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MOULD EFFECIENCY AS AN ELEMENT OF PRODUCTION EFFECIENCY

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ABSTRACT

The article deals with mould efficiency as an element of production efficiency. The article is divided into three main parts. The first part describes the aspects of effectiveness of production. The second part describes production efficiency including Production Test Effectiveness. Final part considesr mould efficiency, which is one of the two key factors of the production efficiency.
Key words: effectiveness, aspects of effectiveness of production, production efficiency, production test effectiveness, mould efficiency

1. INTRODUCTION

One of the three conditions necessary for an economy to be economically efficient is to be on its production-possibilities frontier. If it is not on the production-possibilities frontier, more could be produced with the given resources and technology. Any position below the production-possibilities frontier is inefficient. The condition of production efficiency satisfies many points – every point on the production–possibilities frontier.

To be on the production-possibilities frontier, all resources have to be used. Unemployed resources indicate that more goods and services could be produced, which means that the economy was not on the frontier initially.

2. ASPECTS OF EFFECTIVENESS OF PRODUCTION

Effectiveness means the capability of, or success in, achieving a given goal. Contrary to efficiency, the focus of effectiveness is the achievement as such, not the resources spent, so anything that is effective is not necessarily efficient, but anything that is efficient also has to be effective [1,11].

Effectiveness is generally considered from 2 basic sides [2]:

1. **Social usefulness of production** – means that output has to meet the social need. Product has to be made purposeful and in high quality. This side is shown in output,
2. **System economy –** explains, in what rate was maximum output (final product) achieved by using minimal input (elementary production factor). System economy can be achieved by two subsidiary means, namely saving and efficiency.

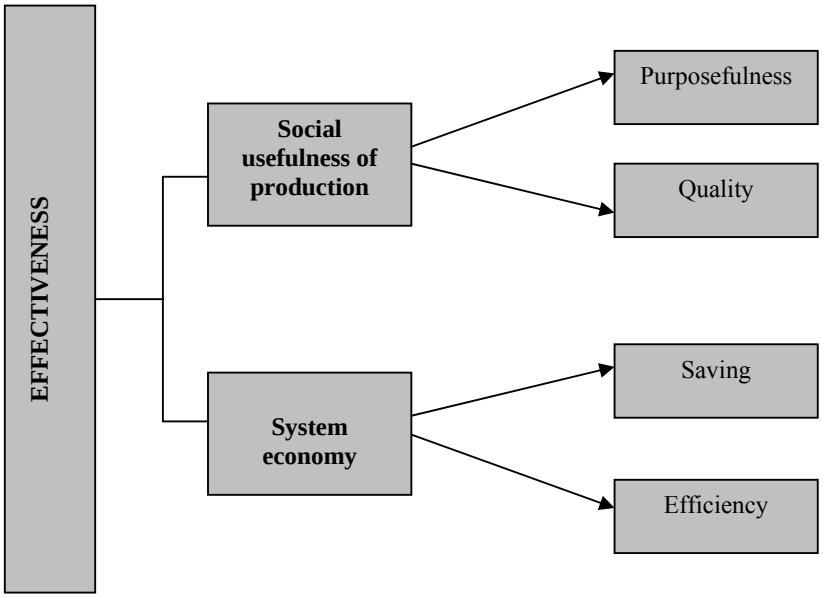

Figure 1 - Aspects of production effectiveness [2]

3. PRODUCTION EFFICIENCY

Improvements in ***production efficiency*** mean that more goods and services can be produced with the same amount of resources. In other words, productivity rises for the given resource-base available for use in production. [3].

In order to achieve improvements in production efficiency resources have to be shifted between industries within the economy. This means that some industries have to expand while others have to contract. Which industries expand and which contract, it will depend upon the primary incentives or basis for trade. Different trade models emphasize different incentives to trade. For example, the Ricardian model emphasizes technological differences between countries as the basis for trade. The factor – proportions model emphasizes differences in endowments, etc. In the real world it is likely that each of these incentives plays some role in inducing the trade patterns that are observed [10].

Thus as trade opens, the country could either specializes in the products in which it has a comparative technological advantage, or shifts the production to industries that use the country's relatively abundant factors most intensively, or shifts the production to products in which the country has relatively less demand compared with the rest of the world., or shifts production to products that exploit economies of scale in production.

If for any of these reasons production change occur, then trade models suggest that total production would rise. This would be reflected empirically in an increase in the country's gross domestic product (GDP). This means that free trade would cause an increase in the level of a country national output and income.

Everyone wants to improve production efficiency – but it is easier to say as to do. But the experiences of companies tell that it can be done.

It is vital to a company to ensure that it works efficiently. The company has to be careful about how to compare the costs. One of the ways is to look at the level of average costs. The average cost is calculated as follows:

$$Average\ \cos t = \frac{total\ \cos t}{output}$$

This paper outlines a general approach to implementation of new technology, identifies the keys of its success and how further sustainable growth can be achieved when new technology implementation is considered as a part of a company-wide strategy. [4]

4. THE PRODUCTION TEST OF EFFECTIVENESS

Test effectiveness experiments are generally performed under controlled conditions (focussed on system inputs and production time periods) in order to carefully document how many failures are found by each test of the machine. Engineers have a responsibility to consider constraints in real-world production environment before they implement results of test effectiveness experiments. In the manufacturing environment we have limited human resources, constrained investment budgets and restricted factory floor space. [9]

"Production Test Effectiveness" ***(PTE)*** is a measure of the defect coverage of a test strategy with constrained resources. It measures coverage when using fixed capital expense, fixed human resource and a fixed amount of floor space. These constraints are fixed, as real world production environments do not have the unlimited resources that might be available under experimental conditions. Production Test Effectiveness is calculated by multiplying the percentage of total defects found with the relative throughput of the test strategy.

$$\text{Pr}\,oduction\ Test\ \ Effectiveness\ (PTE) = (\%\ \text{of total defects found})\ \text{x}\ (\text{relative throughput})$$

Note that the relative throughput is normalized to 1. If, for example, test strategy *A* provided three times faster test speed than *B (at the same outlay of resources)*, then the relative throughput of *A* would be "1" while that of *B* would be "1/3". If *A* provided three times faster test speed than *B* at ″ the outlay of resources (capital cost, floor space, support), then the relative throughput of B would be "1/6".

PTE is contrasted with Test Effectiveness (TE), which is simply the percentage of total defects found by the test strategy during the experiment (regardless of the resources required to implement the strategy).

$$Test\ Effectiveness = (\%\ of\ total\ defects\ found)$$

As described in the discussion that follows, both TE and PTE reveal important attributes of product test strategies. A high PTE value indicates the cost effectiveness or economic advantage of a test strategy whereas a high TE value indicates effectiveness regardless of cost/constraints.

Production Test Effectiveness (PTE) is indicative of the cost effectiveness and economic advantage of a test strategy and is an important metric to evaluate in parallel with the test effectiveness (TE). Case study data on a high complexity double-sided board with real production defects demonstrates that the TE of two different test strategies can be identical at 97% while their PTE´s are 97% and 32%; this represents a three-fold difference in the total cost of ownership.

5. MOULD EFFICIENCY

Usually the Production Efficiency could be divided into two parts. First part could tell us how much we run the machine and the other how well it runs.

This principle applies to injection moulding: Production Efficiency can be split into how much and how well a machine runs. Let's call the former factor Machine Efficiency because it tells us how much the machine was in use. We'll call the latter factor Mould Efficiency, which tells us how well the moulding process runs [5,6].

Machine Efficiency is a simple to be calculated, where the machine's run time stands versus available time. So, a machine that was down two hours of eight- has a 75% of overall Machine Efficiency. Because Machine Efficiency is easy to calculate and understand, many moulders already monitor it as a critical performance measure.

Mould Efficiency is more abstract. It tells us how the moulding machine performed during the run time or, where we could have made good parts but did not. The problem with Mould Efficiency is that there are several factors that determine how well you ran a machine--including scrap, cycle time, and cavitations. All three factors interact in determination of a machine's efficiency. [8]

For example, let's assume we have a 10-cavity tool that is under-performing. In order to run all 10 cavities, we need to lengthen our cycle time by 10%. However, if we were to close off a cavity, then the tool could run nine cavities at standard cycle time. In either case, we only have 90% efficiency. In practice, the interactions between scrap, cycle time, and cavitations often achieve a balance.

Working with the idea that Mould Efficiency can be expressed as a combination of scrap, cycle time, and cavitations, we can define easy-to-use measures for all three factors to arrive at a working definition for Mould Efficiency.

Shot Efficiency is our window into scrap rates and is easy to measure. It is the number of good parts versus the number of total parts made (good parts plus scrap). This value tells us what percentage of all the parts we made were good parts.

Cycle Efficiency is also easy to measure. It is the ratio of standard cycle time over the average cycle time. We need to be sure to express the ratio this way and not the reverse, so that faster cycles yield higher values. For example: if we run a tool with a 10-sec standard cycle at 9.5-sec, the Cycle Efficiency should be 105%, not 95%.

Cavity Efficiency is trivially easy to measure. It is the number of cavities that were run against the number of cavities that the tool was designed to run. Cavity Efficiency is sometimes overlooked as a major factor in overall efficiency. However, I have seen cases where tool cavitations varied depending on material, machine, frequency of preventive maintenance, and even relative humidity [7].

6. CONCLUSION

In generally, company that operates on the market under competition pressures, should try to raise effectiveness of their production. Business processes are effective only when the production costs are minimized, technology is on required level, productivity of labour is high,; and production reacts elastically to customer requests.

The aim of effectiveness of production increase is not to raise numeric value of various production indicators, but particularly leads enterprise to reduce relative costs by upgrading production of components, better utilization in time and to help eliminate narrow place at production. Management has to think above effectiveness of production process on the daily base. The interest in effectiveness relates with effort (rather urgency) to produce more products, with less costs, higher quality and on the right time.

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EFIKASNOST KALUPA (ALATA) KAO ELEMENT PROIZVODNE EFIKASNOSTI

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REZIME

Rad analizira efikasnost kalupa (alata) kao elementa proizvodne efikasnosti. Prvi deo rada opisuje relevantne aspekte proizvodne efikasnosti kao i mogućnosti za njeno povećanje. Drugi deo rada uključuje i test proizvodne efikasnosti. U završnom delu rada analizira se efikasnost alata (kalupa), kao ključnog faktora proizvodne efikasnosti.