APGA INNOVATION AWARD

Live Well Workover / Flare 360 Solution

MPK. Right solutions. Right people. Right for the future.

Summary of the benefits of MPK's Live Well Workover/Flare 360 Solution

In 2021, MPK embarked on a research and development initiative to reduce or eliminate the carbon emissions that occurred during underbalanced Coal Seam Gas (CSG) well maintenance and workover activities across the Surat Basin.

MPK has been working in the live well workover (LWW) space for many years and recognised that while they are a necessary part of required compliance for production of this energy source, there was no industry solution in existence that could manage and record carbon emissions created during the LWW maintenance process.

MPK, in collaboration with its CSG client, collected 12 months of unquantified LWW emission data to get at least a clearer picture of the approximate carbon emissions that each well workover created during the final process of methane cold-venting.

The data collected was eye opening, given each well produced on average around 10,000kg of methane for every underbalanced workover performed which, given the number of wells to maintain annually, represented around 280 tonnes of carbon emissions vented into the atmosphere for each well worked over.

To quantify the scale of the problem, there is currently over 3000 wells worked over in Queensland per year. If each of these were worked over underbalanced it could equate to over 840 kilotons of carbon emissions.

Over the next three years, MPK's Research and Development team pursued a realistic solution that could, if not eliminate carbon emissions, at least reduce carbon emissions created through the LWW process.

After a series of trials, and in an industry first, MPK designed, fabricated and introduced the LWW/Flare 360 solution into its client's maintenance program, and it delivered immediate environmental benefits.

Basically, the LWW/Flare 360 solution removes the need for large volumes of water (upwards of 2000 barrels) to be pumped into wells and potentially causing well reservoir damage, shortening the lifecycle of a well and, replaces it with a unique vacuum process that manages carbon emissions created during final methane cold-venting.

The benefits of the LWW/Flare 360 process are a 20% reduction in production impairment, and reduction of the time back to normal production (production deferment) of up to 65 days.

To gain an understanding of the importance of this innovative solution, the LWW/Flare 360 solution prevents 21 kilotons of Co2 Equivalent (per rig, per year) that would historically be vented into the atmosphere.

To put that into perspective, just one LWW/Flare 360 unit can successfully perform required LWW and eliminate the same amount of carbon that is produced by 3800 cars on our roads – every single year.

The LWW/Flare 360 solution has been so successful, that MPK now has five units operating, with two more currently in production. MPK is also collaborating with other CSG developers seeking the same positive environmental outcomes currently being realised by MPK's current CSG client.

In short, MPK's fully-patented LWW/Flare 360 solution is set to radically change the CSG industry's LWW landscape, by helping energy developers achieve reduced environmental impacts and reach their net zero carbon emission goals.

An added benefit of the LWW process is a reduction in the volume of fluid required for each workover, which results in a reduction of trucks on the road and kilometres travelled. This is in the vicinity of eliminating **18,000** water truck movements per year.

Clients using the LWW/Flare 360 solution for underbalanced workovers can achieve an annual emission reduction of approximately 750 tonnes of methane per each rig in operation.

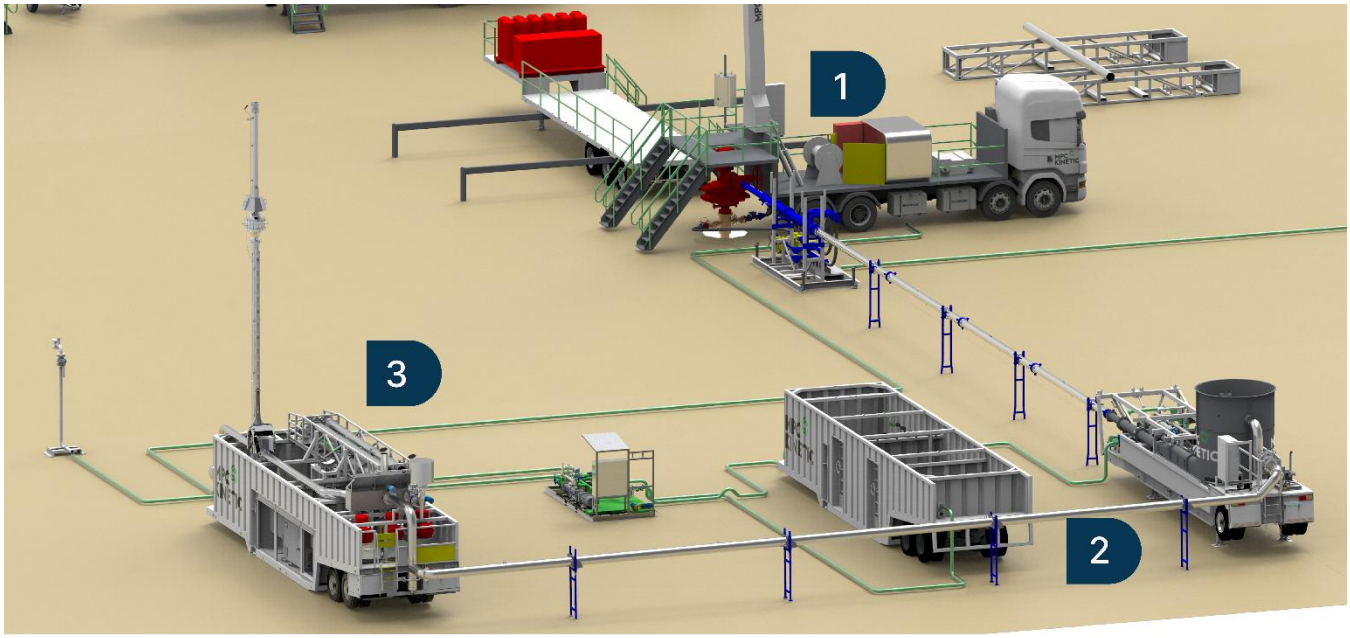
Using the agreed methane Global Warming Potential ratio of 28, using the LWW/Flare 360 solution is the equivalent of reducing Co2 emissions by 21 kilotons or removing 3800 cars off the road – every single year.

Using The LWW/Flare 360 solution instead of performing overbalanced workovers increases public road safety by eliminating the need for transport of water by truck to/from well lease pads.

Clients can achieve longer well production efficiencies and less reservoir damage, because the LWW/Flare 360 solution doesn't require water to be pumped into well formations.

While the LWW/Flare 360 solution has been designed for well workovers, it can also be applied to any other industrial scenarios where the fugitive emission process involves evacuated.

The LWW/Flare 360 solution decreases the need for large water volumes being used during overbalanced workovers, reducing environmental risk of uncontrolled spills.



The LWW/Flare 360 solution begins once (1) MPK's workover rig commences its live well workover operation, which then activates the (2) SCUF process and sends fugitive methane emissions to be captured and flared off in the (3) Flare 360 unit.

What was the environmental issue?

The primary driver for MPK's development of the combined Live Well Workover and Flare 360 package was two-fold:

A) Provide a unique solution that enables more effective LWW of underbalanced wells using an **innovative approach to address environmental issues**.
B) Integrating an **industry-first** solution for underbalanced well workovers, by developing a combination of vacuum and flare off, to minimise the emission of Co2 gas into the atmosphere.

Background on LWW: LWW are becoming more commonplace in the CSG sector as the benefits become better understood. With upwards of 3,000 overbalanced workovers occurring annually, there is huge potential to reduce emissions, while ensuring increased production. LWW allow wells to be worked over with the least amount of damage or impairment to the reservoir. If reservoir damage or impairment occurs during workover operations, it reduces the **cost effectiveness** of well performance because of the shortened production lifecycle of the well. The **major environmental impact** of underbalanced workovers is the large volume of methane gas that has to be cold-vented into the atmosphere.

Background on LWW alternatives: The only alternative to underbalanced workovers, is an overbalanced workover, but this requires a large volume of water to be transported to the well location and pumped into the formation. To gain a perspective of the volumes of water needed, on average, up to 2000 barrels (318,000 litres) of fluid is required for each well, but can sometimes be much more, depending on the well. The aim of clients using overbalanced workovers is to reduce rig workover downtime time on the well, and while overbalanced workovers are standard practice, the major difference is the column of fluid used for pressure control.

Maintaining pressure control during any intervention operation is a regulatory requirement and pressure control can be more easily achieved with a column of fluid in the well. As noted earlier, the intent with any workover method is to reduce the risk of damage to the well, and the risk of reservoir, or near wellbore damage, is greater using the overbalanced workover method.

Solution: Clients try and avoid overbalanced LWW and prefer an underbalanced method to be performed if possible. MPK's patented LWW/Flare 360 system allows clients to use a vacuum on the well, which effectively provides the pressure control required. The LWW/Flare 360 system eliminates the need for large volumes of water for overbalanced LWW, therefore removing the risk of "killing" the well due to the water being pumped into its formation.

MPK recognised that many CSG developers were starting to move away from overbalanced workovers due to:

- increased environmental fluid risk spills associated with multiple trucks on well lease pads
- decreased cost-effectiveness of transporting large volumes of water to well lease pads
- increased safety risk resulting from increased water trucks sharing roads with other motorists
- reduced production life of wells via damage to reservoir during water pumping info formation

MPK believed its development of the LWW/Flare 360 solution addressed the well-maintenance changes that were occurring across the Surat Basin's CSG fields.

What did MPK do to solve the environmental issue?

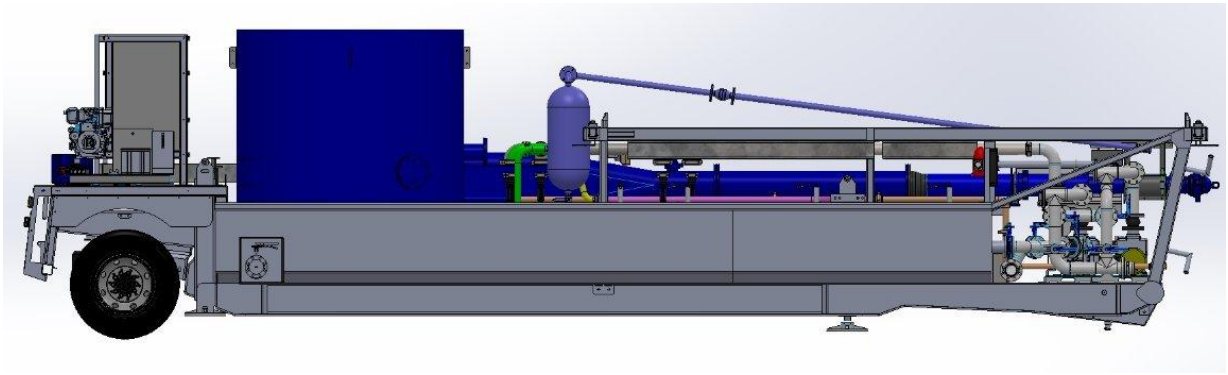
As part of MPK's commitment to developing innovative solutions that reduce the environmental footprint of the company's operations, and also those of its clients, MPK's Research and Development (R&D) team looked at ways it could minimise or eliminate fugitive Co2 emissions from live well workover operations.

Over an R&D period of nearly three years, MPK was able to develop and patent an **industry-first** solution, whereby the LWW and Flare 360 systems were combined as a single package to deliver better environmental outcomes.

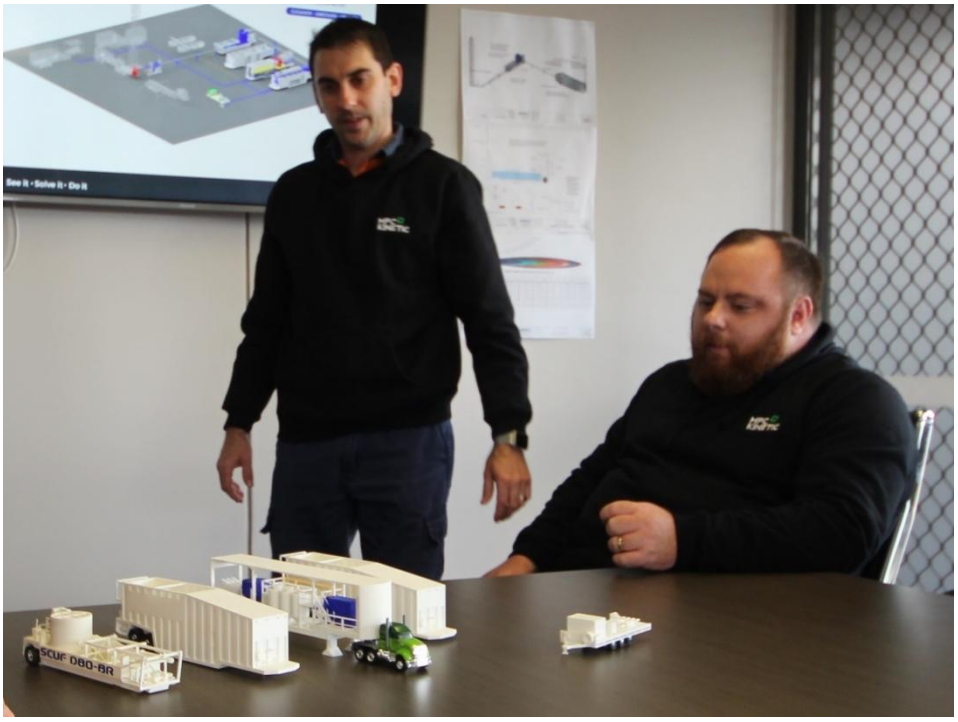
The Flare 360 component used during LWW operations is essentially a set of vacuum pumps that extract the gas mixture from a Safe Controlled Unload and Flowback (SCUF) unit used during well workovers.

The uniqueness of MPK's combined LWW/Flare 360 system, is that it allows underbalanced workovers to take place with minimal emissions, while also enabling physical measuring of emissions before being flared.

Until MPK's introduction of the LWW/Flare 360 package solution, there was **no industry system in place** that enabled emission reduction and accurate emission quantification during underbalanced LWW operations.



.

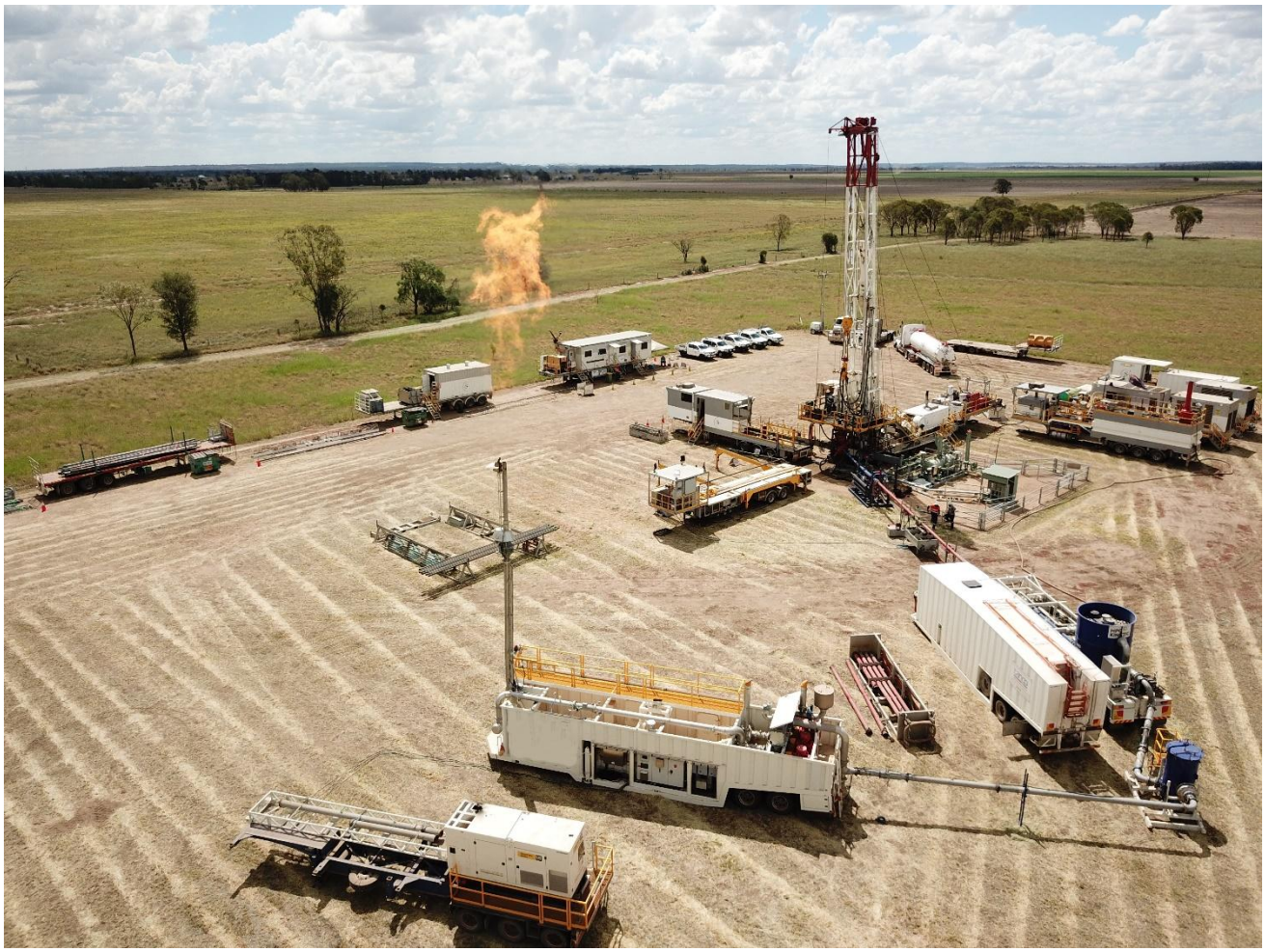


MPK's R&D team developed the combined LWW/Flare 360 from initial CAD and 3-D modelling concepts, to in-house fabrication and then field operation trials over a three-year period.

Where has the environmental solution been implemented?

MPK has so far successfully introduced **five** of its LWW/Flare 360 packages into its client's well-maintenance operations across the **Surat Basin**. Now fully field-proven, MPK has also been in collaboration with the CSG developers who are transitioning to increased underbalanced well operations and seeking the same positive environmental outcomes.

MPK's manufacturing schedule will have two further LWW/Flare 360 packages completed and rolling off its Wellcamp workshop floor into the Surat Basin CSG fields by end of 2025.



One of the challenges overcome by MPK's R&D team was ensuring the design and layout of the LWW/Flare 360 units could fit alongside other required static and mobile equipment also present on CSG well lease pads.

What issues did MPK encounter when developing the LWW/Flare 360 package?

Following an extended period of research and evaluation of CSG well performance, safety compliance requirements and existing workover practices, MPK embarked on the development of the LWW/Flare 360 package.

The main issue MPK's R&D team encountered, but overcame, mainly revolved around the multiple field trials of the componentry involved, which took a number of years to complete to ensure the componentry combination was fit-for-purpose.

Individual componentry existed in the marketplace already, but none of it had ever been used in this type of multi-faceted, fully integrated combination before.

Other constraints and issues that had to be addressed and overcome included:

- Layout of LWW/Flare 360 equipment needing to fit within tight well lease pad boundaries
- Logistics, such as reducing number of semi-trailer loads required for LWW/Flare 360 mobilisation
- Associated costs/technical requirements so LWW/Flare 360 was compliant and cost effective
- Allowing maximum gas flow and achieving maximum vacuum, so work was carried out "live"
- Correct selection of instruments and system fine tuning to achieve optimal well performance.

What supporting data does MPK have to prove LWW/Flare 360?

As part of MPK's three-year R&D trials to prove up the combined system, operational data was collected and analysed across myriad parameters, but the key area was collation of cumulative methane emissions being flared during workovers, as this had never been possible in the CSG industry before the LWW/Flare 360 solution was developed. As seen in the Tables 1 & 2 below, the data fully supports the integrated system's success and the positive environmental outcomes the LWW/Flare 360 delivers. The table shows the cumulative methane produced from a series of typical workovers over a 12-month period. As noted earlier, the LWW/Flare 360 almost totally eliminates fugitive methane emissions vented to the atmosphere during the underbalanced well workover process – **an industry first outcome.**

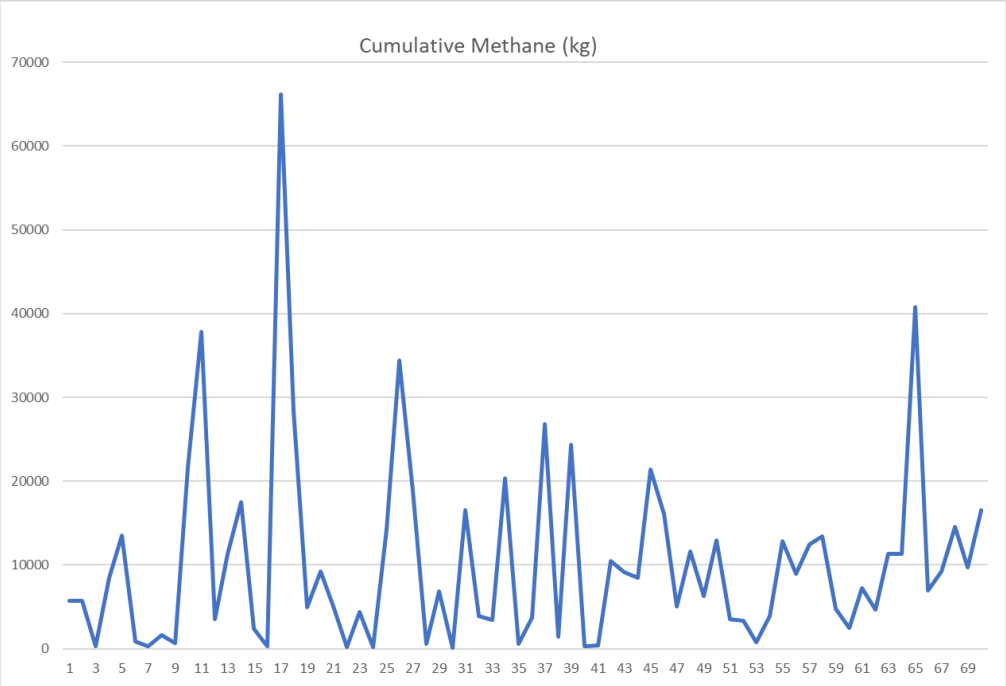


Table 1: Cumulative Methane (kg) over a 12-month period.

Well Name	Cumulative Methane (kg)	Well Name	Cumulative Methane (kg)	Well Name	Cumulative Methane (kg)	Well Name	Cumulative Methane (kg)
Well 1	5750.12	Well 19	4991.05	Well 37	26806.16	Well 55	12861.85
Well 2	5677.85	Well 20	9201.96	Well 38	1413.72	Well 56	8921.47
Well 3	267.12	Well 21	5024	Well 39	24341.73	Well 57	12495.3
Well 4	8443.73	Well 22	234.57	Well 40	300.97	Well 58	13418.14
Well 5	13533.73	Well 23	4379.9	Well 41	422.95	Well 59	4789.5
Well 6	858.17	Well 24	192.52	Well 42	10450	Well 60	2442.61
Well 7	342.13	Well 25	14306.38	Well 43	9091.46	Well 61	7208.68
Well 8	1646.22	Well 26	34400.13	Well 44	8474.81	Well 62	4679.48
Well 9	685.52	Well 27	18787.23	Well 45	21393.25	Well 63	11289.79
Well 10	21635.17	Well 28	624.79	Well 46	16084.95	Well 64	11280.72
Well 11	37869.34	Well 29	6877.32	Well 47	5085.02	Well 65	40812.76
Well 12	3487.63	Well 30	71.57	Well 48	11636.88	Well 66	6937.33
Well 13	11310.65	Well 31	16503.9	Well 49	6268.43	Well 67	9199.13
Well 14	17527.65	Well 32	3868.68	Well 50	12906.29	Well 68	14600.86
Well 15	2383.17	Well 33	3388.2	Well 51	3547.97	Well 69	9672.11
Well 16	270.01	Well 34	20382.42	Well 52	3327.13	Well 70	16511.82
Well 17	66143.13	Well 35	620.05	Well 53	753.06		
Well 18	28369.5	Well 36	3705.45	Well 54	3953.32	**Total Flow Rate**	**727140.61**

Table 2: Cumulative Methane (kg) per well.

Does MPK plan to further develop the Flare 360 for the industry?

Yes, MPK's R&D team has a defined plan to further evolve this emissions reduction process for the LWW/Flare 360 package, as well as continually assess additional process applications.

MPK's R&D team is also currently developing and trialling the following, to add further value to the LWW/Flare 360 offering.

- Flaring equipment that does not require air compressors as the suction source, to reduce diesel consumption during workover operations.
- Methane emissions reduced and cost recovered through methane re-injection into the gathering network, once air is removed from gas mix.
- Design of a new generation of a highly evolved system to realise the additional environmental benefits is progressing, with a Gen 2.0 version expected to be operational in Q1, 2026.

While developed for the CSG sector, the LWW/Flare 360 package can also be used to reduce Co2 emissions in other operational scenarios, such as pipeline bleed downs or pigging operations, and any situation where there is a process connection to wet or dry gas that would normally be vented.

Does the CSG industry support the development of the LWW/Flare 360 solution?

MPK is continuing to collaborate with its gas development clients to introduce these LWW/Flare 360 units across their gas field operations. At present it has five units operating and two units currently being manufactured in the Wellcamp workshop for deployment in 2025. MPK has further committed the capital to build a further three units.