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Flare Gas Recovery – A Cleaner Solution from UnitBirwelco

Flare Gas Recovery (FGR) is one of UnitBirwelco's flagship cleaner technologies, delivered through our Birwelco division based in Halesowen, which brings over 50 years of experience in flare system design and implementation.

FGR offers significant environmental and financial benefits — reducing emissions while enabling the recovery and reuse of valuable hydrocarbon gases that would otherwise be flared.

Each system is individually engineered to match the specific gas composition, liquid content, flaring frequency, and flow rate of the client's facility. This tailored approach ensures optimum performance and return on investment.

To demonstrate economic viability, both equipment and engineering costs are quantified, along with the monetary value of the recovered gas. A typical UnitBirwelco refinery installation includes:

- A skid-mounted liquid ring compressor
- A seal liquid cooler and separator
- All associated pipework, instrumentation, valves, and structural steelwork
- Comprehensive engineering design

Each package includes a complete control system, with local and off-skid control panels, and is fully designed, fabricated, installed, and commissioned by UnitBirwelco.
This in-house turnkey capability provides clients with full project visibility and cost control, unlike many other engineering firms that rely on subcontractors for fabrication, instrumentation, control systems, or commissioning.

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A Flare Gas Recovery System - Case Study

The LP Gas Recovery Package (360-XXX-001) will be installed on the DP4 production platform as part of the Bouri Gas Utilization Project. UnitBirwelco was awarded the design and fabrication of this Flare Gas Recovery (FGR) package in June 2024, with the goal of significantly reducing routine flaring to atmosphere in line with project environmental targets.

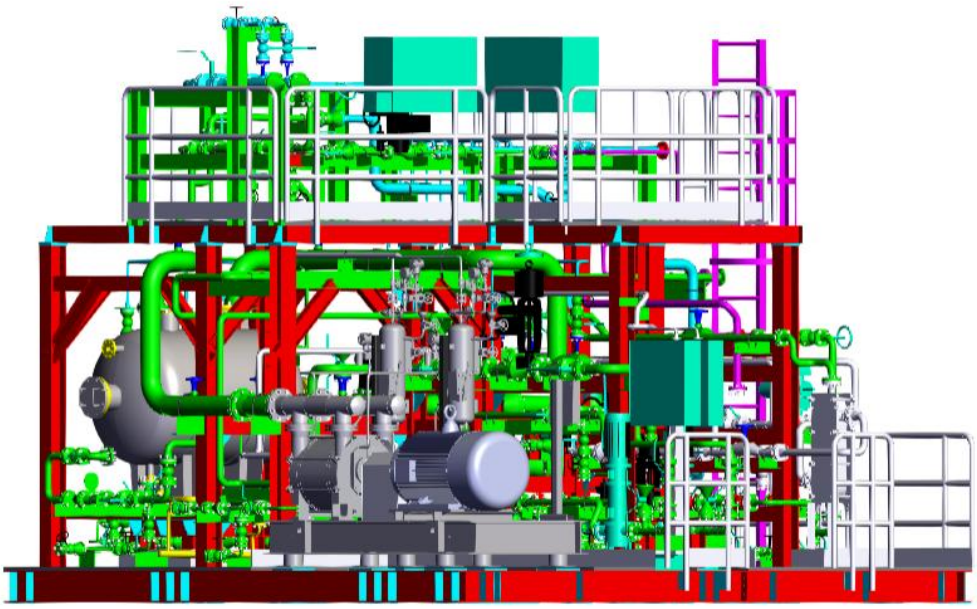
Process overview of the package

The LP Gas Recovery Package 360-XXX-001, designed and fabricated by UnitBirwelco, will be installed on the DP4 production platform for the Bouri Gas Utilization Project. The system reduces routine flaring by recovering wet sour gas for reuse.

The package includes a Liquid Ring Compressor (LRC), which compresses 2800 kg/hr of wet sour gas from 0.15 barg / 63°C to 1.5 barg / 55°C. Compressed gas flows to a separator, where sour gas, seal water, and HC condensate are separated:

- Sour gas and HC condensate are routed to skid edge.
- Seal water is cooled via a plate heat exchanger, pressurised by a recycle pump, and returned to the LRC.

Design limits: Inlet – 5 barg / 195°C; Outlet – 11 barg / 195°C.
All equipment is rated to 11 barg / 195°C.



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Environmental Benefits of the FGR Package (360-XXX-001)

The FGR system significantly reduces the routine flaring of wet sour gas, which contains lethal concentrations of H_2S (~5000 ppm). By capturing and compressing this gas for reuse instead of burning it, the system delivers the following environmental benefits:

Reduced Toxic Emissions:
Prevents the direct release of highly toxic **hydrogen sulfide (H_2S)** and other hazardous pollutants into the atmosphere.

Lower Greenhouse Gas Emissions:
Minimises the flaring of hydrocarbons, reducing **CO_2**, **methane**, and **NO_x** emissions that contribute to global warming and air pollution.

Improved Air Quality & Worker Safety:
Limits the spread of harmful combustion by-products and reduces the risk of H_2S exposure to personnel and nearby communities.

Energy Recovery & Resource Efficiency:
Captures valuable hydrocarbon gas that would otherwise be wasted, enabling its reuse downstream and supporting more sustainable energy practices.

Compliance with Environmental Regulations:
Supports operator alignment with tightening emissions standards and global ESG (Environmental, Social, Governance) goals.

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Economic Benefits of the FGR Package (360-XXX-001)

The Flare Gas Recovery (FGR) project at the DP4 production platform is designed to significantly reduce routine flaring by recovering valuable hydrocarbons from the gas stream. The system processes a total fluid input of **2800 kg/hr**, effectively capturing both gas and hydrocarbon condensate streams for reuse or sale. This initiative supports environmental sustainability goals while delivering strong economic benefits, making it a valuable addition to the facility's operations.

The FGR system recovers approximately **2414.5 kg/hr of gas** and **385.5 kg/hr of hydrocarbon condensate**, achieving a **gas recovery rate of 86.2%** and a **condensate recovery rate of 13.8%** of the total fluid input. This recovery results in a **reduction of hydrocarbon emissions by 64.8%**, significantly minimizing environmental impact. Operating continuously for an estimated **8,424 hours per year** (accounting for 24/7 operation with a planned two-week annual downtime), the project provides strong financial returns.

Key economic indicators show a **Return on Investment (ROI) of 117.3%**, demonstrating that the system generates net income exceeding the initial capital investment within the first year. The **payback period is estimated at 10.2 months**, indicating rapid recoupment of the capital expenditure.

Together, these factors confirm the FGR project's viability as both an environmentally responsible and financially attractive solution for the DP4 production platform.

Table 1. Summary of estimated economic indicators

Economic Indicators of the Project	
Total Fluid into FGR system	2800 kg/hr
Recovered gas	2414.5 kg/hr
Recovered HC condensate	385.5 kg/hr
Reduction of HC Emission	64.8%
ROI in year 1	117.3%
Payback period	10.2 months

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Social Benefits of the FGR Package (360-XXX-001)
Implementing the FGR system on the DP4 production platform brings clear social value by improving health, safety, and long-term well-being for workers and surrounding communities:

Enhanced Health & Safety

- Reduces the risk of exposure to toxic gases, particularly H_2S, which is lethal at concentrations as low as 5000 ppm.
- Minimises the hazards associated with open flaring, including heat radiation, toxic smoke, and flare stack failures.

Improved Working Conditions

- Creates a safer and cleaner working environment for platform personnel by limiting atmospheric contaminants and flare-related risks.

Positive Community Impact

- Decreased emissions contribute to cleaner air and reduced odour nuisances for nearby coastal or offshore communities.

Conclusion
As a carbon-negative company, UnitBirwelco delivers bespoke Flare Gas Recovery (FGR) systems for both new-build and retrofit applications. UnitBirwelco's FGR solutions provide a proven pathway to reduce operational costs, generate revenue, and reduce environmental impact — making them ideal for today's cost-conscious and sustainability-driven global energy and oil & gas sectors.

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Engineering Capability Highlight – Lethal Service FGR Package

This Flare Gas Recovery package represents one of the most demanding engineering projects delivered by UnitBirwelco.
The system processes wet sour gas containing extremely hazardous levels of hydrogen sulphide (H_2S) at approximately 5000 ppm, which is widely recognised as immediately lethal at these concentrations.

Handling gas streams of this nature requires extremely robust engineering standards and strict compliance with onerous project specifications.
Materials selection, mechanical integrity, sealing systems, instrumentation, and safety systems were all designed to meet the highest safety and reliability requirements.

The successful design and fabrication of this skid-mounted Flare Gas Recovery package demonstrate UnitBirwelco's ability to deliver complex, safety-critical process equipment for the most demanding oil and gas applications.

For prospective clients, this project serves as a clear demonstration of capability. If UnitBirwelco can engineer and deliver an FGR system operating under these extreme lethal-service conditions and strict project specifications, we have the expertise and engineering capability to deliver any flare gas recovery or gas compression package required across the industry.

Birwelco offer a wide range of products with each project being developed and engineered to a bespoke design. This allows clients to receive products to their specific requirements whilst maintaining safety and high-quality.