

The economics of cylinder gas bundles

By Anthony Wright

With most industrial gases sold in cylinders, the advantage of purchasing in bundles is considered more efficient economically and environmentally.

The humble bundle is a form of compressed gas storage ubiquitous across the industrial gas distribution sector, but just what makes them so economically advantageous? And

as global industry turns its focus on green, more sustainable solutions, how is their economic efficiency linked to the environmental footprint placed by the bundle?

By providing the ability to reduce the amount of transport required to deliver packaged gases and therefore the quantity of the workforce required in the process, cylinder bundles serve to simplify the compressed gas supply chain. The advantages are clear: delivering a large single bundle packed with a dozen cylinders is far more efficient than delivering a dozen cylinder separately.

The potential for loss is also greatly reduced. According to Emre Koyuncu of industrial gas equipment company Koyuncutas, cylinder bundles are far easier to trace and less prone to loss than cylinders themselves.

“Imagine delivering 12 separate cylinders one-by-one and compare it with delivering a single bundle,” he said. “Aside from the workload it brings, drivers usually fail to scan all barcodes and therefore, with fewer barcodes to scan, there are fewer cylinders to lose.”

“Any type of gas storage system is equally important. A 10 litre cylinder is as important as a cylinder bundle, each has their own application.”

By serving to simplify the supply ▶



► chain, cylinder bundles, often assembled in a modular fashion, are most often comprised of a frame. By using lighter weight materials in the frame's construction, some companies have advanced frame design to save costs and reduce the number of trips required to transport more bundles.

This lightweight nature reduces the carbon footprint at all stages of the bundle's lifecycle, from handling and shipping to storage and fuel costs when transporting.

By utilising a bolted, galvanised steel frame, UK-based Cefrank can create a frame capable of protecting the cylinders while also weighing much less than alternatives. The company's modular, bolted design allows for bundles to be transported and stored much more efficiently.

A simplified overall design reduces the number of welds required, further lowering the cost and time needed during the manufacturing process.

Its manifolded range of bundles come with an interchangeable stainless-steel manifold that can be used for a range of applications including oxygen, acetylene, nitrogen, hydrogen, helium carbon dioxide, argon, and special mixed gases.

Justin Cetinich, Logistics Manager at CEFRANK, has also noticed specific trends in improving economic efficiency while seeking to protect the environment. "These trends range from finding new ways to distribute energy generated in remote locations such as wind farms and solar arrays to reducing energy costs and associated emissions when transporting bundles and their contents," he said.

Koyuncutas has observed trends in similar areas. Commenting on the use of cost-efficient bundles, Koyuncu said, "Efficiency comes from transportation

costs due to lower weight and thus smaller trucks with less fuel consumption, and no need for crane trucks as LCs can be delivered with a single life."

"However, the lifetime of an LC is much less than a bundle's lifetime."

Provider of bundles manufactured in accordance with oxygen, nitrogen, argon, CO₂, CNG, helium and mixed gases, Koyuncutas produces bundles with 6-9-12-16-32 cylinders. With a focus on future fuels and the ongoing energy transition, the company has also witnessed growing trends in future fuels such as hydrogen.

"With the emergence of hydrogen fuel cell cars, ultra-high pressure hydrogen storage bundles have become extremely important," explained Koyuncu. To help sate a market hungry for sustainable solutions, he has started to see companies providing storage systems capable of handling pressures between 500 and 700 bar.

Importance of TCO

When considering the economic advantages of cylinder bundles, emphasis must be placed upon TCO, or total cost of ownership. By adjusting cylinder configurations and boosting storage capacity, including scaling up the modularity of bundle solutions,

companies can maintain a low carbon footprint while providing more product.

A company that has aimed to maximise its TCO is Worthington Industries (Worthington). Having spoken to gasworld in 2020, Mark Jackson,

Worthington's Director of Technology, Innovation and Digitalisation for Europe, revealed that its Max9 Bundle boosted storage capacity by nearly a quarter with no additional footprint.

Having worked with German Wystrach GmbH, the companies were

"Efficiency comes from transportation costs due to lower weight and thus smaller trucks..."

able to come up with a solution that resulted in fewer back and forth trips to return empty bundles and pick up new ones, reducing operational costs and lowering the number of truck deliveries that need to be made. Commenting on the importance of TCO, Gabriele Zeilerbauer, European Sales Director – Industrial Products at Worthington Industries, stated that merely looking at purchase price when acquiring high-pressure gas cylinders is short-sighted.

Three main factors must be considered when looking to maximise industrial gas cylinder TCO: cylinder weight, logistics, and maintenance. This is due to the operational costs generated over the lifetime of a typical cylinder, which could number decades. The company recently concluded a 15-year study that calculates TCO for standard 50 litre/200 bar and 300 bar steel industrial gas cylinders that considered those three main factors.

- **Cylinder weight:** With Worthington's 50 litre, 200 bar steel cylinders weighing between 44-60kg – at least 5kg lighter than the rest of the market – a projected 120 fillings over the 15-year period, 800km round trips from filling centre to delivery sites, and a fuel cost of €1.5 per km, the added cost per cylinder could equate to around €38.05.
- **Logistics:** More trips directly correlate to the increased wear and tear of trucks, pallets, and other equipment used for loading and offloading, resulting in additional ►

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Bundles can be provided with up to 32 cylinders in one shipment

- ▶ indirect hard-to-calculate costs. Taking this into account, Worthington used a ‘conservative’ projection of the additional cost per cylinder, based on cylinder weight, in its model for calculating TCO – €2.2 for cylinders in the 50kg range and €11 for cylinders that weigh 60kg.
- **Maintenance:** Unsurprisingly, well-maintained gas cylinders will increase a company’s TCO. Durability of a cylinder’s finish is a major factor in the maintenance requirements of a particular unit. According to Worthington, the company’s high-quality powder coating is designed to last the entire 15-year period as a standard.

Other factors

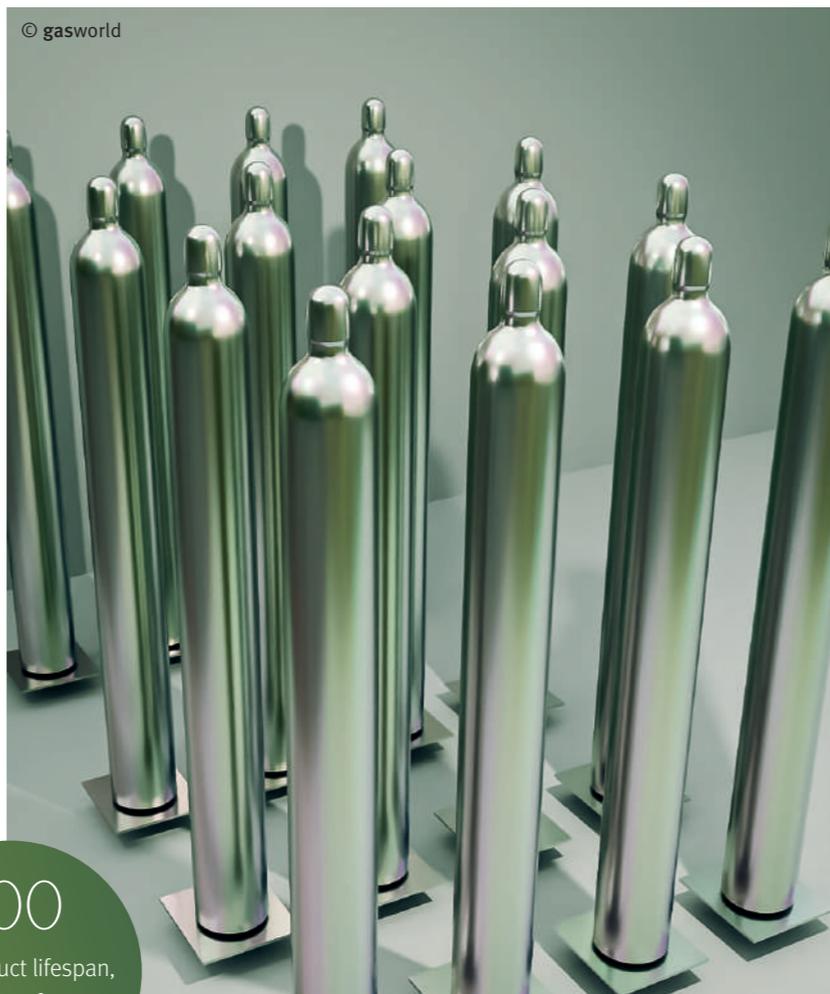
The TCO of a cylinder can increase markedly if it does not have a durable finish. Having to be painted an average of two times over 15 years, the process could cost the company €12 each time.

Durability of a finish can also apply to the frame of a bundle. CEFRANK utilises hot-dip galvanising to protect the steel of the frames used in all its products, from manifolded cylinder packs, cylinder pallets and filling system frames.

According to the company, all its modular pieces are hot-dipped galvanised inside and out to a thickness of 70 microns, implying that the frames will not rust or age from environmental exposures over years of field service.

This method of galvanising is considered by CEFRANK to be ‘consistent and durable’. By bonding metallurgically to the frame’s steel structure, the finish won’t age and chip, nor is it easily damaged during handling, storage, transport, and construction.

Galvanising uses zinc to coat steel structures. The highly recyclable



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Zinc product lifespan, maintenance-free, can reach up to 100 years

nature of zinc contributes to a relatively circular economy. Around 30% of the world’s zinc supply comes from recycled zinc, and about 80% of the zinc available for recycling is recycled. The lifespan of zinc products can see products lasting maintenance-free for over 100 years, with a considerable amount of zinc produced in the past still in active use.

TCO has also been improved through advances in digitisation. “We’ve noticed our customers are beginning to introduce digital telemetry features to their bundles,” revealed Cetinich.

“This digitisation allows bundle owners to leverage new data streams to

improve the security of their bundles and offer their customers a more efficient services, such as anticipating when a bundle needs a refill.”

The company is looking to further increase its TCO through negotiations being undertaken with gas power producers to manufacture specially designed cylinders for use exclusively in its bundle products.

“These new cylinders will further minimise impact on the environment and will offer our customers a significant economic advantage compared with existing cylinder bundle products,” added Cetinich.

“We hope to bring this new product to the international market soon.” **GW**