

Lexus CT 200h Manufacturing

September 12, 2010

Chapter 6: MANUFACTURING, QUALITY AND SATISFACTION

- High-precision assembly line combining innovative production technology with the skills of master craftsmen at every stage.
- High quality assured through unique, Lexus MUST development standards for design, engineering and manufacture
- Legendary customer service

Combining the strengths of the renowned Toyota Production System (TPS) with the company's own peerless build quality standards, Lexus continues to set the world benchmark for overall quality in the premium automotive segment.

The Kyushu Plant – Innovative Production Technology and the Lexus Master Craftsmen

The CT 200h is built at Toyota Motor Kyushu (TMK) where, in 2008, the Kokura plant started operations as the world's first factory dedicated to hybrid production. The plant maintains high standards of manufacturing quality through the high-level fusion of innovative production technology and the skills of Lexus master craftsmen.

Throughout all processes on the CT 200h production line, TMK is committed to the reduction of inconsistencies. One of the most effective approaches is data-driven manufacturing. In each process, from stamping, painting and assembly through to inspection, highly precise data is measured, collated and managed. Measurements for each vehicle are recorded in its production history. By monitoring measurement data in real time, inconsistencies and abnormalities can be detected instantly. Cross-checked against design parameters and stored on a database, this data is then used to hone assembly operations to even higher levels of precision.

However, though cutting-edge robots, digital devices and testing equipment now perform many of the tasks and inspections carried out during CT 200h assembly; there are still many areas of manufacture in which human skills far exceed those of even the most sophisticated automated systems. And the TMK production process integrates Lexus' legendary manufacturing quality with an entirely humanized focus on subliminal quality; those aspects of a car which cannot be mechanically measured or quantified, yet contribute at a fundamental level to perceptions of the very highest overall quality.

For instance, though undetectable by machines, subtle imperfections such as virtually invisible scratches, dull patches in surface coating and gaps or misalignment in body panels are detected by highly skilled Master Craftsman and finished meticulously, one vehicle at a time.

Stamping

Dust-free stamping dies are essential to the creation of a flawless bodyshell. A dust particle need only measure some 20 microns –the size of a grain of pollen from a cedar tree- to leave scratches on body panels, and stringent controls are essential to keep dust away from the entire stamping line.

Twice a week, the dies are taken to a maintenance area within the same plant to be sanded and washed. To ensure that the fine dust generated by this process does not re-enter that stamping area, the maintenance area is surrounded by a dust-catching water curtain net nicknamed 'Niagara'. Niagara is a ten-foot high green net with water flowing constantly down its surface, which catches over 90 percent of airborne particles, resulting in a dramatic improvement in the quality of the stamped panels.

Bodyshell

A high degree of body rigidity underpins the CT 200h's driving performance, ride comfort and quietness. This rigidity has been achieved through key developments in high-precision, advanced welding technologies.

Vehicle body shells are assembled by spot welding performed by robots moving in and out of the vehicle body, which is held in place by a number of jigs. The rigidity and precision of the body is determined by the number of spots the robots are able to reach, and weld. Interspersing slim robots between the standard units has resulted in a dramatic increase in the number of weld points.

Careful analysis ensures that the most appropriate number of weld points is used for each area. This not only improves body rigidity, but also dramatically reduces inconsistencies in body shell.

Painting

The unparalleled surface quality of the Lexus multi-coat painting process is underpinned by meticulous cleanliness in the paint application, particularly in the top-coating booths during the latter half of the process. The eradication of airborne particles is fundamental to the successful application of paint.

TMK has introduced a system such as those used in semi-conductor factories, employing a number of small, one way air outlets to pressurize the area prior to the top coat booth, thus forcing air away from the booth.

This approach has resulted in a significant reduction in the infiltration of airborne particles, achieving a degree of air quality approximately halfway between Class 1,000 and Class 10,000 under the FED (U.S. Federal) standards for cleanrooms. The number 5,000 refers to the number of 0.5 micron dust particles in one cubic foot of air, here corresponding to the cleanliness of air in the earth's stratosphere.

To ensure the CT 200h's outstanding surface quality is maintained throughout the finishing process, the production line combines the latest generation of robotized paint coating technology with the master craftsmanship of hand polishing techniques. The vertical surfaces of the new full hybrid are water polished with a plane sander after the intermediate coat application, and checked by eye as well as digitally to ensure both a physically and visually unparalleled quality of finish.

Assembly

The CT 200h assembly process involves the fitting of several thousand parts to the bodyshell along the assembly line. Lexus has introduced the Set Part System (SPS), in which all parts required for the assembly of a particular vehicle travel along the line with that vehicle in a gondola. Time spent in collecting parts is minimized, and the system can respond flexibly to complex part combinations, enabling it to cope with even complex customer orders.

Numerous 'Clean and Silent' initiatives are being undertaken in all TMK plants. The adoption of a 'friction-driven conveyance' system in the assembly process is a key contributor to a quiet factory environment. The conventional chain-driven conveyor has been replaced by a system employing urethane rollers to move bodyshells along the assembly line.

The resultant, dramatic reduction in noise within the plant improves technicians' concentration, leading to improved work efficiency and precision. In addition, most air tools have been replaced with electric nut driver which automatically adjust to a pre-set torque, ensuring consistent precision and enhanced vehicle body rigidity.

Inspection

During the meticulous inspection process, Lexus once again combines cutting-edge digital measuring technology with the sensory skills of takumi to help ensure the highest levels of vehicle quality and appearance.

Automated, in-line measurements and quality gate checks are conducted by technicians throughout the body welding and assembly processes. Checks carried out during earlier processes are followed by a final fitting inspection in which panel gaps and panel alignment are checked by hand and eye. The inspectors carrying out this work undergo daily training and testing to maintain their sensory skills.

One hundred percent of completed vehicles are inspected in a bespoke 'Quiet Dome' area, checked for leaks in a shower test booth simulating weather conditions worse than a severe typhoon, and driven on a dedicated proving course which simulates various road conditions and driving situations.

Lexus MUSTs

The full hybrid CT 200h has been developed in accordance with an extremely rigorous set of development standards known as the Lexus MUSTs. These unique standards include more than 500 items that set strict guidelines for design, engineering and every stage of the manufacturing process.

The Lexus MUSTs also set NVH standards to achieve the levels of quietness and durability expected of Lexus Hybrid Drive technology and the Lexus brand, and even apply to static factors such as the appearance, tactile quality, sound quality, and the performance and sensitivity of controls.

Customer Satisfaction

Quality, legendary customer service and the finest dealer network in the industry have always represented the bedrock of the Lexus brand. With the launch of the new CT 200h, premium compact customers can now experience the full benefit of these remarkable standards of customer care.