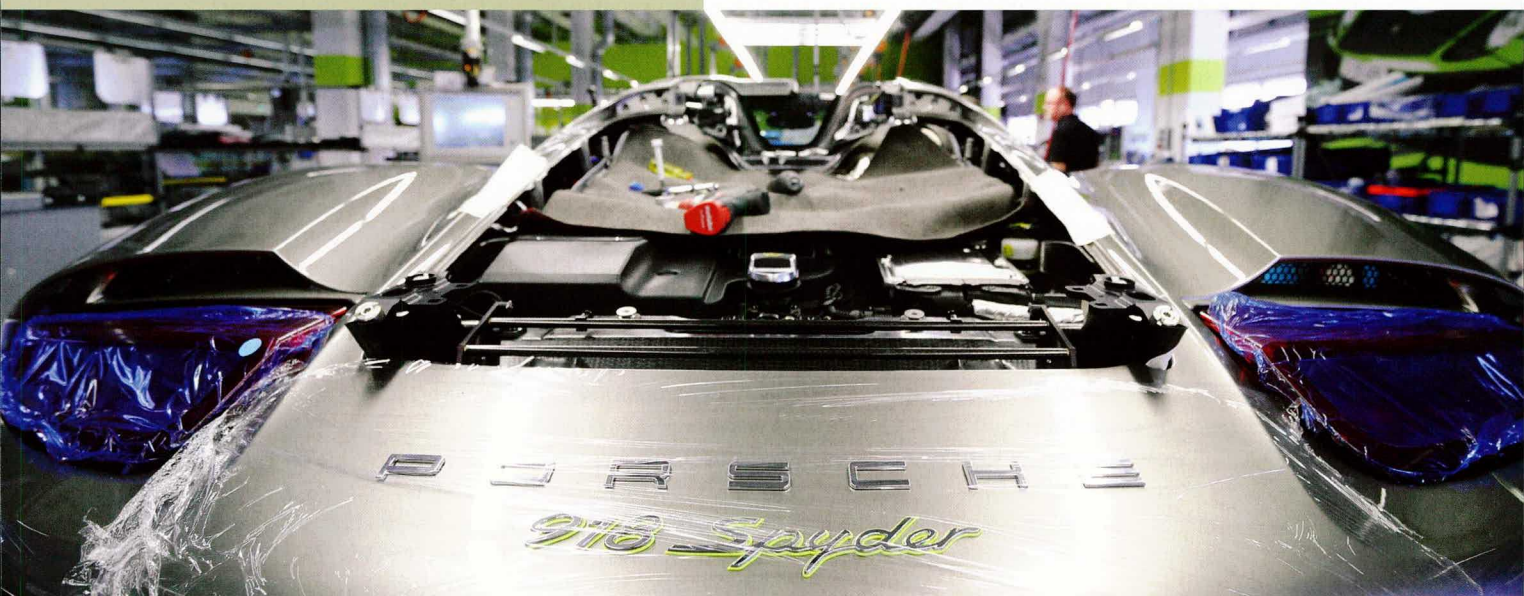


From concept to reality

Hand-built but high-tech, the 918 Spyder is being made in a specially adapted production area at Zuffenhausen. Nick Holt takes a look



A former paintshop with numerous logistical challenges might not sound like the ideal setting to hand-build a hybrid supercar, but Porsche has created a fascinating production area in just such a space. This 'Manufactory' will produce the ultra-high-tech 918 Spyder, but rather than being just another production line, it is an attempt to create a manufacturing environment as special as the car itself.

Many legacy production sites located in large cities lack the space to expand, so when a new paintshop was built at Zuffenhausen, the area occupied by the old one was quickly put to good use. The logistical challenges come as the 918 operation is split over two levels. Parts and materials are stored below the production area and delivered by lift to the sub-assembly sections as complete kits. This area covers about half the 918 production area and assemblies are delivered in a sort of one-sided herringbone layout.

Balancing design & production

The 918 was designed with the production process firmly in mind. The very low volume of production (just 918 units) allowed for a far more indulgent use of materials and production processes, and the two areas that exemplify this best are the 'saddlery', where the leather trim is skillfully applied to the interior parts, and the engine assembly area.

In the former, the steering wheel and seats are supplied ready covered, but the trimming team covers all the other leather-trimmed parts at the line-side. The commissioning carts have a complete set of trim parts for each car and the



It takes around 40 minutes to hand-stitch each pair of sun visors for a 918 Spyder

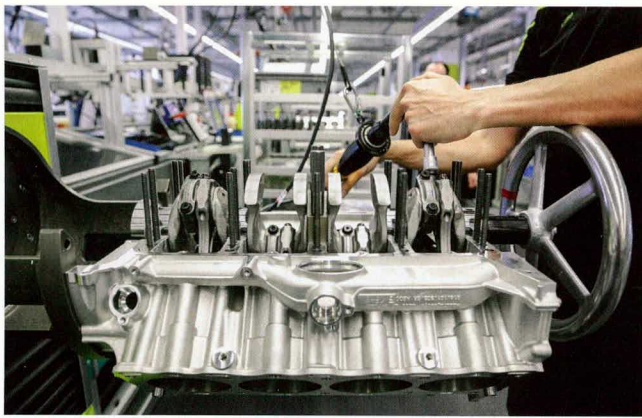
particular colour of the leather ordered by the customer is then applied at various workstations. The attention to detail is such that the leather covering on each pair of sun visors receives 200 hand stitches that take around 40 minutes to complete. This and the other trimming operations are hugely labour-intensive but almost impossible to automate. Although it is an artisan process, the operation is highly organised, with workers

completing the trimming at specially designed, ergonomic workstations, using specialist tooling and custom-made jigs and work-holding rigs.

Using in-house experts

Labour-intensive is a term which can be applied to the whole 918 build. The expert team of 100 is drawn from the production areas building the company's iconic 911, Boxster and Cayman models, so the competences needed for the 918 were already in-house.

In the engine assembly area, each of the V8 units is hand-built in the Manufactory, with a single operative performing all the assembly operations – following the engine through each station. Again, the commissioning carts hold the complete kit of parts for each section of the engine build. Everything down to the the inlet and exhaust valves with



Every V8 engine is assembled by hand at the line-side

associated springs, stem seals, retaining collets, is laid out ready for assembly, with the operatives meticulously fitting and checking each part.

The finished engines are then 100% cold tested in the Manufactory before being sent over to the main powertrain facility at Zuffenhausen, where the units are hot tested then returned for installation.

While lean manufacturing principles might seem at odds with the 918's hand-build ethos, it is very much part of the process. As mentioned earlier, parts storage is limited, so a very efficient supply flow is required from external suppliers. Even given the low production volume, in-hand parts supply is limited. In addition, all components have to be very carefully stored and handled to prevent damage or defects.

A complex build

The 918 build starts with the carbon-fibre monocoque, supplied by Austrian composites company Mubea Carbo Tech. It is initially mounted on a special lift truck that allows the structure to be raised, lowered and rotated as required by the workers. At this first stage, wiring looms, electronic control units, pedal boxes, braking systems and additional non-carbon crash structures are fitted to the chassis. Operatives work in a synchronised fashion, carefully fitting each part and checking the installation at each stage.

The dashboard is assembled at the line-side then fitted to the monocoque, and the final stage in this section is the installation of the windscreen. This is done by hand, the workers applying adhesive with an electronic dispenser before manually lifting the screen into place.

All the hand tools are cordless, minimising cabling and creating an uncluttered production area. Closer inspection reveals that these are electronically calibrated and monitored via Bluetooth, lending an essential measure of quality control and consistency, and ensuring no over- or under-tightening of fastenings during the hand-building process.

As you might expect from a brand like Porsche, quality is one of the highest priorities. On the 918 build there is an additional, practical requirement. Due to the tight packing of components in the car, a system/integrity check is required at each stage of the assembly process as the inaccessibility of some parts would require dismantlement of the vehicle if problems were discovered at a later stage.

Once the initial fitting out of the monocoque is completed, it is transferred from the lift truck to a specially adapted automated guided vehicle (AGV) which has the hybrid system's Bosch battery pack positioned ready for

the monocoque to be lowered on to it. The use of AGVs is another element of the Manufactory concept as they are neat, fully adjustable and do not require built-in floor-mounted or overhead conveyor systems.

With the fuel tanks and other ancillary components fitted, the monocoque is ready for the engine and transmission. The latter, supplied by ZF, is mated to the engine along with the hybrid module, which comprises an 115kW electric motor and a decoupler that serves as the connection with the combustion engine. This occurs in a dedicated area at one end of the assembly hall. Once together, they are placed into a carbon-fibre rear chassis and the whole assembly is then bolted to the monocoque.

From this point, the car travels via AGV along the main assembly line, where cooling systems, exhaust, steering and suspension, interior trim and the pre-painted outer body panels are fitted.

Low-speed, high-quality assembly

Each station has a takt time of 112 minutes, which sounds quite leisurely, but the assembly of the 918 is very complex and requires a good deal of dexterity on the part of the workers – fitting components, pipe work, electrical connections, etc into areas with extremely limited space. Build quality is a high priority and so is safety, especially with the use of high-voltage systems for the hybrid drive. The station where the car's electronic systems receive the software download and are tested is cordoned off to prevent anyone getting too close; even the operator avoids contact with the car during this phase.

However, not everything is high-tech. The painted body panels are delivered to the line-side in special crates to prevent damage. To indicate when the crate is empty and a replacement is required, the operative simply slides a tube on the carrying handle to one side to reveal a red band, indicating 'empty'. Pushed the other way, it exposes a green band for 'full'.

Final stages include the setting of the steering and suspension, fitment of the wheels and final quality and system checks.



Final stages include the setting of the steering and suspension, plus quality and system checks

Production of the 918 Spyder will end in June this year, when the 4,000 sq.m space for the Manufactory will be given over to another role, but the company says that processes and technologies developed for this project can be transferred to higher-volume models. Plus, with Porsche now stating its intent to develop electric vehicles, the experience gained on the 918 will be put to good use. *

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