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N20-Numerical Modelling Simulation of Tensile Behaviour of AA5052-PVC-AA5052(Al-PVC-Al) Sandwich Sheets (Paper Id:078)

P. Praveen Kumar Reddy[1], Dr.Chinmaya Prasad Padhy[2*]

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ABSTRACT

Composite materials are made from two or more constituent materials with significantly different physical or chemical properties that, when combined, produce a material with characteristics different from the individual components. This synergistic combination results in new materials stronger, lighter, or less expensive when compared to traditionaland conventional materials. Composites are preferred over the conventional materials in the several applications due to their superior mechanical, thermal, chemical, and electrical properties. Based on this concept, the trend in the sheet metal industry has been focused on strength to weight ratio of the industrial components. The sheet metals are exclusivelyapplied with the single materials by various thicknesses in the industry, which is expensive and more weight. This can be overcome by introducing the new sheet metal concepts as Metal-Polymer-Metal (MPM) sandwich sheet composite. This MPM sandwich sheets areless weight and cost effective. Many researches already had been attempted on various Al alloys and steel alloys by keeping polymer in the middle for their formability studies. In general, MPM sandwich sheets after the fabrication; tensile behaviour has to be carried out for their mechanical behavior. From the obtained mechanical properties, the formability of MPM sandwich sheet can be predicted using various finite element softwares. The present work aimed the tensile behaviour of AA5052-PVC-AA5052 (Al-PVC-Al) sandwich sheets though numerical simulations using PAMSTAMP 2G software. For tensile behaviour prediction of Al-PVC-Al, the base material AA5052 alloy and PVC have been considered with 1mm and 0.5mm thickness respectively. The mechanical properties of Al-PVC-Alwere evaluated through uniaxial tensile testing and obtained the properties such as yield strength (YS), ultimate tensile strength (UTS), strain hardening exponent (n), material strength coefficient (K) and Plastic strain ratio (R) in three rolling directions as shown in Table 1. These mechanical properties were used for numerical simulations by modellingthe tensile test in the PAM STAMP 2G finite element software. Simulation were performed and verified with the

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Forming Analysis of Metal-Polymer-Metal Sandwich Sheets

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Abstract

The sheet metals are exclusively used with the single materials in the industry, which is expensive and more weight. This can be overcome by introducing the new sheet metal concepts as Metal-Polymer-Metal (MPM) sandwich sheet composite. This MPM sandwich sheets are less weight and cost effective. Many researches already attempted on various Al alloys and Steel alloys along with polymer for their formability studies. Any MPM sandwich sheets after the fabrication, tensile behaviour has to be studied by which formability of MPM sandwich sheet can be predicted using finite element software's. The present work aimed the forming behaviour of AA5052-PVC-AA5052 (Al-PVC-Al) sandwich sheets though numerical simulations using PAMSTAMP 2G software. For forming behaviour prediction of Al-PVC-Al, along wirh the base material AA5052 alloy respectively. The mechanical properties of Al-PVC-Al were evaluated through uniaxial tensile testing and obtained the properties such as yield strength (YS), ultimate tensile strength (UTS), strain hardening exponent (n), material strength coefficient (K) and Plastic strain ratio (R). These mechanical properties were used for numerical simulations by modelling the limit dome height tests in the PAMSTMAP finite element software. Simulation will be performed and extracted the limit strains. From the obtained limit strains, forming limit diagram will be developed.

Keywords: MPM, sheet metal, forming, limit strains, mechanical behavior.

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Dr. A. Nanda Gopal Reddy received his BE in Computer Science and Engineering from the Madras University. He has done his MS in CSE/Image Processing from the Manipal University in 2005. He received his PhD (CSE) in Cloud Computing from Manipal University, Jaipur in 2019. He has 17 years of varied experience in the software industries and academics. He had worked in multinationals like GE Healthcare and PIONEER Technologies Pune. He joined in the Department of CSE at the MIST in the year 2008 as an Associate Professor. His areas of specializations are image processing, cloud computing, machine learning and artificial intelligence. He published various papers on Image Processing and Cloud Computing in various Top rated international journals and he is the life membership of the ISTE.

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