



PLUG THE GAP

Buddy Powers, Clock Spring Company, Inc., USA, provides an overview of a simplified solution to address active leaks and restore pipeline integrity.

Hydrocarbon emissions and spills are dangerous to the environment and costly to the bottom line. Stakeholders in the oil and gas industry are aware that mismanaging emissions and unplanned discharges can have negative consequences and that finding a better way to identify and control leaks has the potential to significantly reduce the environmental impact of operations and improve profitability.

Responsible companies rank environmental stewardship among their corporate values and are constantly looking for ways to reduce the impact of operations on the natural world.

Managing releases of emissions

A lot of work has gone into addressing gas emissions, and research has led to improvements in technologies such as carbon sequestration to reduce the amount of carbon dioxide in the atmosphere. The focus on minimising CO₂ discharge has moved the needle in the US, positioning the country in first place globally in terms of emission reductions. In 2017, the US reduced CO₂ emissions by a volume of more than 40 t.

The scope of emissions reduction has expanded to address other gases such as methane – which is more than 80 times more potent than CO₂ in terms of its impact on the environment. Studies have been carried out to quantify methane emissions to better understand the effect on the environment and to find more effective ways of containing the gas. There is particular interest in the oil and gas industry, which is the biggest emitter of methane in

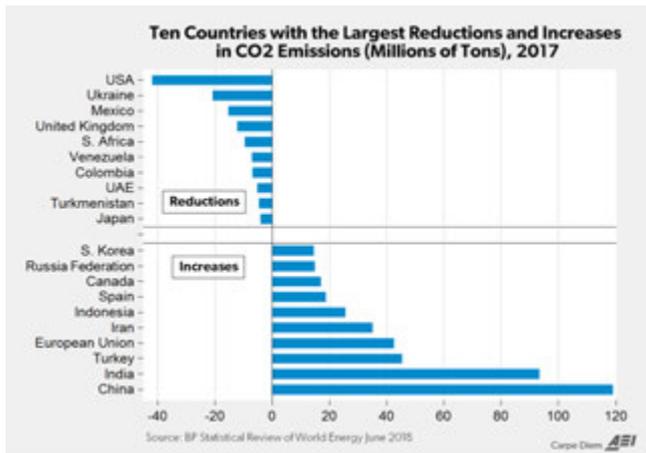
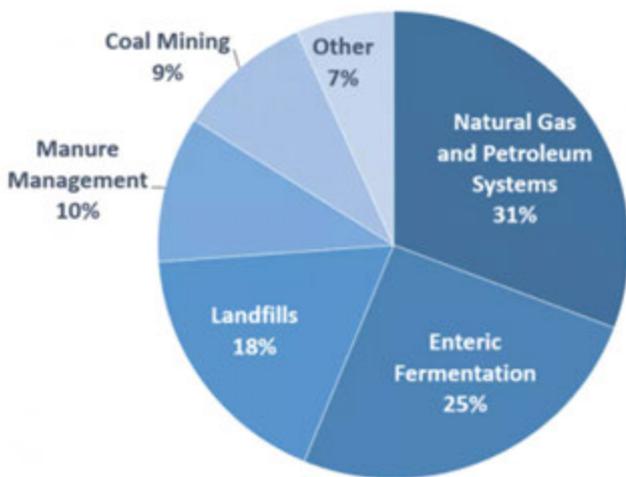


Figure 1. Countries with the largest reductions and increases in carbon dioxide emissions.



U.S. Environmental Protection Agency (2017). Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2015.

Figure 2. 2015 US methane emissions by source.



Figure 3. A completed Leak Stopper installation has a low profile that allows it to be overwrapped with a composite for a long-lasting repair.

the US. According to statistics published by the US Environmental Protection Agency, more than 30% of methane pollution is generated by natural gas and petroleum systems.

Fugitive emissions, however, are just one part of the picture. Spills and discharges are another, and more effort needs to be invested in managing them.

One of the most frequent causes of unplanned discharge is line damage. Rapid containment is critical, but most of the tools for halting leaks are only partially effective. Devices for arresting leaks have been around for some time, but as needs evolve, traditional methods sometimes cannot meet new performance expectations. They can stop the unwanted flow of escaped effluent, but they are not designed for long-term efficacy. A fair number of these solutions are bulky bolt-on products that require a lot of time to put in place, and the way they are installed introduces risk.

If the industry is going to be responsible about stopping leaks and restoring line integrity, other tools need to be considered, and that means looking at the problem from a different perspective.

Sometimes, the best solution is not a complicated new technology, but rather the intelligent and creative application of proven methods combined with specialised materials that can deliver long-lasting and dependable performance.

A recently introduced system for containing pipeline leaks is a prime example. It offers a straightforward way to arrest leaks in pipelines, and it is effective not only for hydrocarbons but for a broad range of industrial chemicals.

Stopping leaks fast

The Clock Spring Leak Stopper is designed for quick and safe temporary leak containment. It has a simple and effective design that includes a plug to cover the hole in the pipeline and an optimised strap that allows for efficient and secure plug placement, using teeth that are part of the band.

The process requires a trained installer using a gauged clamping device to tension the specialised band securely over the leak. The installer fits the band loosely onto the pipe with the Leak Stopper parallel to the pipe and just enough slack to allow easy movement so it can be moved into place to plug the leak. When the centre of the stopper sphere is on the centre of the leak, the installer applies pressure. Being mindful of the pinch points along the edges of the stopper, the installer uses the ratchet to tighten the band, resetting the metal bracket onto the teeth and closing the ratchet until no more pressure can be applied – and the leak has stopped. To tidy up the work, the back of the tool is used to trim the excess slack from the band and provide a smooth profile across the pipe.

The result is a reliable and durable temporary repair that can be installed in seconds. Using the low-profile buckles makes executing repairs less cumbersome and time consuming than alternative methods and produces a finished profile that is only 1 in. (25.4 mm) thick. This means that once the system is installed and the leak is stopped, the restored area can be covered with an engineered composite to prolong the life of the piping system using a proven technology.

Being able to perform small repairs delivers savings on multiple levels – technicians can prepare the pipe closer to the defect than more cumbersome repair methods allow, using less material and achieving a faster repair that reduces open ditch time, along with associated safety risks.

This system is ideal for onshore oil and gas pipelines, refineries and petrochemical plants, and municipal water and gas distribution lines. It fits pipes of practically any diameter and it is fast and easy to install. Moreover, because this leak containment system is not complicated to use, it can be installed by onsite crews with minimal training.

The components needed for the repair are provided in an installation kit that can be kept on hand for easy access. The kit includes everything required to stop the leak as well as guidelines and materials for installing a composite overwrap to extend the life of the repair.

Testing and validation

Before introducing this system for oil and gas operations, it was important to test it in a range of scenarios.

Engineers developed a testing programme to establish a proof of concept for sealing active leaks at or around 200 psi (13.8 bar). The initial tests evaluated a nylon strap compressing a urethane stopper, using a ratchet device to secure the stopper to the pipe. Two stopper prototypes were tested.

A nitrogen tank supplied pressure to a water storage tank, from which pressurised water was sent to the test pipe. Technicians attempted to arrest leaks on a 4 in. (101.6 mm) pipe with a 0.25 in. (6.35 mm) diameter hole and a 6 in. (152.4 mm) pipe with a 0.44 in. (11.2 mm) hole. Once in place, the stopper was ratcheted until the leak was sealed or until no more force could be applied using the mechanical ratchet. The initial test pressure started at 100 psi (6.89 bar) and was increased gradually in subsequent tests to 200 psi (13.8 bar). When the leaks were sealed, the stopper configuration was pressure tested to failure.

Because the objective was to deliver a permanent solution, the next step in the testing programme was to overwrap the stopper with different composite materials. After sealing two 7/16 in. (11.1 mm) diameter holes on a 6 in. (152.4 mm) pipe under 100 psi (6.89 bar), the test team installed four layers of fibreglass/epoxy over one stopper and four layers of carbon/epoxy over the other, following standard installation procedures.

When the composites were fully cured, the overwrapped stopper configurations were pressure tested to determine their strength. Both functioned to well beyond the 100 psi (6.89 bar) requirement. The fibreglass/epoxy was effective to 250 psi (17.2 bar). The carbon/epoxy composite was effective to 487 psi (33.57 bar).

These results indicate that when the stopper is overwrapped, composite materials can effectively increase the pressure rating of the Leak Stopper assembly.

Additional testing validated the stopper's chemical compatibility with 50 common process materials, including gasoline, glycol ether, kerosene, naphtha, toluene, phenol and carbon disulfide. The stopper was rated for emergency containment for some chemicals and for permanent containment for others.

Performance in the field

In addition to performing successfully under testing in controlled conditions, the Leak Stopper has been used effectively in the field.

In one case, a facility owner had identified a leak in a 14 in. (355.6 mm) flare line operating at 80°F (27°C) under 24 psi (1.7 bar) and wanted to contain it as soon as possible. Onsite technicians



Figure 4. A repair in the field awaits a composite overlay.

installed a Leak Stopper to stop the leak. With the leak sealed and the pipe functioning properly, installers applied a fibreglass/urethane engineered composite solution to the repaired line to extend the life of the repair. The stopper functioned as well in the field as it did under testing, restoring the line to safety and providing a permanent seal.

Changing expectations

Maintaining safety in oil and gas operations is a priority, but even when every precaution is taken, incidents are unavoidable. Having the right tools within reach can be the critical difference between a minor incident and a major catastrophe.

It is hard to predict when a leak will happen, but it is easy to predict the consequences – emergency shutdowns, lost production, and potential damage to people and the environment. The faster a leak is addressed, the fewer the repercussions.

Owners that are willing to look beyond traditional products and consider new solutions that have been tested and verified for performance will have more tools in their tool kits to ensure safe and sustainable operations. 

Benefits of this solution

- Appropriate for all industries.
- Not diameter specific – the band can be used for various pipe diameters.
- Rapid repair process terminates environmental exposure within seconds.
- Teeth designed into the tightening band improve strength, safety and repair speed.
- Low-profile repair simplifies installation and application of composite overwrap.
- Third-party verification of materials performance in aged samples.
- Certified SGS tensile strength. 

Get a Jump on Emergency Leak Repairs.

The **Leak Stopper™ Response Kit** includes everything you need to stop an active leak and overwrap the restored line with composite material for a long-lasting repair.

The faster you address a leak, the fewer consequences you have to deal with. But you need the right tool on hand to make repairs.

Make sure you have the right tools within reach.

Order your **Leak Stopper™ Response Kits** today.



Leak Stopper™ Response Kit

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