HANSER

Selecting Injection Molds

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Weighing Cost vs Productivity

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Vorwort

Preface

When I retired in the early 1980s, from my position as VP of R&D and Engineering at Husky Injection Molding Systems, Ltd., I had been in the plastics field since almost from the beginning of the technology, from Compression Molding of Thermosets, and then worked through the gradual shift to Injection Molding, after the Second World War. In 1985, I was asked by a Canadian non-governmental organization that supplies technical assistance to industries in developing countries to join them. At their request, I traveled to countries in East Asia, North Africa, South and Central America, and worked with a number molders and mold designers of small and medium sized operations in the plastics industry. The time spent there was very rewarding, and I was able to help them to improve their designs, methods and, ultimately, their productivity. These experiences abroad, but also many previous events throughout my career pointed out a general need for easily understood technical (theoretical and practical) education. As a result, I started putting my thoughts and experience first into a book "Understanding injection Molding technology" (1988) and followed it up by other books on Injection Mold Design and Engineering, as well as on Product Design for Injection Molding. But still missing was an easily understood book about the relationship between Productivity, Production and Mold Costs.

I was fortunate that my friend Bruce Catoen, who joined Husky in 1987 as development engineer and who is, at this time, VP of Packaging and Systems at Husky accepted my invitation to co-author the book I had in mind. The purpose was, partly, that Bruce should review what I had written so far, but mainly, to update it where necessary and add the latest developments, where they are germane to the subject of this book.

Injection molds are always expensive to make, but unfortunately, without a mold there cannot be a molded product. Every mold designer will have his or her own approach to the design of a new mold, and there are many different ways a mold can be designed and built.

A frequently asked question is then how to get the lowest cost mold. But this is the wrong question. The question to ask must always be:

> "*How can I get the best molded product at the lowest cost, for the expected production?*"

Whenever talking with molders, mold makers and mold designers I have been asked many times how to decide which features a mold should have. (Number of cavities, methods of injection, type of runners, methods of gating, methods of ejection, machine selection, etc). I have also been frequently asked how one can reasonably estimate the mold cost.

As will be shown, mold cost, mold quality and cost of product are inseparable. The often-quoted saying: "*The devil is in the details*" applies clearly to molds, and the effect of many such details are illustrated and discussed. "Productivity and Cost of Injection Molds" is not a design manual, although there are a number of suggestions for the mold and product designers how to select certain design features to build the most suitable mold for the job. The authors highlight some of the critical decision areas for the construction and the operating details for the most economical mold for the job on hand in an easily understood language, with a minimum of theory or complicated formulae.

The book tries to explain to the "decision makers", i.e. the persons given the responsibility of deciding what kind of mold to design and build, (or to purchase, if the mold is to be built elsewhere,) how they should examine the product design and its specifications, and to highlight the significance of some of the features of the product design on the expected productivity. Such examinations often result in suggestions for practical product design changes that will make it easier to build the best-suited mold at the lowest cost. I have used some examples of molds I have been involved with, and tried to show how even little details can significantly affect the mold cost, the cost of the product, and the productivity of the mold. For the actual mold engineering process I have referred occasionally to my earlier books "Mold Engineering" (ME) and "Understanding Product Design for Injection Molding" (UPDIM.)

An event (from the early 1960s) will illustrate the importance of getting the right mold for the purpose. A friend, starting up as a custom molder with a few small machines, came one day, and told me of a prospective customer, requiring 100,000 each of three very similar, simple, round containers, who had approached him with the request to quote 3 single cavity molds, to be used on his 100 ton machines. We quoted these molds at $3,000 each, (runnerless, fully automatic,) and estimated a cycle time of 10–12 s. Based on these figures, the molder submitted a quotation to his customer who liked the price of the products, but objected to the "high" price of the molds. He said he could get these molds for $1,000 each. The molder, glad to get an order for his machines, accepted that the customer would supply the molds. When they were delivered, they were of very poor quality, with a sprue to be cut, with only token cooling, and the mold ran no better than at a 60 s cycle, or 60 pieces per hour, also, it needed an operator to cut the sprue and to scrape flash where the stripper joined the core. The molder had based his pricing on a 12 s cycle, or 300 pieces per hour. At a machine hour cost of $25.00, this would be $0.08 per piece machine hour time. However, the machine hour cost with the supplied molds would be $0.42 per piece. The mold cost per piece based on our proposal was $0.03, for the 100,000 pieces, and with the cheaper molds only $0.01, so there was little difference ($0.02) in mold costs per piece, but a huge difference in the machine hour costs. In order not to lose his shirt on this deal, the molder thereupon asked us to supply the molds, and paid for them out of his own pocket. He would have lost 0.42 – 0.08 = $0.34 per piece shipped, and his total loss would have been in the order of $100,000.00 for machine time and the unforeseen labor!

The example above shows that a mold is not "just a mold"! When ordering a mold it must be clearly specified what is expected from it. The "cheap" molds would have been all right for very small requirements, but were very expensive for the expected production.

Bruce and I would like to thank all those companies that contributed illustrations and photos to the book. We would also like to give special thanks to Elaine Lafontaine for her administrative assistance during the writing of this book.

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