

Low-cost domestic water filter: The case for a process-based approach for the development of a rural technology product

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Abstract

The paper describes the case of development of a rural technology product in a high-technology IT (information technology) environment. The product is a low-cost water filter for which there is a definite need in rural India. The case brings out how even a simple-looking concept for water filtration has to go through several well-defined steps for successful introduction into the field. These evolutionary steps resulting in a process for product development were found to be not too different from any high-technology product process (including a software product process) leading to the inference that in general the steps for a successful product process are the same whether the end use is for a high-technology application or a low-technology application. The usefulness of carrying out work within a process framework is highlighted. Since the project aims at technology transfer to the rural poor for generating rural livelihoods, appropriate financial models and the general sustainability issues for such an activity are briefly discussed. The usefulness of an IT environment in facilitating the development activity is pointed out. The lessons learnt in this exercise are documented.

Introduction

Tata Research Development and Design Centre (TRDDC) is one of India's leading R&D centres in the private sector. It is the research division of Tata Consultancy Services (TCS) and is situated in Pune. TCS is Asia's largest independent IT company having its corporate office in Mumbai, India. Its activities are spread over several centres both in India and overseas. TCS is one of the highly successful companies of the TATA group, the largest industrial conglomerate in India having presence in very diverse areas such as steel, automobiles, chemicals, advanced materials, watches, tea, finance, etc. in addition to IT.

TRDDC was conceived as a contract R&D and consultancy organisation to start with when this work was initiated. The centre also has provision for some limited in-house funding for certain selected projects. The currently described activity is supported by such funds although initial R&D work which resulted in the demonstration of the basic concept was funded by an international agency, IDRC, Canada.

TRDDC has an interdisciplinary team of scientists and engineers. It has broadly two divisions, namely process engineering and software engineering. The process engineering division has three groups: Process Modelling, Minerals and Materials and Rural Technology. The core strength across these groups, however, is mathematical modelling of processes.

The rural technology group works on the use of waste materials for developing processes and products for rural needs. Currently two areas are receiving major attention, one being the use of rice husk ash (rice husk is available in large quantities in rural India) for low-cost water filters and the other, use of rural waste to cater to the energy needs of the villagers through the biogas and gasification

route. The present paper deals with the first area, viz. use of rice husk ash for the fabrication of low-cost water filters on which a couple of patents were filed by TRDDC.

According to the recent WHO (World Health Organisation) assessment (Mathys, 2000), there are at least 5 m. deaths/yr due to the use of unsafe drinking water and at least 1.4 bn do not have access to drinking water. To address such a gigantic problem, novel technical, managerial and financial solutions are required. The work reported in the present paper is one such attempt.

The paper first outlines the experiences and difficulties in taking a technical solution to the field. Based on these experiences an attempt is made to evolve a generic process for this activity. Considering that the beneficiary of the invention is rural India adds an additional significance to this effort and more so that a good part of this effort was supported by a leading IT company, viz. Tata Consultancy Services, India.

Background

Rice-husk ash (RHA) as a filtration medium for water is fairly well known (Frankel, 1979); however, the use of RHA for designing a usable filter element for domestic filtration in rural homes is new. TRDDC, Pune has done extensive research in this area and has filed two Indian Patents for this application, (Sundaram et al., 1997), (Meher and Prasad, 1999). The patents describe the materials, the composition, and the processing details for the fabrication of the filter element and the container designs. The filter is called a pebble matrix filter (PM filter).

A schematic of an initial filter design used by the inventors is described in Fig. 1. The process of making the filter element involves thorough mixing of RHA, pebbles and cement in required proportion along with water to the consistency of a concrete mix. The mix was rammed into a sanitary-ware pipe closed at the bottom end with a nylon mesh (placed on a tray to have a hard surface for ramming). After ramming, the top end of the bed is also covered

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