, this will require further innovative products and solutions,” concluded Langro.

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Paradee Paradee | Dreamstime.com

CHAPTER 2:

Reduce, Reuse and Recycle: 3 Key Facets to a Circular Supply Chain

SARA JENSEN, Executive Editor, *Power & Motion*

The concept of circular supply chains is to reduce waste and promote sustainability by using materials and goods as long as possible.

Creation of a circular supply chain is one of the many methods being employed to improve sustainability.

Unlike traditional supply chains in which materials and goods are produced, consumed and wasted, a circular supply chain aims to reduce waste by using materials and goods as long as possible. This can include the recycling and reuse of materials such as plastics, steel and cardboard as well as the refurbishing of previously owned products. Essentially, a loop is created in which materials and goods are returned to a manufacturer.

Doing so not only helps to lower the number of materials sourced and used in goods production, but also aids with emissions reduction efforts and other sustainability initiatives.

For component manufacturers who are in the early stages of the supply chain, it is important to understand what circularity means from both a customer and regulatory perspective said Zhao Wang, Strategy and Business Development at TE Connectivity, during a panel discussion on circular supply chains which took place as part of the [ZAPI GROUP's Future of Electrification 2024 event](#).

[READ MORE: Electrification Growth Prompts Launch of New Engineering Conference](#)

Understanding these requirements allows the necessary technical aspects to be integrated into the design of a product, she said. "When we talk about circularity and sustainability, in general, it's about making this planet a better place to live, so we see a lot

CIRCULAR ECONOMY



LINEAR ECONOMY



A depiction of circular vs. linear supply chains. In a circular supply chain, efforts are made to reuse, reduce and recycle materials and goods as much as possible to minimize waste. Petovarga | Dreamstime.com

of requirements from the governmental point of view,” said Wang. “We need to make sure that what we do is compliant with what is being required by national, regional and international [regulations].”

Wang said design considerations for circular supply chains can be categorized into three key areas—reduce, reuse and recycle. “From my point of view, if we really want to look into a circular economy we need take these three points into consideration,” she said.

Following is an outline of what these terms mean to the creation of a circular supply chain and examples of how they are being implemented within various industries.

1. Reduce Materials and Waste

When talking about the term reduce in relation to circular supply chains, Wang said it is not only about materials but also waste. Materials used in production as well as waste that can occur during each stage of the manufacturing supply chain should be taken into consideration—everything from the raw materials, processing, transportation and more.

There are of course numerous ways materials and waste can be reduced. [Technology company igus](#), for instance, has installed magnetic foils, guide plates and other mechanical devices to

Circular Supply Chain vs. Circular Economy

The terms ‘circular supply chain’ and ‘circular economy’ are often used when talking about sustainability. So, what exactly do these terms mean and how do they differ from one another, if at all?

Both have to do with prolonging use of materials and goods as long as possible through the principles of reduce, reuse and recycle with the caveat that one applies to the supply chain of a single entity and the other an entire economy.

Circular supply chains can be driven by a manufacturer or other goods producers’ own sustainability goals as well as government regulations while a circular economy is primarily driven by the government. For the latter this can take the form of regulations, incentives for following circular best practices and financial penalties.

prevent parts from falling out of machines during the production process which would otherwise cause them to become waste. According to the company, in 2021 it was able to reduce its waste ratio by 21% because of these devices and other measures taken.

Another potential avenue [for reducing materials is the use of additive manufacturing](#) (also referred to as 3D printing). With additive manufacturing, material can be placed only where needed as well as allow for the integration of multiple parts into a single device. Both of these aspects help to reduce the amount of material required for component production. Less machining is also required when utilizing additive manufacturing, offering the potential to reduce energy and waste.

[In the article “How 3D Printing Can Drive Us Toward a More Sustainable Future” from Endeavor Business Media partner site Machine Design](#), it is said that additive manufacturing is a key enabler of a circular economy. This is due to the ability to reuse and recycle materials throughout the process. In addition, this technology allows many to produce a component locally on site, reducing the need for transporting goods.

3D printer manufacturer Desktop Metal Inc. recently announced its qualification of a 100% recycled nickel-based superalloy from Continuum Powders. It is listed as R&D Qualified in the company’s binder jet 3D printing portfolio and can be used for applications requiring high strength at temperatures up to 1,000 C.

“The fact that we’re seeing reclaimed metal powders validated by Desktop Metal, along

Creation of a circular supply chain in which materials and goods are used as long as possible can help manufacturers lower their carbon footprint. Thai Noipho |

Dreamstime.com



with other leading AM (additive manufacturing) OEMs, signals that these materials are now a proven resource for manufacturers,” said Continuum Powders’ CEO Rob Higby in the press release announcing Desktop Metal’s qualification of its powder. “Use of recycled powders can shorten supply chains, reduce costs and support corporate goals for carbon footprint reduction.”

2. Reuse What is Feasible

In terms of reuse, Wang said it is important to think about the second life of a product. For goods such as clothing and plastic bottles, there are many ways items like these can be reused such as reselling clothes or turning plastic bottles into other products.

But for components used in mobile and industrial machinery, she said a more detailed study is required to determine exactly how reuse will occur. “Is it about how we reuse materials? Is it about how we reuse scraps? Or is it about how we reuse the product when it goes into customers’ products?” said Wang.

This is an area in which igus is investing its resources as well by working to reuse materials when possible. Per the company, 99% of the rejected materials from its injection molding production are recycled and returned to the manufacturing process. Reusing

Once past their useful life in electric vehicles, lithium-ion batteries can be used for energy storage and other applications but some challenges still exist with doing so. Vessathada | Dreamstime.com



materials in this manner minimizes the amount of raw material required for its component designs as well as the transport of them to igus' various facilities.

Electric vehicle batteries are a component which often comes to mind when discussing reuse. Once past their useful life, there is the potential for utilizing batteries for energy storage or other applications. However, there are some challenges associated with second-life batteries (as they are referred to) noted Trevor Steele, Business Development Manager at Staff Systems—a developer of lithium-ion batteries—during the circular supply chain panel discussion.

“In a lot of cases, we don't understand how that battery was used,” he said. Typically, there is no information available on whether the battery was abused in some way which is critical to know in a second-life application.

“There should be some technology coming out in the next few years that should help with that, but for right now second life is more limited because we don't have that history of use [information],” said Steele.

[READ MORE: Getting Connected to Sustainability](#)

3. Recycle Throughout the Value Chain

Recycling can come in many forms as well. From TE Connectivity's perspective, Wang said it includes reusing raw materials or scraps as well as the collection of waste heat generated during manufacturing which is then used to heat office buildings.

Here again igus is making major investments. In 2022, the company introduced its first e-chain cable carrier made from 100% recycled materials which features the same wear behavior, stability and bending fatigue as conventional versions. The company offers various other components made from recycled materials as well.



The E2.1.CG cradle-chain from igus is made from 100% recycled materials with almost the same technical properties and load limits as an energy chain made from standard materials. igus

[READ MORE: igus Unveils Bike Made from Recycled Plastic](#)

igus has invested in Mura Technology's Hydrothermal Plastic Recycling Solution which uses pressure, heat, and water to turn plastic waste into oil that can be utilized for production of new plastics. igus

The company has also established the change recycling program which allows customers to turn in old cable carriers — which can be from igus or other manufacturers — for recycling; customers receive a voucher for the purchase of new igus products. As of December 2021, the company states on its website it has received 25.97 tons of material.

Additionally, igus is investing in companies that can aid its recycling efforts. One such company is Mura Technology which has developed a plastics recycling plant known as the Hydrothermal Plastic Recycling Solution (HydroPRS). The plant uses only pressure, heat and water to turn plastic waste back into oil within 30 minutes. This oil can then be used to produce new plastics and other products.



Per an igus press release on the commissioning of the HydroPRS plant, independent life-cycle analyses by WMG at the University of Warwick have shown that carbon dioxide (CO₂) emissions are 80% lower than with combustion. When compared to fossil oil-based raw materials, the HydroPRS plant is able to offer products with equivalent or lower global warming potential and save up to around 5 barrels of oil for every tonne of plastic waste processed.

“This technology is a real game changer in plastics recycling,” said igus CEO Frank Blase.

When developing its Air-X filter technology for use with hydraulic reservoirs, a key aspect for HYDAC International was to use materials which could be recycled. Filters are a component which need to routinely be replaced due to the nature of their job — capturing contaminants — leading to them being thrown out.

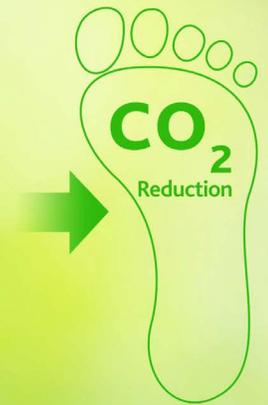
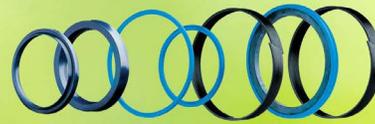
To help mitigate the waste associated with frequent filter replacements, HYDAC chose to use plastic and aluminum for the cartridge used in its filter as they are both recyclable materials. According to the company, its goal was to develop a filter containing as many core components as possible which could be reused.

[READ MORE about the Air-X filter and how sustainability is influencing fluid power filtration in the article “Innovation is Transforming Filter Designs for Fluid Power Systems.”](#)

As resources become scarcer and concerns over environmental impacts from emissions and other byproducts of goods production increase, establishing circular supply chains offer the potential to help mitigate these issues and create a more sustainable future.

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Freudenberg Sealing Technologies

CHAPTER 3:

Reduce Emissions Through New Materials and Production Methods

SARA JENSEN, Executive Editor, *Power & Motion*

Bio-based materials and lower emissions methods of producing steel are aiding decarbonization efforts for manufacturers.

The materials from which components are made — such as steel, plastic and rubber — can play an important part in their performance and lifespan. Extracting, producing and utilizing these materials, however, can be energy intensive and dependent upon finite resources.

With an increased emphasis on sustainability across the entire supply chain, many companies are looking to new material options and production methods to mitigate environmental impacts, including those in and related to the fluid power and electric motion control sector.

Bio-Based Materials Provide More Sustainable Option

In an effort to reduce the use of finite raw materials such as petroleum which are used for plastics and rubber, many manufacturers and research organizations are looking into potential alternatives.

Chief among these are bio-based options made from plants and other renewable sources. [SMC Corp.](#), for instance, now offers biomass tubing produced from plant derived raw biomaterials such as castor seeds.

SMC's new biomass tubing is produced from plant derived raw biomaterials, reducing the use of petroleum-based raw materials and thus carbon emissions. SMC Corporation of America

According to the company, reducing use of petroleum-based raw materials can lead to reductions in both carbon dioxide (CO₂) and greenhouse gas (GHG) emissions, benefiting SMC and its customers' decarbonization goals. This is possible because of the emissions associated with harvesting and refining raw materials which will no longer be created. In addition, bio-based materials have the potential to be recycled, further adding to emissions reduction opportunities.

[READ MORE: Pneumatic Designs Evolving to Meet Industry Trends](#)

[Freudenberg Sealing Technologies](#) is analyzing the possibility of using various sustainable substances for its seals. The company said these can include plant or animal sources as well as recycled materials.

"Our intention is to decrease the CO₂ footprint of our products," said Dr. Boris Traber, Director of Advanced Material Development for Freudenberg Sealing Technologies in Germany, in a press release discussing the company's research in this area. "Some of our base polymers have a high CO₂ footprint, and if we use sustainable fillers, we can achieve a smaller footprint. But at the same time, we do not want to compromise our sealing properties. The sustainable material must provide the same sealing functionality."

Traber noted that customers are more interested today in utilizing sustainable materials which is helping drive Freudenberg's development of them. Additionally, there are predictions that global oil reserves may only last another 50 years, emphasizing the need for alternatives to fossil-based materials.

Material experts at Freudenberg's research & development laboratories in Plymouth, MI, are currently assessing numerous sustainable options including calcium phosphate derived from bone ash, an antioxidant extracted from Eucalyptus plants, sugarcane, grain chaff, and recycled rubber, among many others.



SMC is one of several fluid power manufacturers researching and where applicable utilizing renewable materials such as those from plants to minimize their environmental impact. SMC Corporation of America

The company said extensive evaluation and testing is being undertaken to determine which sustainable materials can provide the same quality and performance as fossil-based options. Doing so is necessary to ensure Freudenberg continues to provide products that meet customer requirements.

[READ MORE: Selection and use of bio-based hydraulic fluids](#)

Proceed with Caution When Using Alternative Materials

While there are many potential benefits to using bio-based and other material alternatives, it is important to properly assess all aspects of their use. As the [study “The potential of emerging bio-based products to reduce environmental impacts”](#) points out, on average emissions are 45% lower for emerging bio-based products. However, on an individual product basis the emissions savings can vary widely.

Researchers for this study believe it is necessary to evaluate environmental benefits on an individual product basis and that more development is required to reach global emissions-reduction targets.

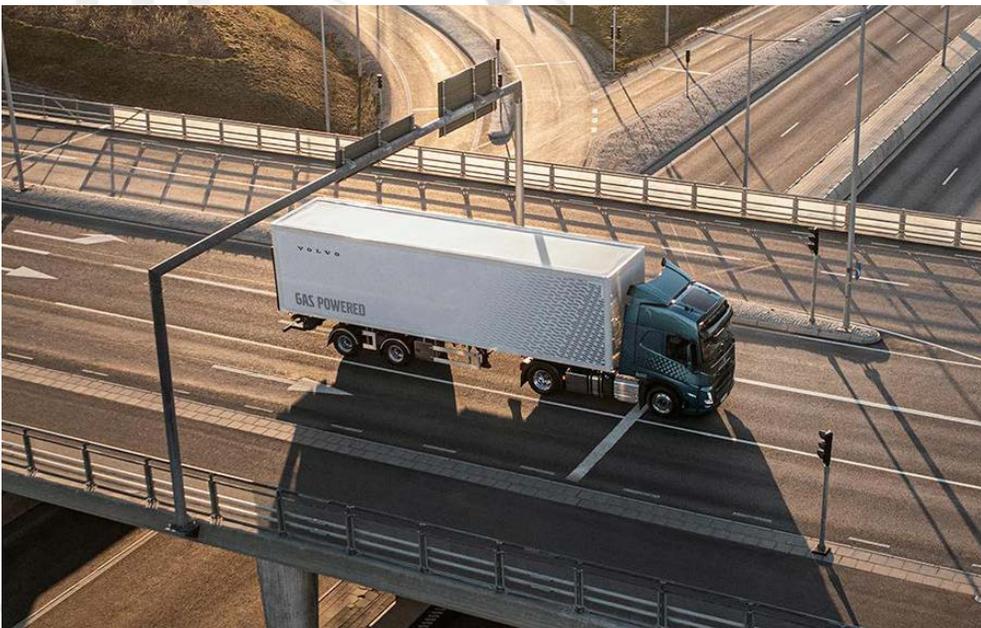
There are many factors to consider with alternative materials. Some options may still be energy intensive to harvest and produce, negating their emissions reduction potential. It can also be costly to make the material, leading to costs being passed on to customers who may not see the value in using a more expensive option.

Freudenberg pointed out that one of the biggest challenges can be reliably sourcing plentiful, high-quality feedstocks that will result in consistent batch material production. The company went on to say that a poor growing season, the quality of a recycled source material, and other factors could all pose challenges.

Traber gave the example of sustainable carbon black. Processing sustainable carbon

black from recycled tires is energy intensive and requires a consistent, high-quality source of tires. There is also market competition from tire manufacturers and other industries who want to use the material for their own sustainability efforts, presenting further challenges.

As Freudenberg noted, extensive testing is also required to ensure the chosen material will meet desired performance requirements. If they don't, customers are less likely to purchase them which hinders market uptake and implementation of potential environmental benefits.



Volvo Group sees greater demand from customers for products which have less of an impact on the environment, including materials such as green steel. Volvo Group

[LEARN MORE: Sustainability, Education and Testing Important to Hallite's Seal Development](#)

Decarbonizing Steel Production

Steel is an important material for the manufacture of many fluid power and electric motion control components, as well as the machines in which they are used. Production of these materials, though, are a large contributor to carbon emissions.

[Citing data from environmental advocacy group Industrious Labs, Politico reported in early 2024](#) that the steel industry is responsible for at least 7% of global GHG emissions and up to 30-50% of total emissions associated with the manufacture of cars.

This has prompted some producers and other organizations to investigate alternative methods for producing steel as well as other metals.

[The Race to Green Steel initiative](#), for instance, was launched in February 2024, creating a coalition of environmental and transportation groups urging the production and use of so-called green steel — that which is made from sources other than coal such as hydrogen and renewable electricity.

Sweden- and U.S.-based steel producer SSAB initiated its efforts to produce fossil-free steel in 2016, culminating in its HYBRIT joint venture which produced what is thought to be the world's first fossil-free steel in 2021. The HYBRIT technology replaces coal in the iron ore reduction process with hydrogen which the company states removes fossil carbon emissions, causing water instead of CO₂ to be emitted during the steel production process.

Watch SSAB's video below to learn more about how the process works.



Since production of its first steel made with the HYBRIT technology, SSAB has been working with various OEMs and other customers to use this fossil-free steel product.

Mining equipment manufacturer Epiroc is one such example. The OEM is partnering with SSAB to research use of the fossil-free steel for spare parts and component production using additive manufacturing. They are starting with a hydraulic block utilized in the OEM's mining rock drills which they believe will offer opportunities to improve its design.

[READ MORE about this project in the article "Manufacturers Researching More Sustainable Component Production Process."](#)

Volvo Group is another OEM which has been working with SSAB to use its fossil-free steel since it first became available. Both the company's truck and construction equipment divisions are utilizing the steel, demonstrating its ability to be used in heavy-duty applications. Volvo Construction Equipment (Volvo CE) unveiled its first concept machine made

with the steel in October 2021, a load carrier for mining and quarrying, which it put through rigorous testing to validate the capabilities of fossil-free steel.

Nine months later, the company delivered its first production machine made with the SSAB steel to a customer, an A30G articulated hauler. The company stated in its press release announcing the delivery that use of SSAB's steel is part of its goal to achieve net-zero GHG emissions by 2040. To do so, Volvo CE said it needs to reduce its carbon footprint across its entire value chain which includes the raw materials required to manufacture its machines and components. Continued use of the steel will be gradual, the company said and dependent upon various aspects such as availability of the fossil-free steel.

Stegra (formerly known as H2 Green Steel) is another company working to reduce the emissions associated with steel production. The Swedish startup uses green hydrogen — that which is produced from hydro- and wind-powered energy — to produce steel; the company states its process can achieve up to a 95% reduction in CO₂ emissions, enabling it to offer a near-zero emissions product.



The Volvo CE A30G articulated hauler is made from SSAB's fossil-free steel which testing by the OEM has demonstrated its ability to withstand use in harsh operating environments. Volvo Construction Equipment

Volvo Group has signed a long-term agreement with Stegra to purchase its steel, further enhancing its decarbonization efforts. As a founding member of the [First Movers Coalition](#), the company has committed to have at least 10% of all steel purchased per year be near-zero emissions by 2030 which the agreement with Stegra will help it achieve.

“The commercial vehicle industry has actively been driving the demand for green steel, validating the market interest. When [a] large player like Volvo Group, working at the forefront of sustainable change, places a customer order it's a clear sign of confidence in both our company and our product,” said Henrik Henriksson, Stegra's CEO, in the press release announcing the supply agreement with Volvo.

[Schaeffler Group](#) is also partnering with the startup, announcing in 2023 an increased investment in Stegra. The companies will work together to develop use of the near-zero emissions steel for electromobility solutions as well as rolling bearing products.

Like many manufacturers, Schaeffler has committed to reducing its carbon footprint with the current aim of becoming completely carbon neutral by 2040. By 2030 it wants to achieve climate neutrality in its own production processes (Scope 1 and 2) and a 25% reduction in its supply chain emissions (Scope 3 upstream) which will require decarbonizing the materials used for its products.

According to Schaeffler, the company uses an amount of steel equivalent to that in the Eiffel Tower each working day which is over 7,000 tons. Working with Stegra to use its steel will therefore play an important role in helping the company achieve its emissions-reduction goals.

Material selection is of course just one piece of the decarbonization puzzle, but an important one which these and other efforts being made by various component and machine manufacturers demonstrate.

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[Read “Circular Steel: What It Is, How It’s Made and Its Role in Reducing Emissions”](#) to learn about other steel production methods being employed as part of decarbonization efforts from Endeavor Business Media partner site Industry Week.



Use of green steel, that which does not produce carbon emissions during its production process, will play an important role in Schaeffler's efforts to decarbonize its supply chain. Schaeffler



Zimmytws | Dreamstime.com

CHAPTER 4:

PFAS Regulations: The Impacts for Fluid Power and Electromechanical Systems

SARA JENSEN, Executive Editor, *Power & Motion*

Emerging global regulations aimed at limiting the use of PFAS will provide new design opportunities and challenges for manufacturers of fluid power and electromechanical systems.

The U.S. and Europe are implementing regulations related to the family of per- and polyfluoroalkyl substances (PFAS) utilized in a range of products. They are considered forever chemicals because they do not break down easily and can therefore cause harm to humans and the environment by getting into waterways, soil and more.

On April 10, 2024, the U.S. Environmental Protection Agency (EPA) announced the final National Primary Drinking Water Regulation (NPDWR) for six PFAS to limit how much of these substances can be present in public drinking water. In addition, the EPA has established a rule requiring manufacturers to report use of PFAS (see sidebar on page 8).

Meanwhile in Europe, the European Chemicals Agency (ECHA) published a proposal on February 7, 2023, for a comprehensive PFAS ban. This legislation is still under review, but [current projected timelines show it could be enforced as soon as the end of the decade](#).

While these regulations will benefit the environment, meeting them will be challenging for manufacturers in a range of industries — including those in the fluid power and elec-

Read these articles from Endeavor Business Media partner site WaterWorld and Wastewater Digest to learn more about the U.S. PFAS regulations.

[How PFAS came to be regulated by U.S. EPA](#)

[EPA announces final PFAS Maximum Contaminant Levels \(MCL\)](#)

[How CERCLA's PFOA, PFOS designation could impact wastewater treatment](#)

[Water industry responds to EPA's PFAS MCL ruling](#)

tromechanical motion control sector — due to the widespread use of PFAS and the time it will take to develop appropriate alternatives.

The Challenges Posed by PFAS Regulations

In response to the proposed European legislation, HAWE Hydraulik and [Freudenberg Sealing Technologies](#) noted the prominence of PFAS compounds, particularly fluoropolymers, in many components such as seals, cables and lines, coatings, electronic components, corrosion inhibitors, compressors, motors and hydraulics.

HAWE said in a statement it released related to the blanket ban on PFAS that “the physical and chemical properties of these materials allow our products to withstand various technical parameters, such as high temperatures and wear resistance.”

Freudenberg added that fluoropolymers are often the “material of choice” when seals must meet multiple requirements — such as excellent high-temperature resistance, lubricant compatibility, or complying with stringent standards for material with food contact.

“We support the goals of the European Green Deal and the Chemicals Strategy for Sustainability, but are calling for a differentiated, risk-based approach to chemical regulation than is planned for PFAS,” said Dr. Ruth Bieringer, Vice President of Technology & Innovation at Freudenberg, in a press release discussing the results of a study conducted by the company and Germany-based research organization Fraunhofer on the impact of a potential PFAS ban.



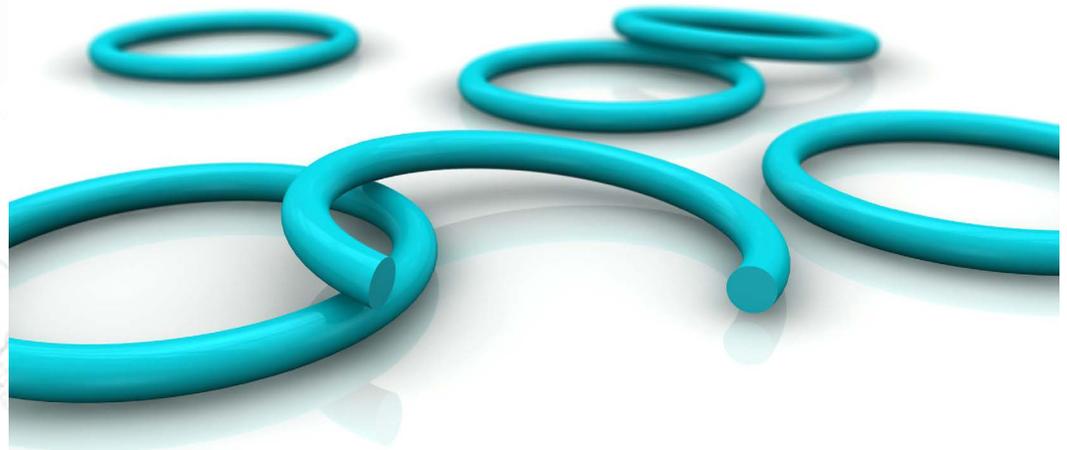
PFAS are used in numerous applications, including compressors, motors, transmissions, drive systems, as well as in hydraulics and the food and beverage industry. Freudenberg Sealing Technologies

Developing alternative options which meet the same performance requirements as PFAS-based technologies will take time. And as Nancy Getz, Global Product Line Director at [Trelleborg Sealing Solutions](#) said in an interview with *Power & Motion*, there are some performance advantages that customers might sacrifice with PFAS-free alternatives such as the low friction properties achieved with PTFE (polytetrafluoroethylene, a commonly used type of fluoropolymer).

“A different material may cause a product to wear faster, reduce its operating temperature range or have less material compatibility than its fluoropolymer counterpart,” she said. “That’s why it’s important for customers to engage with us to find the best material for their application.”

She went on to say that Trelleborg is proactively contributing to the development of effective regulatory change. “Simplistic ‘one size fits all’ regulations would be problematic as fluoropolymers’ unique attributes mean that they will not be replaced by a single ‘magic bullet’ material; alternatives will need to be developed as ‘premier’ application-specific solutions.

“New regulations related to PFAS need to be differentiated by application because for some materials in demanding environments more time will be needed to develop effective new solutions,” she said.



The low-friction properties of PTFE have led to their use in o-rings and many other products. If included in a widespread PFAS ban though alternative options may not be able to provide the same performance characteristics.

Trelleborg Sealing Solutions

In a webinar co-hosted by [Assent Inc.](#) — a provider of supply chain sustainability management solutions — and the Association of Equipment Manufacturers (AEM), Jason Malcore, Senior Director, Safety & Product Leadership at AEM, said there are not viable replacements for many of the PFAS chemistries currently used by OEMs and their component suppliers.

“Now the components you’re going to use, the equipment you’re going to build, is not going to have the [same] critical functionalities,” he said. “This could result in a number of things. If you’re using sealing technology and hydraulics, you could have a loss of pres-

sure which means massive safety concerns, damage to the machine, severe performance [and] quality problems.”

[READ MORE: The Right Seal Reduces Contamination in Hydraulic Systems](#)

Differentiation Between Regulations

Governments at all levels — city, state and national — are looking to regulate the use of PFAS because of their environmental impact. However, this means there is also differentiation between some of the regulations which can be challenging to monitor and design products to meet.

As Cally Edgren, Vice President, Sustainability at Assent Inc., noted during the webinar with AEM, PTFE is in the scope of some regulations but not others. “That’s where understanding the regulations is actually quite critical,” she said.

Malcore added that the sheer number of different emerging PFAS regulations that are coming into play are also adding compliance costs for manufacturers. “It means [they have to] spend more money trying to understand what the rule is, collect different forms of data, [and] perform different activities to meet the requirement in whichever jurisdiction [they’re] trying to sell into.”

AEM and other global construction equipment industry associations co-signed a world-wide Declaration on PFAS restrictions in May 2024. In it the associations discuss the importance of these chemicals to the sector due to their use in critical components and systems, offering the following examples:

- Coatings and Seals: [O-rings](#), gaskets and seals prevent fluid leaks as well as contamination of internal systems from water, dirt, dust and debris. Coatings protect the machine surfaces from premature deterioration, extending machine lifetime.

Cables and hoses transfer fluids and prevent leaks.

- Cables and hoses: Cables and hoses transfer fluids and prevent leaks.

- Hydraulic systems: PFAS is an additive in [hydraulic fluids](#) and lubricants.

- Refrigerants: The industry utilizes two PFAS compounds, HFC-134a and HFO-1234yf, in their air conditioning systems to satisfy various health and safety requirements.

- Alternative Power Technologies: PFAS provides the functional properties that are essential for many new alternative power technologies, including batteries and hydrogen fuel cells.



PFAS covers a number of compounds for which there are not yet viable alternatives, which will pose challenging to those who currently use them in various components. 296186310 © Francesco Scatena | Dreamstime.com

The associations say broad restrictions on PFAS could be harmful to the industry and its supply chain by impacting safety, durability and environmental compliance. Instead, they believe regulations should be “focused on high-risk PFAS, emphasizing prevention of chemical release, proper waste management, and recycling.” Harmonized global definitions and sufficient transition periods would be a better approach as well to benefit both the goals of the regulations and manufacturers’ ability to comply with them.

Authors of the study “Replacement of Polymeric PFAS in Industrial Applications with Harsh Environments,” conducted by Freudenberg and Fraunhofer concluded that a full replacement of PFAS in the sealing industry is not currently feasible without negatively impacting material properties, performance, and product longevity. They instead are advocating for a differentiated and fact-based discussion because of the diversity of the over 10,000 PFAS compounds found in the market today.

“From our perspective, assessing the life cycle of fluoropolymers, which are considered ‘polymers of low concern’, is a credible method for realistically evaluating potential risks to human health and the environment,” said Dr. Raimund Jaeger, Head of the Tribology Business Unit at Fraunhofer IWM in Freudenberg’s press release announcing the release of the study. “All stakeholders involved in this study agree that the safe production and disposal of polymeric PFAS is crucial. As long as precautions are taken to avoid harmful environmental impacts, the continued industrial use of fluoropolymers should remain possible.”

[HAWE](#) noted in its statement that the fluoropolymers it uses meet the criteria for “Polymer of Low Concern” which means they are considered non-toxic, non-bioavailable and non-water soluble.

[READ MORE: Seals contain fluid to pressures well above 4000 psi](#)

Development of PFAS Alternatives Spurring Innovation and Sustainability

Despite the challenges, that does not mean companies are not making efforts to reduce



Trelleborg’s polyurethane (PU) based products offer an existing alternative to PFAS which can be used in a wide range of applications. Trelleborg Sealing Solutions

their use of PFAS. In early March 2024, [igus](#) announced its chainflex cables are now manufactured without PTFE or PFAS chemicals. Additionally, the company is assuring that it is using PFAS-free materials in 95% of its chainflex cables.

As the European Union and other regions assess their PFAS regulations, igus wanted to assure customers of the compliance of its products should a ban take place as well as take another step in its own sustainability journey.

Getz said sustainability and compliance are important areas of focus for Trelleborg. As such, the company is working to find alternative solutions to meet various customer requirements and aims to be PFAS surfactant-free by the end of 2025 at the latest.

“This is an ambitious target to achieve for every material group; for example, for fluoro-elastomers (FFKMs) this may not be realistic, but we need to move as quickly as possible,” she said.

She said some of the solutions Trelleborg currently offers include:

- Various existing alternative compounds that cover a broad range of application replacement qualities. These include PU, ultra-high molecular weight polyethylene (UHMWPE), Polyether Ether Ketone (PEEK), high-performance plastics (HPP) and thermoplastic elastomers (TPE) for some suitable applications.
- Alternative sealing configurations which when paired with non-fluorinated materials can also reduce the need to use PFAS materials.
- Utilizing the company’s polymer R&D capabilities to develop entirely new solutions that can meet challenging application requirements.

“PFAS regulations are spurring innovation and conversations about what is truly possible,” said Getz. “We continue to look at our portfolio of materials and see what properties we can leverage and how better performance can be achieved by pairing an alternative material with the right design.”

She also noted that in addition to PFAS, there are other regulatory changes which could impact the performance of sealing systems. “A lot is possible when you change a seal’s geometry and pair it with the right material, but customers must talk to us about their needs before making decisions about transitioning to alternative products and materials.”

Additionally, she said it is important for customers to remember that new regulations relating to PFAS in fluoropolymers have not been finalized. “While we do recognize the importance of and are proactively identifying alternative solutions, PFAS surfactant-free PTFE may continue to be a viable solution into the foreseeable future,” she said.

Getz concluded by saying, “We don’t want to create waste. If you put PTFE in a landfill, it’s there forever. In the future we want to take production residues and end-of-life materials and give them new value. We work hard to find ways to reuse it in our products or in other demanding applications.

“We know customers are also interested in reducing waste but it’s going to take commitment on both sides. We want to work with customers and say, ‘We know you have requirements to reduce waste and increase circularity. How can we partner up to achieve those objectives?’ We will not compromise on performance, reliability or value of our products and materials.”

[READ MORE: How FFKM Elastomers Benefit Critical Applications](#)

Manufacturers to Report Use of PFAS Starting in 2025

The [U.S Environmental Protection Agency \(EPA\) established a reporting rule in October 2023](#) that requires those who manufactured or imported Per- and Polyfluoroalkyl Substances (PFAS) as well as products containing the substance between January 1, 2011, and January 1, 2023, to submit information on their use of PFAS to the EPA.

Manufacturers are being asked to submit information related to chemical identities, production volumes, industrial uses, commercial and consumer uses, worker exposures, disposal, and any existing information related to potential environmental and health effects.

Initially, reporting was to begin November 12, 2024, but on September 5 the EPA extended the reporting timeframe due to budget constraints which impacted development of its reporting software. Reporting is now scheduled to begin in July 2025. During this extension period the EPA will seek more feedback from the industry on the necessary reporting and its Central Data Exchange (CDX) system through which the information will be submitted.

[Organizations such as the Association of Equipment Manufacturers \(AEM\)](#) and National Association of Manufacturers (NAM) note the extended reporting timeframe is beneficial for the industry as it provides more time to fully understand and collect the required information.

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CHAPTER 5:

What are Scope Emissions and How Can They be Addressed?

SARA JENSEN, Executive Editor, *Power & Motion*

Scope 1, 2 and 3 emissions classify the types of greenhouse gases produced by companies to help them better understand how they can reduce their carbon footprint.

In 2001, the World Resources Institute and the World Business Council for Sustainable Development created global standards for measuring greenhouse gas (GHG) emissions known as Scope 1, 2 and 3 emissions.

These three categories were established to help classify the types of GHG emissions produced by companies and aid with setting targets to reduce them. Doing so has become increasingly important to many manufacturers — including those in the fluid power and electromechanical motion control industries as well as their customer markets — who want to be better environmental stewards and help mitigate further warming of the planet.

Scope 1 Emissions

Scope 1 emissions are those which are produced by a company at its own facilities such as GHG created by burning oil or gas to heat a building.

To reduce these emissions, many companies are employing more efficient technologies to reduce energy use which leads to fewer emissions produced. This can include installing newer, more energy-efficient equipment in a facility or updating company fleets to electric or other alternatively powered vehicles.

In late 2023, battery charging technology developer [Delta-Q Technologies announced](#) it achieved the goals of its Scope 1 and 2 emissions reduction targets. To meet its Scope 1 targets, the company built a new global headquarters equipped with technologies designed to meet the company's net-zero emissions goals.

Electric heat pumps, ultra-efficient LED lighting, smart building controls and enhanced insulation are used in the new building to reduce energy consumption. In addition, the company said in its press release announcing it achieved its emissions reduction targets

that it no longer consumes fossil fuels for heating or powering any systems in its new headquarters. This results in zero direct carbon emissions the company said.

Scope 2 Emissions

Scope 2 deals with indirect emissions related to the purchase of electricity, steam, heat or cooling. Because they have to do with a company's energy use, and ability to potentially reduce that or use alternative sources, they are included in the scope emissions.

To mitigate these types of emissions, many companies are turning to alternatives to fossil-based energy sources such as solar panels and wind turbines. Delta-Q Technologies for instance, is using energy supplied by a hydroelectric grid to power all systems at its new headquarters which has enabled it to achieve near-zero emissions.

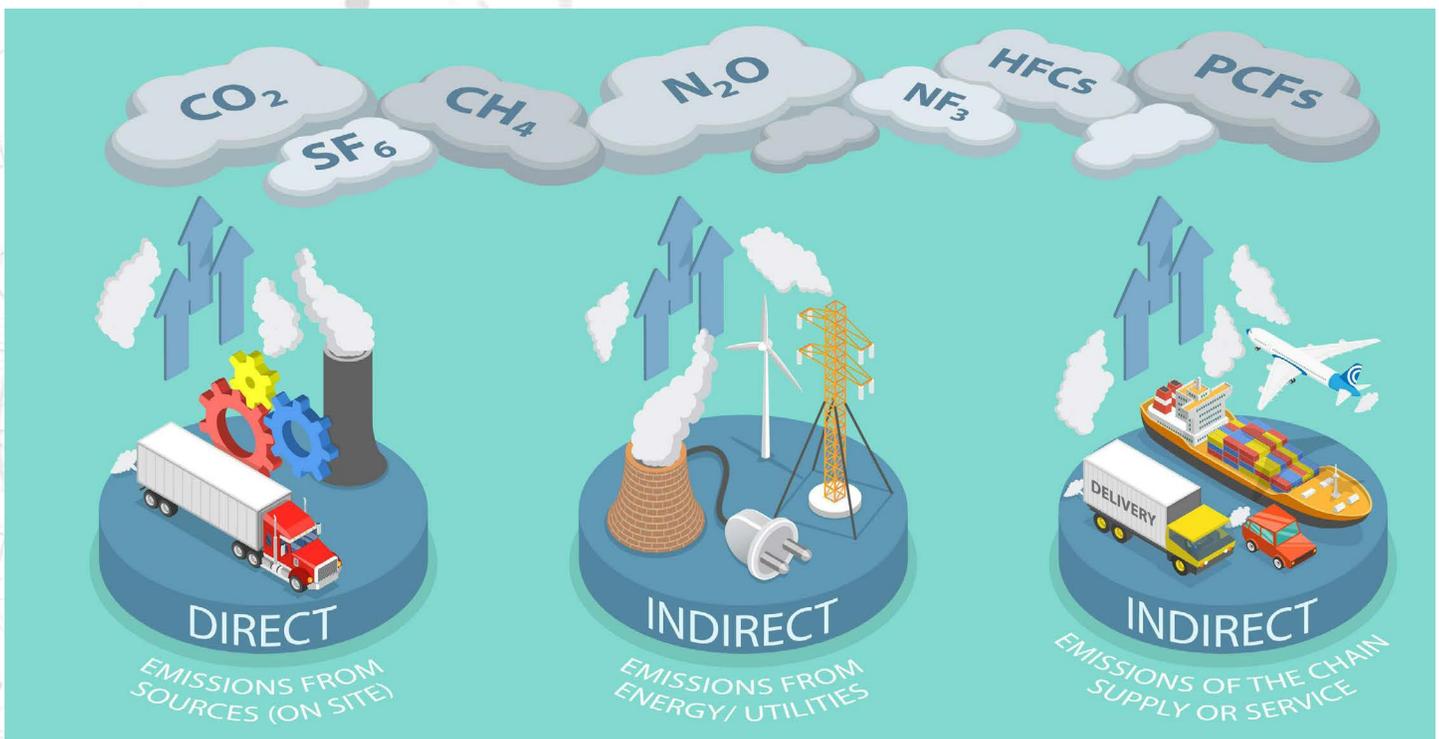
By utilizing less energy and reducing dependence upon fossil-based sources like coal and

What are Greenhouse Gas Emissions?

Greenhouse gases are those such as carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O) which are released into the atmosphere and trap heat, causing the earth to get warmer. Various human activities are considered to be the leading producer of GHG emissions, such as burning fossil fuels for electricity and transportation.

Transportation and industry are among the top producers of GHG which is why there are so many efforts to reduce emissions from these sectors.

ISN, a provider of contractor and supplier information management tools, [recently collected data from contractors and suppliers in a range of industries](#) — including construction, manufacturing, mining and more — to gauge how they are addressing their Environmental, Social & Governance (ESG) goals. In terms of the environment, ISN's analysis showed 16% of companies have strategies in place to reduce GHG and nearly 18% are calculating and reporting both Scope 1 & 2 Emissions data.



Scope emissions categorize the types of greenhouse gases produced by companies to help entities better analyze their output and reduction strategies. 239801700 © Tarikvision | Dreamstime.com



SCOPE 2 INDIRECT EMISSIONS FROM ENERGY / UTILITIES

Scope 2 emissions are those related to the purchase of electricity and other energy sources and can be lowered by using less energy as well as solar, wind or other fossil fuel alternatives. Rudzhan Nagiev | Dreamstime.com

gas, demand for these products can be lowered as well as the emissions associated with producing and using them.

In 2022, Danfoss' largest production facility located in Nordborg, Denmark became carbon neutral. The 250,000 m² facility was able to do so by reducing its energy consumption, reusing excess heat from processes and data centers as well as purchasing green electricity—that which is produced from renewable energy sources such as solar and wind.

Five additional factories became carbon neutral at the end of 2023, with more set to do the same in the coming years. Like many companies, Danfoss has set ambitious emissions reduction targets; it has committed to reducing 46.2% of its absolute Scope 1 and 2 emissions by 2030 which it aims to achieve through steps like decarbonizing its production facilities.

In line with these efforts, [Danfoss announced in 2023 its plans to power all of its facilities in North America with solar energy by 2025](#). It believes doing so will help reduce the company's carbon footprint in North America by 75%. Danfoss also plans to reduce and reuse energy in these facilities by utilizing oil-free, variable speed compressors and other technologies that can recover heat and improve energy efficiency.

[READ MORE: The Differences Between Oil-Free and Oil-Lubricated Air Compressors](#)

Scope 3 Emissions

Scope 3 covers all other indirect emissions sources such as those associated with materials purchased and utilized by a company. The [U.S. Environmental Protection Agency \(EPA\) said Scope 3 emissions](#) are also referred to as value chain emissions and include those which are produced both upstream and downstream of an organization's activities.

These are considered more difficult to address because they encompass so many aspects and can be difficult to measure. The Greenhouse Gas Protocol, which established the scope emissions, [defines 15 categories under Scope 3](#) including:

- purchased goods and services
- upstream transportation and distribution
- waste generated in operations
- employee commuting
- use of sold products.

However, this does not mean companies are not doing what they can to address this category of emissions. Delta-Q Technologies said that after addressing its Scope 1 and 2 emissions targets, it is now focusing on reducing its Scope 3 emissions. It stated in its press release that it will do so by collaborating with and educating partners across its value chain.



SCOPE 3 INDIRECT EMISSIONS OF THE CHAIN SUPPLY OR SERVICE

Scope 3 emissions encompass many aspects of a company's supply chain such as the materials utilized to produce components or waste generated by operations.

Rudzhan Nagiev | Dreamstime.com

Danfoss has set a target of reducing its value chain emissions (i.e., Scope 3) 15% by 2030 as part of its corporate decarbonization efforts. To aid with this, it will increase its use of low-carbon aluminum.

In late 2023, the company announced it had joined the aluminum sector of the [First Movers Coalition \(FMC\)](#), a global coalition to decarbonize hard-to-abate industries including aluminum, aviation, chemicals, concrete, shipping, steel and trucking, which are responsible for 30% of global emissions.

As part of the coalition, Danfoss commits to at least 10% (by volume) of all the company's primary aluminum procured per year being low carbon by 2030 while also ensuring that at least 50% of all aluminum used annually is composed of secondary aluminum by 2030.

By having large, global companies like Danfoss join FMC and commit to using low-carbon options, it demonstrates the feasibility of these solutions and will hopefully aid their continued market uptake to help bring down costs and emissions.

Through these and many other initiatives, companies are working to reduce their environmental impact as well as that of their customers. While the environmental aspect is important, it is also providing business opportunities for many by lowering operational costs due to the use of more energy efficient solutions and prompting new technological developments to aid global decarbonization.

[READ MORE: What New Regulations Could Impact Fluid Power](#)

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How are Emissions Reduction Efforts Trending?

On September 20, [the California Air Resources Board \(CARB\) released a report](#) showing greenhouse gas emissions (GHG) have declined in the state without negatively impacting its economy.

The report on 2022 GHG emissions shows declines in most sectors, with transportation recording the largest drop in emissions due to increased use of renewable fuels and zero-emissions vehicles. Emissions declined in five of the seven sectors tracked in the report, reducing total emissions in California by 9.3 million metric tons.

CARB stated in a press release announcing the new report that between 2000 and 2022, emissions fell by 20% while California's gross domestic product increased by 78%. "The numbers are clear: our world-leading regulations are reducing emissions, spurring innovation, and bringing us closer to achieving our climate goals," said CARB Chair Liane Randolph. "A future with clean air and a vibrant economy is possible."



credit: Iigus

CHAPTER 6:

Plastic Components: More Sustainable Than You Think

IGUS

As a producer of plastic components, igus is often at the center of the discussion about the environmental impact of these components and whether sustainability initiatives are in place. When most people hear the word plastic, they first think of single-use water bottles, cups, plates, utensils, etc, so this line of questioning makes sense. However, our [high performance plastic components](#) are actually more beneficial for the environment than both these single-use items and similar components made of metal. Read on to learn more.

CO₂ emissions

As part of a company-wide push towards [achieving carbon neutrality](#), the switch was made to green electricity in mid-2021 and climate-neutral gas in October 2021. This directly contributed to a 31.2% reduction in scope 1 and scope 2 CO₂ emissions versus the previous year, even with an increase in total production hours. According to scopes 1 and 2, as of April 2022 we have achieved 95% climate neutrality, and continue to make progress towards our goal of complete carbon neutrality.

Other changes igus has made include a switch to new injection molding machines that are 40% more energy efficient than previous machines, replacing old lighting with LED lighting, and installing charging stations for electric vehicles at the igus headquarters in Cologne, Germany. The CO₂ footprint of the top five best-selling materials of iglide bearings are available in the online shop, so they can be individually selected and compared. Efforts are being made to add even more CO₂ footprint calculations over time.

Plastic versus metal

Many of you reading this may still be asking yourself “Why should I bother switching from metal to plastic? I’m avoiding plastics altogether!” However, the truth of the matter is metal

components actually do more damage environmentally than plastic. This is largely due to the lubrication needed for metal components to operate successfully.

Out of all lubricant sold worldwide, 50% will end up in the environment. Considering that a single liter of lubricant can poison as much as 1 million liters of drinking water — and the demand for lubricants in 2019 [amounted to nearly 37 million metric tons](#) — this is a staggering figure. The high-performance plastics from igus avoid the need for external lubricants entirely, as solid lubricants are blended into the plastic material and can't be pressed from the component.

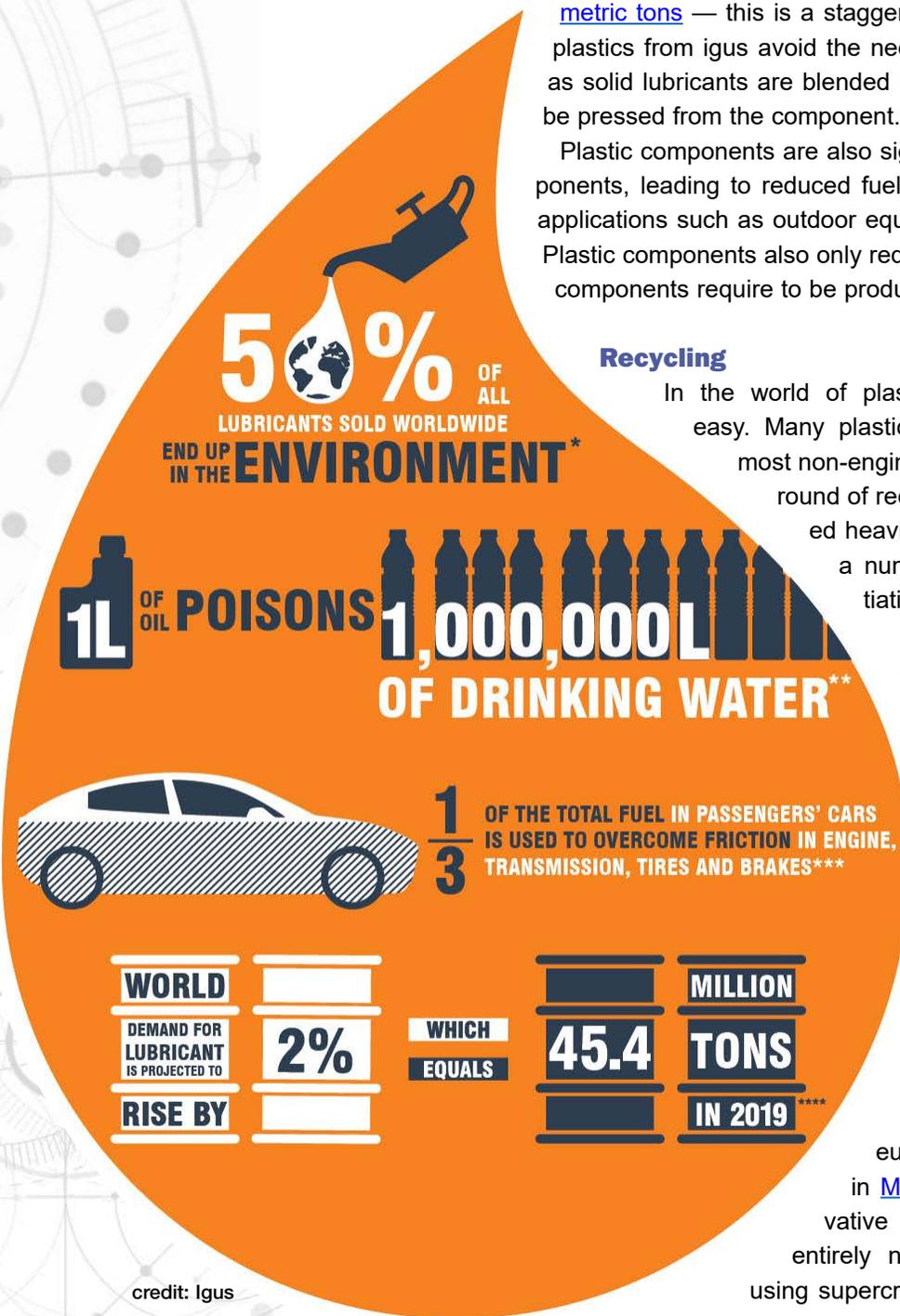
Plastic components are also significantly lighter than metal components, leading to reduced fuel consumption and CO₂ output in applications such as outdoor equipment, automobiles and aircraft. Plastic components also only require 10% of the energy that metal components require to be produced.

Recycling

In the world of plastics, recycling has never been easy. Many plastics can't be recycled at all, and most non-engineered plastics degrade with each round of recycling. However, igus has invested heavily in the recycling of plastics with a number of different programs & initiatives.

The first of these is the [change program](#): a recycling program that allows customers to exchange old plastic cable carriers for a voucher (based on the weight of the cable carrier) able to be used to purchase new products. The cable carriers are unmixed and shredded, then sent to a recycling partner in Massachusetts to be processed back into material usable for making new cable carriers.

igus has also invested 5 million euros (roughly 5.49 million dollars) in [Mura Technology](#) Limited, an innovative company that has developed an entirely new method of plastic recycling using supercritical water that can process previously impossible-to-recycle plastics. This technology — [Hydrothermal](#)



credit: Iigus

Tribo-plastic bearings do not require lubrication

* M. P. Schneider, 2006; ** Saskatchewan Association for Resource Recovery Corp., 2008; *** K. Holmberg, P. Andersson, A. Erdemir, 2012; **** The Freedonia Group, 2015



[Plastic Recycling Solution](#) (HydroPRS) — converts unsorted plastic waste into usable oil within 20 minutes. A single HydroPRS recycling plant can process 20,000 tons of plastic per year and reduce CO₂ output by 28,180 tons — equivalent to the annual energy consumption of 4,914 households. The first commercial HydroPRS plant in Teesside, England is expected to begin operation in 2023.

Finally, for Cyber Monday in 2021 igus planted a tree for every online order placed that week, and has even committed to planting 10,000 trees in US National Forests by the end of 2023, with a long-term goal of planting over 100,000 trees.

Conclusion

Not bad for a plastics manufacturer, huh? Despite the preconceived notions surrounding plastics, igus has gone above and beyond to dispel the myth that their plastic components are worse for the environment than the alternatives and take initiatives to further improve their sustainability across the globe.

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