Low-pressure carburising supply system.

Continuous and safe gas supply customised to individual needs.
Acetylene breaks down easily into carbon and \( \text{H}_2 \), making a high volume of carbon available for surface reactions, even on complex metal shapes.

**Challenge**

In the highly competitive and quality-driven automotive industry, low-pressure carburising (LPC) – also called vacuum carburising – is seen as an efficient and environmentally friendly alternative to conventional atmospheric carburising. It offers tangible performance improvements with more homogenous carbon diffusion and no internal oxidation.

Acetylene is widely used as the carbon source for this process, as it easily breaks down into C and \( \text{H}_2 \), making a high volume of carbon available for surface reactions, even on complex metal shapes.

To ensure safe, reliable supplies of acetylene to the furnace, certain handling and safety requirements must be observed however:
- Like all fuel gases, acetylene can pose a fire and explosion risk if not handled properly. Safety is therefore a high priority when planning, engineering, testing, operating and maintaining acetylene supply units.
- Acetylene must be supplied in the required volumes and purities.
- Pressure drops in the supply line must be avoided when acetylene is pulsed towards the furnaces.
- Acetylene is supplied in bundles of gas cylinders so rapid, timely changeover between the bundles is essential to avoid interruptions to the supply.
- The cylinders and bundles must be handled efficiently to ensure maximum utilisation of acetylene reserves and avoid wastage.

Through many projects for different customers, Linde has gained comprehensive expertise and experience in mastering these challenges and in setting up acetylene supply schemes customised to different needs in an efficient, timely and safe manner.
Acetylene is supplied in bundles of cylinders so rapid, timely changeover between cylinders is essential to avoid interruptions to supply. The LINDOMATIK ® pressure-regulating station enables repeat changeovers between acetylene bundles to make the best possible use of gas reserves.

Solution

Linde’s solution – a ready-to-implement acetylene gas supply scheme for small, medium and large installations, includes:

→ Acetylene bundles in the required volumes and purities
→ A portfolio of gas pressure regulation systems with/without automatic switchover between the bundles when supply runs low

The entire system is designed to optimise acetylene utilisation and ensure stable supply pressure. All components are certified and Linde experts ensure that the supply scheme is designed for maximum safety.
Great Wall Motors: A success story

Great Wall Motor Company Limited (GWM) is China’s largest SUV and pickup manufacturer. Committed to consistently innovating and extending its business, GWM launched various innovation programmes. New Energy Intelligent Transmission is one of these. It includes a new heat treatment plant with the world’s largest LPC facility using high-purity acetylene. With this investment, GMW wants to upgrade its operations by embracing sustainable sources of energy for its vehicles.

Situation at Great Wall Motors

GWM’s aim with the new heat treatment plant was to produce LPC components in house.

In order to execute this project smoothly, however, the challenge for GWM was to find a partner:

→ who could ensure timely supplies of gas in the right qualities
→ who could set up an acetylene supply system for the world’s largest LPC plant in compliance with national safety requirements
→ who could ensure process stability by supplying gas at consistent pressure to up to 48 pulsed furnaces located over 300 metres away from the acetylene supply point
→ who could implement the solution within the given time frame
→ who could build upgradability into the system to support future plans and demands

Solution for Great Wall Motors

GWM decided that Linde would be the best partner for the job – based on Linde’s extensive experience in the area of LPC and its ability to support all of GWM’s requirements. From the signed contract to the fully implemented solution, the project timeline was six months. During all project phases, Linde’s local and global teams worked hand in hand to achieve the best possible results.

The local team, for instance, designed and assembled the high-pressure connection and the supply pipeline in close collaboration with GWM’s technicians, while the global team provided consultation and support services. This was particularly valuable in relation to the overall gas supply scheme and the engineering of highly sophisticated hardware components like the pressure regulation system.
This custom-engineered solution avoids any pressure drops during the pulsing of acetylene towards the furnaces, thus ensuring a consistent carburising result. To mitigate and manage any risks and handling challenges associated with acetylene, Linde experts worked on an overall safety concept. This ensured that the gas system matches local safety standards and that GWM’s technicians and operators are well trained in the safe handling and use of acetylene.

As GWM wished for the highest levels of process reliability, even at high flow rates, Linde engineers installed the LINDOMATIK® pressure-regulating station with an automatic changeover unit.

This state-of-the-art system enables repeat changeovers between acetylene bundles for the greatest possible utilisation of acetylene reserves.

To enable high-volume storage on site, the acetylene cylinders were increased in size from 40 to 52 litres and the cylinder bundles were adapted specifically for GWM. In order to deliver on its volume commitment to GWM, Linde upgraded its acetylene plant to produce high-purity acetylene at a rate of 80 m³/h and shortened delivery times for GWM.

“Our new heat treatment low-pressure carburizing (LPC) plant is designed to the world’s leading standards. Our huge investment in state-of-the-art technology includes Linde’s gas supply systems. With this solution using high-purity acetylene, we are capable of running 48 vacuum chambers simultaneously with a production capacity of 1 million units per year. We selected Linde as our supplier because of the comprehensive expertise and experience in this area. We developed this project in full compliance with Chinese safety and environmental regulations. The quality, reliability, safety and continuity of the gas supply solution delivered was the key to executing this huge project with Linde in record time.”

Luis E. Centeno
Operation Vice General Manager & DCT Chief Engineer,
Automatic Transmission Plant Xushui
Getting ahead through innovation.

With its innovative concepts, Linde is playing a pioneering role in the global market. As a technology leader, it is our task to constantly raise the bar. Traditionally driven by entrepreneurship, we are working steadily on new high-quality products and innovative processes.

Linde offers more. We create added value, clearly discernible competitive advantages, and greater profitability. Each concept is tailored specifically to meet our customers’ requirements – offering standardised as well as customised solutions. This applies to all industries and all companies regardless of their size.

If you want to keep pace with tomorrow’s competition, you need a partner by your side for whom top quality, process optimisation, and enhanced productivity are part of daily business. However, we define partnership not merely as being there for you but being with you. After all, joint activities form the core of commercial success.

Linde – ideas become solutions.