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Processing of Customized Automotive Components – Nickel Aluminium Bronze Material using Metal Casting Techniques

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Most rotating components for automotive and industrial usage utilize metal due to the material flexibility and ductility in order to ensure failure part gives early warning or indication. So, a failure can be forecasted by stress-strain condition without the disaster of sudden failure. Nickel Aluminium Bronze (NAB) alloy is capable to offer such ductility during operation and gives a signal prior to material failure. NAB processing requires several controlled parameters. A research has been carried out to address the probable interactions among alloy elements and degassing treatment during the production of NAB casting. The effect of solidified alloy is investigated during processing, pre and post-processing. Firstly, the pattern is developed by using a standard shape of connecting rod available in the market. A few modifications are made to ensure that the dimension and shape are according to the customized equipment. Then, a mixture of alloy consisting nickel, aluminium, copper, ferum and other trace elements, degassing agent and oxidation is prepared and added by sequence during melting stages. After tapping temperature is achieved, the molten metal is poured into the sand cast mould.

It is observed that the degassing treatment is effective on the alloy molten metal. Initial visual inspection discovers that the metal has been casted without much of appearance defect. However, after the casting cavity is cut and sampled for microstructure investigation, the specimen shows a distribution of porosity in scale of micro. It is discovered that the thicker the part, the higher the amount of porosity that resides in NAB dendritic structure. So, further investigation is required to minimize the micro-porosity. The target is to achieve minimum micro-porosity to enhance NAB dendritic structure in terms of uniformity and elements distribution. As a result, the alloy will be more reliable during engineering applications.



Figure 1. Solidification of alloy molten metal in the sand cast mould pattern and mould preparation (customize automotive components) for metal casting technique

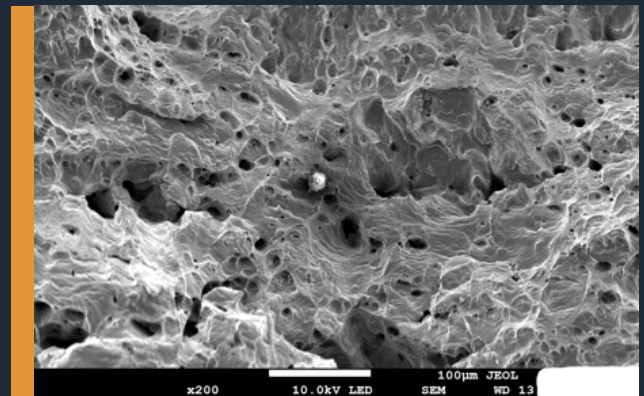


Figure 2. Porosity of trapped gas between transgranular fracture of dendritic structure

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