

TRENDS IN RESEARCH AND DEVELOPMENT IN METAL FORMING

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The talk points out the trends in research and development in metal forming and focusing on hot stamping of sheet metal, roll forming of steel, tube forming, joining by plastic deformation and tribology in sheet stamping. The development of advanced high strength steels (AHSS), which are now extensively used in automotive industry, is based on accurate temperature control of blanks and tools in thermomechanical stamping of structural parts. Different ways of heating and quenching are presented from Japanese and German industry; Incremental roll forming has revolutionized the forming of double curvature sheet panels applied for custom built buildings e.g. Olympic sports arenas and ship hulls. The development of flow splitting by rolling at TU Darmstadt has enabled the possibility of producing complex, hollow profiles in steel; hydroforming of tubes is now state of the art in automotive industry for structural parts. Advanced tube forming has enabled the fabrication of one piece, metallic liners for aerospace pressure vessels thus avoiding assembly by welding; the application of multiple dissimilar materials in automotive industry requires joining of dissimilar metals e.g. Al-steel and Mg-alloys and metals to polymers. To facilitate these requirements, mechanical joining techniques like clinching and self-pierce riveting have become increasingly popular. The legal restrictions on application of environmentally hazardous lubricants in forming of tribologically difficult materials e.g. AHSS, stainless steel, aluminum and titanium has forced metal forming industry to look for alternative tribo systems. The speaker, who has been heavily engaged in this development, gives examples on this work. The presentation covers developments from leading experts in Europe, Japan and South Korea.

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