

Technology transfer through industry-University-government collaboration

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This study examines technology transfer through collaboration between Government, industry and Universities. The Metal Casting Technology Station at the University of Johannesburg (MCTS-UJ) has been a reputed Technology Station and center of excellence for trouble shooting foundry problems and conducting research in South African foundries. The Department of Science and Technology in South Africa funds the Technology Stations Programme (TSP) through the Technology Innovation Agency (TIA). There are eighteen technology stations across the country at various universities and three of these focus in supporting the foundry industry. The mandate of the Technology Station is to develop human capital and support localization through technology and skills transfer. In this paper we discuss two case studies one on human capital development and the other on localization of technology with a partner university in Germany and a local manufacturer in South Africa. Both projects, Research and Innovation in Foundry Technology (RIFT) and inorganic binders for environmental friendly moulding material has benefited graduate students in acquiring the necessary skills and industry with new technology through the use of inorganic binders for environmental friendly moulding material which helped to reduce toxic fumes while mould making. This is an innovative idea used while mould making through MCTS-University of Johannesburg and Technische Universität Bergakademie Freiberg, Germany collaboration.

Keywords: *Technology transfer, RIFT programme, use of inorganic binders, Government-Industry-University collaboration.*

1. Introduction

“Technology transfer is the putting of information (technological innovation) to use, and the technology transfer process usually involves moving a technological innovation from an R&D organization to a receptor organization” [1]. Techakanont and Terdudomtham [2] opines technology transfer is of two types namely product and process transfer. In this

paper we discuss how technology transfer happened in the context of RIFT programme and how the collaboration with industry led to the use of inorganic binders in one of the projects. Sodium silicate binders are used as inorganic binders in foundries as the curing time is low and it is environmentally beneficial [3]. Silicate binders are used to produce moulds and cores especially for castings [4].

2. Research methodology

2.1 Research strategy

We use case study research method as part of the methodology where it covered multiple cases and drew a single set of cross-case conclusion [5]. Convenience sampling [6] was used as it was easy to access and inexpensive to study. Open coding [7] was used to open up case study data related to technology transfer to uncover meanings.

2.2 Case studies

We discuss case studies that covered technology transfer through industry-University-government collaboration namely RIFT programme for localization and the Inorganic binder project. The two cases are discussed in the next section.

2.3 Data Analysis and Results

Case study 1: Technische Universität Bergakademie Freiberg (Germany)-MCTS-UJ (SouthAfrica) –Industry partner : **Inorganic binder project** . Industry partner (IP) initially used the hot box process and they were having problems with binder suppliers and environmental issues. MCTS-UJ collaborated with consultants from Technische Universität Bergakademie Freiberg, Germany to replace the hot box binder. The binder being used after consultation for the project trials is a sodium silicate based binder with slow and fast curing time hardeners. The binder worked well with a slightly increased curing time from the normal time of 10s up to a set up temperature of 160 degree Celcius. There is growing environmental regulations in South Africa. The binder helped to reduce toxic fumes and assisted in producing

environmentally friendly moulding material. Examples of a product using Inorganic binders is shown in figure 1.



Fig. 1 Product using Inorganic binder project

Case study 2: RIFT programme – The Department of Science and Technology (DST), South Africa identified technology gaps and provided assistance to MCTS-UJ to provide an opportunity to four female students to study at the Technische Universität Bergakademie Freiberg, Germany. The students successfully completed their Dipl.-Ing in Foundry Technology in Germany at the end of 2014. In 2015 the graduate engineers were integrated into MCTS-UJ reporting structures that enabled MCTS to enhance its offerings in assisting foundries with skills and new technologies. One of the students on completion of the degree / RIFT programme has been assigned to the Sand Focus Area within the MCTS-UJ, where she contributes to routine checks and tests. She also assisted some local SA foundries with green sand analysis and helped to compare the quality of moulding sand before and after installation of their new sand equipment. One of the other graduates assisted the foundry in the localization of the striker bar casting, simulation and problem solving. The graduates have been involved in developing course material and training activities at the foundry industry.

3. Findings and discussions

The industry-University collaboration led to the use of inorganic binders in the project and helped the industry partner to reduce toxic fume. It also assisted in producing environmental friendly moulding material. The inorganic binder also brought some cost savings to the project. The Government-Industry-University collaboration based on RIFT programme in turn helped in the localization. After completing the degree as part of the RIFT programme the graduates were incorporated into the MCTS structures to strengthen the technical knowledge of local foundries and to provide additional capacity. The graduates used their

knowledge and competence they gained in Germany to assist larger SME foundries with troubleshooting and technology transfer.

4. Conclusion and future recommendations

In this paper we discussed technology transfer through industry-University-government collaboration. RIFT for localization and the use of inorganic binders for environmental friendly moulding material. MCTS-UJ and Technische Universität Bergakademie Freiberg, Germany collaboration led to the use of inorganic binders to reduce toxic fumes and assisted in producing environmentally friendly moulding material. Through the RIFT programme the MCTS staff were able to set up a sand control system to improve the environment. In both programs the technology transfer through industry-University collaboration benefited the staff. The graduates used the knowledge they got in Germany to assist the local South African SME foundries with troubleshooting and technology transfer.

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References

- [1] Rogers, E.M., Takegami, S., Yin, J. Lessons learned about technology transfer, (Technovation, 2001, 21) pp.253-261.
- [2] Techakanont, K. and Terdudomtham, T. Evolution of inter-firm technology transfer and technological capability formation of local parts firms in the Thai automotive industry, (Journal of Technology Innovation, 2004, 12(2)) pp 151-183.
- [3] Rabbii A. Sodium Silicate Glass as an Inorganic Binder in Foundry Industry, (Iranian Polymer Journal 10(4), 2001) pp. 229-235.
- [4] Izdebska-Szanda, I. And Balinski A. New Generation of ecological silicate binders (Procedia Engineering 10, 2011) pp. 887-893
- [5] Yin, R. K. (Case Study research design and method”, 2009, Vol 5, Sage publication, Fourth edition) pp. 20.
- [6] Patton, M., Designing qualitative studies (Qualitative Evaluation and Research Methods, 2002, Third Edition, Sage publication), pp. 241-242.
- [7] Given L.M Open coding (The sage encyclopedia of qualitative research methods, 2008, Sage publications, Vol 2)