



INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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Programme of Study : Ph.D.

Thesis Title: **S & T INTERVENTIONS IN BELL METAL PRODUCT MANUFACTURING: PROCESS IMPROVISATION, PRODUCT DIVERSIFICATION AND DRUDGERY FREE WORKSTATION DESIGN**

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SHORT ABSTRACT

The bell metal industry worldwide enjoys heritage estate. However, field survey and literature review shows the industry is presently encompassed with several difficulties, such as age-old traditional production techniques, limited range of products, lack of modernization in terms of workstation, tools and equipments design, etc. The average annual transactions of the Sarthebari bell metal cluster have decreased from Rs. 11 million in 2017–18 to Rs. 7.5 million in 2019–20 and hence the workers are experiencing a very tough time. Moreover, the young artisans have started to leave the occupations due to the presence of a very high level of drudgeries with the current production units and hence, the bell metal industry is facing the manpower scarcity problem.

*To encourage the young entrepreneurs, this Ph.D. thesis devotes towards the drudgery reduction from the bell metal products manufacturing industries through S&T interventions. Firstly, the thesis addressed the **mechanical properties** of bell metal processed in different conditions for improvisation of the present production process. Thereby, oil quenching has been evaluated to be superior for products that required finishing work at room temperature against the present practice of the water quenching process. Another aspect of this study is creating a database on the mechanical properties of bell metal processed in different conditions to help the engineers on selecting the exact processing conditions for the specific applications. Thereafter, this thesis invented that the bell metal can be joined through **TIG welding** process and then different sets of TIG welding parameter has been proposed based on **Pareto optimal solutions** for various applications. The outcome of this study will open new markets for the industry by allowing the production of diversified welded bell metal products. Further, the thesis advocated for statistically determining the level of **drudgeries** associated with the present bell metal production process.. Eventually, a user-centric ergonomically correct workstation has been proposed along with the dimensions of few regularly used tools and equipments to reduce the level of drudgeries experienced by the bell metal artisans. Finally, the amount of **copper leached** in the drinking water from the bell metal utensils has been measured to prove the existing perceptions of the health benefits of using the bell metal utensils. Overall from the thesis work, it has been expected that due to reduced drudgery and increased efficiency of the **designed workstation**, on implementation, the young artisans who began to leave the trade will start to return to the occupation and hence the manpower scarcity problem will be resolved. Moreover, due to the opening of new markets and improved production process, the income level of artisans will increase and hence, the standard of living of millions of people engaged with the industry will improve.*