TASK39

SHC SOLAR HEATING & COOLING PROGRAMME INTERNATIONAL ENERGY AGENCY

Market and cost effects

INFO Sheet A1

Description:	*Market and cost effects for polymeric solar thermal collectors*
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Introduction

Talking about polymeric collectors, the reduction of production costs is one main argument for the use of polymeric materials instead of metals. This cost advantage can be split into two categories: lower material costs of the polymeric materials on the one hand and lower manufacturing costs on the other hand. Comparing just the prices for raw materials per kilogram is not sufficient and only little can be said about the saving potential of polymeric materials. In the here presented manner, using some assumptions, a detailed analysis of the cost effects of polymeric materials for the use in solar thermal applications can be performed. In a case study for extruded collectors this analysis is broken down into several steps and the importance of every step is explained in further detail:

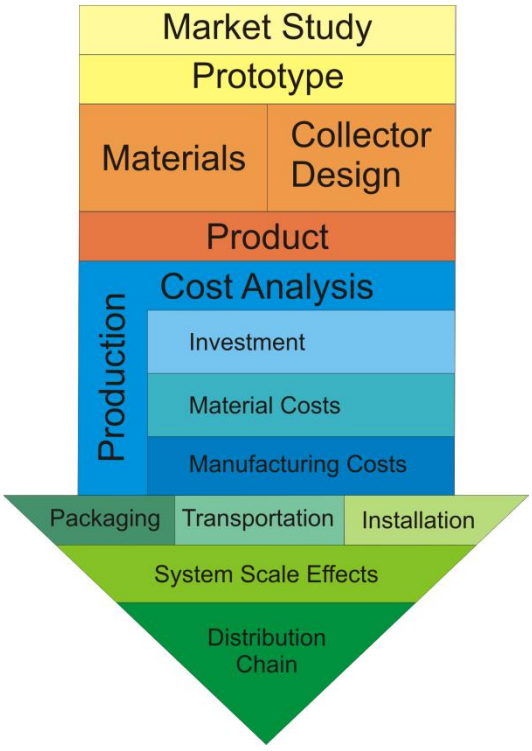

Figure 1: Schematic of the different steps of the cost calculation. At the end of each block the product has to pass the cost analysis. From top to bottom more detailed information about the value chain of the product is needed.

Market

The outcome of a market study is essential for all following steps, influencing not only the collector design, material choice and other product related factors, but also dictates the output and scaling of the production and the targeted price range. Based on the market for conventional collectors and its development, assumptions for the potential market for polymeric collectors can be made.

Materials and Collector Design

Choosing suitable materials demands a detailed consideration of the chemical stability, mechanical performance and other limiting factors. For the calculation of the material costs, the necessary material volume needs to be calculated depending on the collector's design. Compared to metal based collectors, the significantly lower Young modulus needs to be considered and the wall thickness adjusted accordingly, taking into account the decreasing thermal conductivity with increasing wall thickness. Overheating of the material needs to be prevented and the design optimized for the appropriate production technology. Costs are increased or the collector efficiency is reduced by additional measures for preventing overheating, and

additives for the production are factors that need to be considered in the further calculation.

Production

An annual production rate has to be estimated and the production lines are to be scaled accordingly. The manufacturing of the collector has been split into individual steps for which the material costs, individual production costs, the overhead and machine costs can be estimated. Energy costs, investment costs, wages, storage and others are to be mentioned here and depend strongly on the production process and the collector design. Therefore no general consideration can be made. The collector design may have a strong impact on the investment costs (injection mold, extrusion die, welding…) and should be optimized towards process ability. At this step many assumptions need to be made, as detailed data for individual production steps is usually not available. For further analysis a parameter sensitivity study can be included to check, for example, the influence of the energy prices, which are considered one major cost factor.

Scale effects and distribution chain

For some collector designs and systems, scale effects can be investigated, which may reduce the product's market price additionally. Furthermore, the presumed lower weight of a polymeric collector can reduce installation and transportation costs. Based on the distribution chain of conventional collectors, it can be assumed, that most of the savings in production costs, which normally account for one third of the market price, are consumed by the trade margin, installation costs and others. For a thorough analysis of the costs of polymeric and metal based collectors, detailed information about the distribution chain is necessary.

Summary

The production cost analysis can be addressed as known for other products in general, but some differences to metal based collectors should be kept in mind. Material properties vary and require design adjustments. Polymers have significant lower density leading to a lower collector weight and related transport costs.

References

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