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Unipres Hot Press Technology Boosts Productivity to World-class Levels

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Unipres Corporation is pleased to announce that it has achieved world-class levels of productivity by improving hot press technology, which turns out steel sheet products that exceed the strength of high tensile steel. Hot press technology produces high-strength steel products by forming steel plate heated to high temperature while at the same time rapidly cooling the material in the die to harden it. However, such technology presents problems when it comes to improving productivity.

In recent years concerns over environmental conservation have led to calls for the automotive industry to reduce CO_2 emissions by improving fuel consumption, which requires lighter car bodies. At the same time, however, safeguarding passengers in the event of an accident requires stronger vehicle bodies. In its role as a manufacturer of pressed components for vehicle body frames, Unipres has been working for some years now to improve processing technologies for high tensile steel, in order to reconcile these conflicting requirements for lighter yet stronger bodies. Since high tensile steel is stronger than regular steel sheet, thinner gauges offer equivalent or higher strength than conventional steel. However, their very strength creates difficulties in pressing, requiring the use of large presses and advanced die technology. In its plants around the globe Unipres has 11 of the large 3000-ton-class transfer presses required to process such high tensile steel, and the company produces its own dies in Japan and China.

Engineers consider 980 MPa tensile strength steel sheets to be close to the upper limit for processing body frame parts with current cold press technology, but in response to recent demand for lighter yet stronger vehicle bodies, manufacturers are introducing hot press technology to enable production of high-strength frame parts with tensile strength of 1,350 MPa or more.

Hot press technology rapidly cools the heated steel sheet as it is formed, hardening the material to create products that offer high strength plus excellent dimensional precision. However, hot press technology still presents a variety of problems. For example, the time required to cool the high-temperature steel sheet in the die leads to operating times of about 1–2 SPM (strokes per minute), which are an issue when attempting to enhance productivity. Furthermore, the hardening process creates scale (oxide film) on the surface layer of the product, which has to be removed in post-processing. The scale layer can be removed by shot-blasting or deoxidizing, but the removal process increases costs and may cause problems in assuring product quality.

Unipres began developing hot press technology in 2002 and started operating its first hot press line at its Tochigi Plant (Oyama) in 2004. Subsequently the company made improvements to processes including sheet feeding, heating, transfer of steel sheets to

the press, and cooling. A second hot press line has now achieved the world's fastest operating times of 3 SPM or more (multi-cavity die) and is mass-producing parts such as center pillars and floor reinforcing components. For its hot press lines, Unipres has developed a control system for eliminating faulty products and a traceability system for assuring the highest standards of quality. These systems continually monitor factors including furnace temperatures, heating times, press pressure levels, and pressure times.

Unipres worked with Nippon Steel Corporation to solve the problem of the scale layer created by hot press processing, and succeeded in developing scale guard steel sheet on which scale does not form. Scale guard steel sheet is an aluminized steel sheet for which Nippon Steel has been researching manufacturing technology and product characteristics under a licensing agreement concluded as part of a global strategic alliance with ArcelorMittal. The steel sheet also boasts outstanding anti-corrosive properties, since a high-melting-point ferro-aluminum alloy layer is formed on the material by pre-heating it in the furnace and this coating ensures minimal degradation of spot welding.

In 2005 new evaluation criteria for side-impact collisions were introduced in the North American market, and such moves are creating increased global demand for high-strength car bodies. Industry commentators predict expanded use of components manufactured with hot press technology.

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