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Tue-Af-Po2.24-01 [100]: The development of three stage electromagnetic forming facility and its timing control system

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Abstract—a Space-Time-Controlled Multi-Stage Pulsed Magnetic Field (Stic-Must-PMF) forming and manufacturing technology is introduced in Wuhan National High Magnetic Field Center, the technology is based on spatially strategically placed multiple coil systems and each coil can be addressed individually by its associated power supply with precise timing control. Such well-designed space-time distribution of electromagnetic force could lead to the forming and manufacturing of sheet and tube parts and components with controlled materials properties.

Based on Stic-Must-PMF a Three Stage Electromagnetic Forming Facility is developed. The designed facility is composed of three capacitor power modules. The total energy of each power module is 1MJ, 200KJ, and 14.4KJ respectively. The power modules can be freely selected or utilized for driving multi-stage coils under its timing control system. The precise timing control system is designed for power modules configuration and discharge control. By generating precise and synchronous triggering signals according to the requirement of forming, the multiple power modules could be discharged to multi-stage coils synchronously or in a preset time sequence.

With the application of the designed and fabricated triple-stage electromagnetic forming system, an approach of radial Lorentz force augmented electromagnetic forming is proposed to realize the deep drawing with large drawing ratio. The forming depth of aluminum alloy sheet (1060-H24) has been dramatically increased from 8.44 mm to 20.28 mm .

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