

feature

feature

Solutions for a **GLARING GLOBAL PROBLEM**

TEXT: FRAN WEAVER PHOTOS: SHUTTERSTOCK AND WÄRTSILÄ



The flaring of unutilised natural gas at oilfields represents a massive waste of resources – and a huge environmental problem on a global scale. Fortunately, suitable technologies for using this gas already exist, including Wärtsilä’s engines and flare gas recovery systems.

Gas flaring is literally such a glaring problem that it can be seen from space. Composite satellite images of the Earth by night are predictably dotted with bright patches in densely populated regions – but they also feature dazzling spots in remote regions with oilfields, where gas is routinely flared off, often on a 24-7 basis.

The World Bank’s Global Gas Flaring Reduction Partnership (GGFR) estimates that 140 billion cubic metres of unused “associated gas” is flared off at oilfields around the world every year. This amount of gas could be used to meet the annual electricity demand of Germany. In financial terms, calculated using global average gas prices, about 20 billion dollars’ worth of this non-renewable resource goes up in smoke every year.

To make matters even worse, burning all this gas straight into the atmosphere releases about 400 million tonnes of carbon dioxide every year. It exceeds the greenhouse gas emissions of entire countries like France, Italy or Australia. Careless flaring can also release clouds of sooty smoke

containing various toxic chemicals. These pollutants have further climate impacts, and may also cause health problems in local communities.

Solutions at hand

The GGFR partnership aims to break down the barriers to the utilisation of this wasted resource. Technology providers like Wärtsilä can play a vital role. But to find ways to use associated gas it is important to understand these barriers.

“Wherever oil is pumped out of the ground, gas and water come up with it, and have to be separated,” explains **Tomas Rönn**, Director, Oil and Gas Business, Wärtsilä Power Plants. “The industry is generally aware that associated gas is a resource, but the extra investments needed to capture gas have a lower priority.”

Many oilfields are located in remote regions like Siberia, the deserts of the Middle East or tropical jungles, where there are no local markets for gas. It is rarely economically feasible to build gas pipelines for the quantities involved. “Another problem is that the quantities and the composition of



THE AMOUNT OF
GAS FLARED OFF AT
OILFIELDS AROUND THE
WORLD COULD SUPPLY
THE ENTIRE ELECTRICITY
NEEDS OF GERMANY.



[Above] Tomas Rönn: Wärtsilä gas-diesel engines are ideal for using associated gas on site.

associated gas can vary greatly over time. Methane is the main ingredient, but other hydrocarbons like ethane, propane and butane are also present. The varying quantities mean that a flexible way to use this resource must be found,” says Rönn.

Rönn believes that Wärtsilä’s gas-diesel engines are an ideal solution in such cases, able to produce electricity for use within oil-drilling facilities and workers’ housing areas. “Our engine models such as Wärtsilä 32GD and 46GD can be fuelled using both crude oil and associated gas at the same time, and in almost any proportions, primarily using as much of the freely available gas as possible.”

Alternative uses for gas

In some locations associated gas can be viably processed to create liquefied natural gas (LNG). Wärtsilä can provide the drivers for liquefaction compressors, and engines and fuel systems capable of using the complex heavier fractions that result as side streams from this process.

“In other locations the best use for associated gas could be to inject it back down into the oil-bearing strata to facilitate subsequent oil extraction. Again, Wärtsilä can provide suitable compressor drivers for this re-injection process,” says Rönn.

It is also possible to recover associated gas and process it to make other petrochemical products. Rönn explains how Saudi Arabia has been implementing a national associated gas recovery plan that largely follows this approach. “It shows that there really are a variety of commercial solutions available, and we just need to support the oil-producing countries and oil companies to make the most of this potential.”

Another advantage of investments in recovering flare gas is that the parties involved can obtain carbon credits for the consequent emission reductions. These credits can then be sold on global emissions trading markets. “This has certainly helped to encourage such investments,” says Rönn.

Need for effective regulations

Only minimal amounts of associated gas are flared off today in Europe. “Russia, the country where most gas is flared off today, has enacted legislation this year that obliges oil companies to use at least 95% of associated gas, or pay tough penalties,” Rönn describes this as “a very positive development.”

But in many countries around the world such regulations remain ineffective or non-existent. The list of countries where most gas is flared includes Nigeria, Iraq, Iran and Libya. “It doesn’t help that in many cases the oil industry is working in remote areas in very challenging climatic and political conditions.”

Economic barriers may also be significant. In some cases, oil companies’ exploration agreements with host countries only cover oil, so they do not own the associated gas and have no incentive to capture it. The GGFR hopes to end this practice by getting standardised clauses routinely included in

GETTING HOLD OF THE GAS

To be able to use the associated gas available in oilfields, suitable technology is needed for recovering the separated gas from flare lines. Wärtsilä’s acquisition of the marine, oil and gas engineering company Hamworthy in January 2012 means that the company can now also provide these crucial complementary systems.

“Our flare recovery systems really go hand-in-glove with Wärtsilä’s other offerings. They enable us to recover the gas for generating electricity or, for instance, for producing liquid natural gas,” explains **Halfdan Millang**, Director, Gas Recovery, Wärtsilä Hamworthy.

“Our flare gas recovery systems completely close off the flare line with a safety valve, so there are zero emissions. Compressor packages then suck off the gas from the flare headers. A backup flare ignition system is integrated into the system to enable short-term flaring during emergency situations,” says Millang.

Wärtsilä Hamworthy’s flare gas recovery systems are already in use in 22 oilfields in the North Sea, Canada, Brazil and West Africa. Millang sees plenty of potential in other markets around the world. “We’re currently involved in a study for the European Bank for Reconstruction and Development and the GGFR related to Flare Gas Recovery and Utilization programmes for Russia, Tajikistan, Turkmenistan and Azerbaijan, among others,” he says.

Wärtsilä also provides advice on possible uses for recovered flare gas, and supply technologies that use it to produce liquid natural gas, electricity and purified drinking water.

“Though there isn’t such a thing as a typical flare, it might be possible in an average case to recover enough gas to continually generate 15 megawatts of energy, so we’re really talking about substantial volumes. It’s a shame on a global scale that so much gas is still harmfully wasted – especially when we are already worrying about the future availability of cleaner fuel.”



oil exploration agreements, so as to oblige oil companies to recover the gas.

Ecuador shows the way

In other parts of the world, both national regulators and oil companies are beginning to see the glaring light, and find ways to turn off the flares.

Wärtsilä has recently been involved in a major upgrade of energy facilities at the Eden-Yuturi oilfield run by Ecuador's national oil company Petroamazonas. "The oilfield facilities now use electricity produced by four 18-cylinder Wärtsilä 32GDLN gas-diesel, low NO_x engines in V-configuration, which can be run on freely available associated gas as their primary fuel, and varying amounts of local crude oil depending on the varying flows of gas. They previously needed to buy liquid fuel oil that had to be transported huge distances through the jungle by truck."

Petroamazonas reckon that its 150-million-dollar investment in energy efficiency improvements will save it 75 million dollars a year. It is easy to see that the payback time on the investment is very favourable.

Rönn is impressed by the progressive attitude taken by the Ecuadorian authorities. "As a national oil company Petroamazonas has been effectively encouraged to work responsibly in the longer-term interests of the country and the environment. They really are looking at the bigger picture, and not simply rushing to pump out oil as quickly as possible. By taking a wider perspective they are ensuring that no valuable resources are wasted, and that harm to the environment is minimised."

He says the Ecuadorians appreciate the technical solutions provided. Wärtsilä has enabled them to overcome the considerable logistical challenges in this remote jungle oilfield site, and find ways to optimise the utilisation of their natural resources. ●

**WÄRTSILÄ HAMWORTHY'S
FLARE GAS RECOVERY
SYSTEMS ARE IN USE IN
THE NORTH SEA, CANADA,
BRAZIL AND WEST AFRICA.**



WORKING TOWARDS A WORLD WITHOUT FLARES

To address the problem of gas flaring on a worldwide scale, the Global Gas Flaring Reduction partnership (GGFR) was set up by the World Bank at the World Sustainable Development Summit in 2002. This public-private partnership brings representatives of major oil companies together with governments of major oil-producing countries.

Wärtsilä has been an associate member of the partnership since 2010, as a technology provider.

The GGFR aims to reduce the wasteful and environmentally harmful flaring of associated gas by encouraging countries to adopt favourable legislation and policies, and by spreading awareness of best practices and suitable technologies.

In April 2012 the GGFR resolved to intensify efforts to promote the utilisation of associated gas around the world during the years 2013-15. Regional and country-specific programmes will be stepped up where flaring is widespread. The partnership also wants to enable communities close to flaring sites in developing countries to obtain energy from gas that would otherwise be wasted.

The GGFR also monitors the scope of gas flaring around the world using satellite images. Its studies suggest that about 25% of the associated gas extracted in oilfields around the world is today flared off. The problem could be even greater, since satellites can only spot flares at night. In some oilfields gas may be flared more widely by day – or even invisibly vented off without flaring. Such venting is extremely harmful to the environment, because unflared gas has a greenhouse effect about twenty times higher than flared gas emissions.