The great profitability potential in manufacturing industry

Managing director Bo Hägg
Underhållsföretagen AB, Gothenburg, Sweden

Abstract

The unutilized profitability potential in the manufacturing industry is described. The Key Performance Indicator OEE is used to explain the lack of efficiency. The very seldom explored link between OEE and profitability is also discussed as is an idea how to use OEE in acquisition work. The results indicate that an unused average profitability potential of at least 80% exists in Sweden.

Keywords: reliability, maintenance, OEE, profitability, general machining industry

1 Introduction

The globalization and hence the growing threat from low cost countries is putting industry under a constantly growing competition. Some industry sectors have long realized the importance of maximum reliability as a cornerstone for successful international marketplace survival. Among these are Pulp & Paper, Power and Refinaries. In other words, heavy process industry or capital intensive activities.

The general machining industry does however not show the same understanding for the importance of maximum utilization of invested capital. This puts the industry under severe threat, and many decisions to move production to low cost countries are made on false or at least inaccurate information.

2 Efficiency surveys

A survey made in October 2004 in the Swedish manufacturing industry by SCB, the Swedish Central Bureau for Statistics, indicated that the capacity utilization is very high, even above 91% and that only 15% of all industries had any kind of performance problem in their plants. The inquiery was directed to top management. The consensus among the expertise is however that the utilization in industry is far from 91%. Very few investigations have been made, and the most recent was made in 1997 by prof Hans Ahlmann and his students at Lunds Technical University. His findings indicate that the average efficiency or OEE in Swedish industry is around 60%. Very little has happened since then, and even if there is no later survey made in the same way, the common opinion among experts is that the efficiency may have risen to close to 65%, no more.

In figure 1 one can see a bar diagram showing the results from Prof Hans Ahlmann.

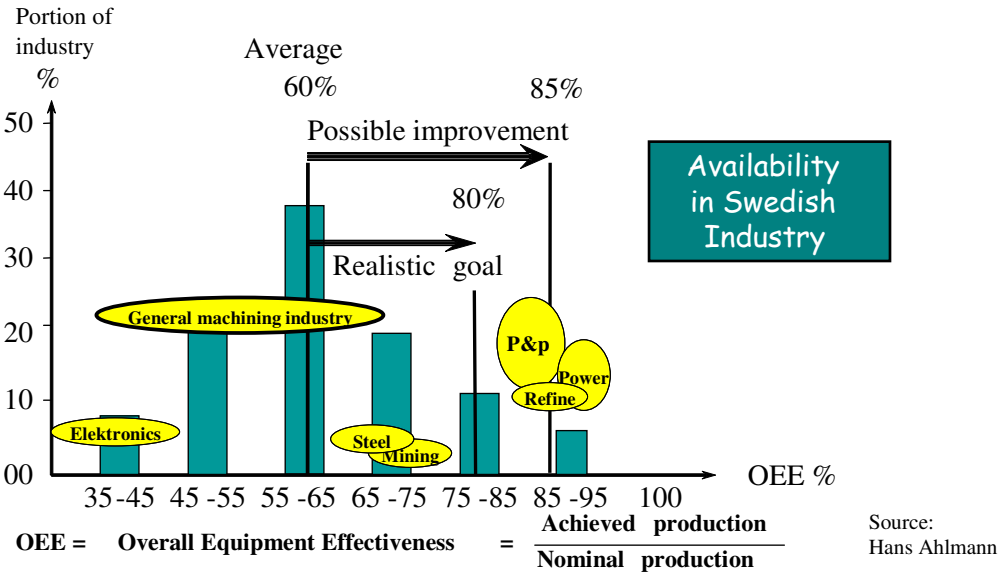

Figure 1. OEE in Swedish Industry

The individual positions for some of the key industry sectors are also indicated. The expected very high position for capital intensive process industries is shown for some of them. The position for steel and mining is however unexpectedly low. Also the very

scattered situation regarding the general machining industry is alarming – but it also gives an explanation to why so many companies in this sector have decided, or will decide in the near future, to move their activities to low cost countries.

Combining above result with the fact that during the last 30 years the capital intensity has increased by almost a factor 4. The capital intensity is equal to the total manufacturing assets divided by the total number of working hours. It is rather obvious that since the efficiency has not increased enough to be able to cover for the heavy investments, the profitability will drop and one will feel the international competition very strongly.

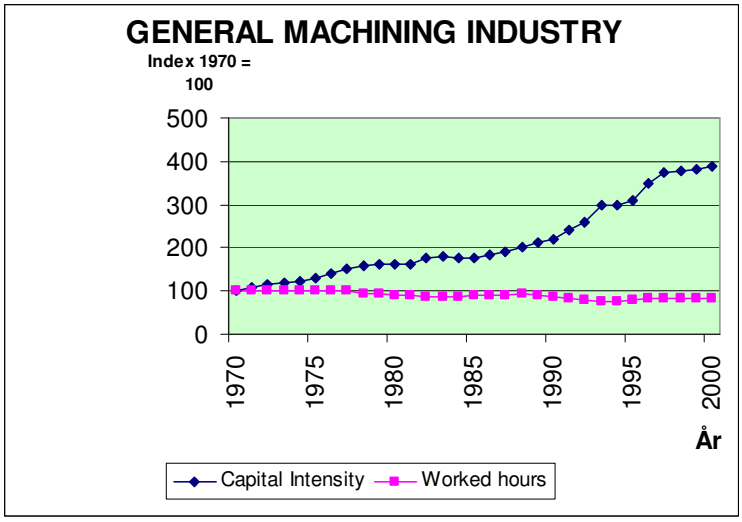

Figure 2 Asset investments compared to worked hours 1970-2000

There are very few publicized investigations on Life Cycle Cost. One of them has been published by The Rockwell Group. This report supports the lower availability figure as stated by the experts.

On average the largest portions of the LCC are the Purchase Cost representing 30%, Installation Costs 15% Costs for Lack of Performance 40%, and Maintenance Costs 9% as shown in figure 3.

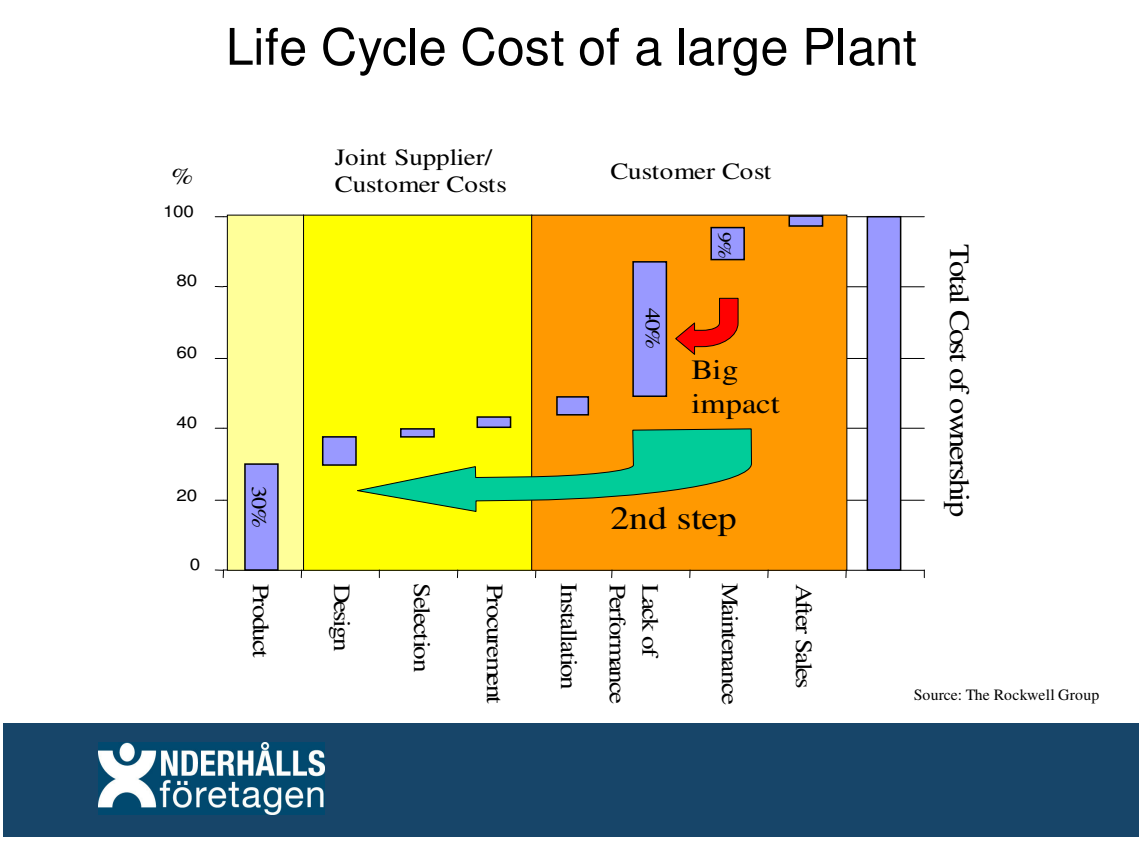

Figure 3. Life Cycle Cost of a larger Plant

Which areas of the LCC contains the largest improvement potentials?

The Cost for the Product or Plant is normally well negotiated and at the best possible level.

The Design Costs should not be minimized but optimized since investments in a correct and well adopted design will ascertain a unit easy to run and maintain.

The Installation Costs are normally kept well under control.

The Maintenance Costs are always under pressure, since they represent a direct cost, which from the management point of view always should be minimized.

The Lack of Performance Costs represent the overwhelmingly largest portion of the LCC. However, its size is constantly underestimated by management. In the earlier mentioned investigation by SCB in Sweden on capacity utilisation, it was also found that 85% of all companies interviewed were of the opinion that they did not have any lack of performance problems affecting their capacity utilisation. Comparing this result with the result from the Rockwell Group, the discrepancy is enormous! Without doubt even in Swedish industry the

largest portion of the LCC is lack of performance. Unfortunately management is unaware of the improvement potential. As indicated in figure 3, correct use of the maintenance resource will have a large positive impact on the the Lack of Performance costs, and in a second phase it can also be utilized to improve the technical specification in the purchase agreement with the ultimate goal to improve maintainability and reliability of the new equipment. This will in turn guarantee a low LCC and a higher LCP.

3 Productivity Improvement and Profitability Potential

To measure properly is only the starting point. To really improve is the real game. The OEE indicator provides a good guidance and sums up all the challenges encountered in Lean Manufacturing:

- *Unused machine time*
- *Setting up downtime*
- *Planned downtime*
- *Unplanned downtime*
- *Speed losses and minor stoppages*
- *Scrap, loss and rework*

Assuming that the total up-time is 90%, the total running speed is 95% of nominal and that the quality output is 99%, the total utilisation is an OEE = .90 * .95 * .99 = 85%. This is regarded as world class in the general machining industry and obtained by few.

The profitability potential can be described by looking at what happens if the OEE value is increased from 60 to 85% - ie a 42% increase in capacity utilisation.
In figure 4 the whole Swedish manufacturing industry is lumped together and it is assumed that the present OEE = 60% is increased to 85%.

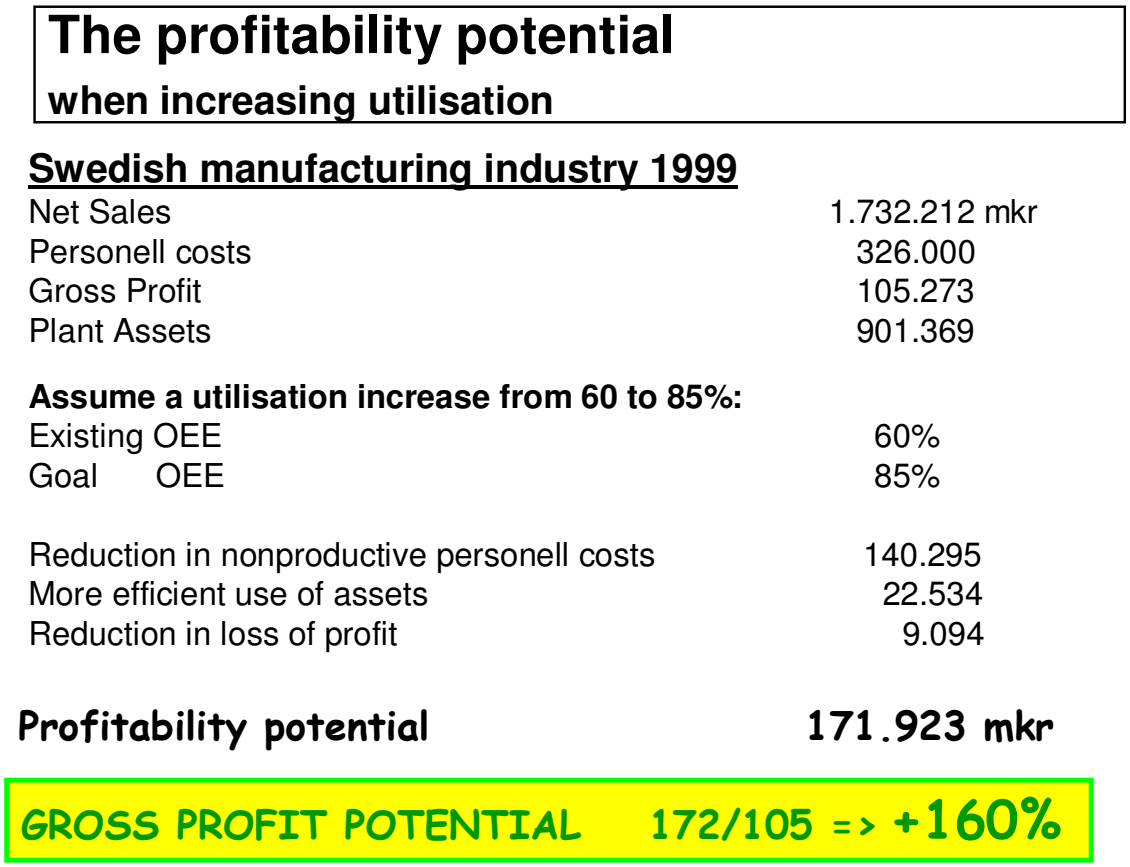

Figure 4. The Profitability Potential

The figures in Figure 4 can be projected down to represent also individual manufacturing units. The numbers will be smaller but the relative improvement potential remains. It is surprising that companies are ignorant about their own position. The truth is that they will discover an enormous improvement potential. which can be achieved without heavy investments.

4 How to get there

There is no quick fix. To improve productivity is a timeconsuming effort which starts from the top. With this I mean that there has to be a total committment from top management otherwise one will never succeed.

The strategy can in short be described as follows:

1. Get total commitment from the Board and the top Management.
2. Get agreement on an actionplan

3. Tidy up and clean up the manufacturing area
4. Define the existing bottle necks
5. Start measuring and define goals
6. Train all employees
7. Introduce TPM
8. Plan
9. Concentrate on reducing unplanned work
10. Introduce CBM and utilise modern technologies.
11. Give continous feed-back to all involved.
12. Revise plan on a regular basis to best describe the current situation

In addition to pure reliability actions naturally there must be efforts put into improving the actual manufacturing.

The currently very popular method Lean Manufacturing is very useful. However, one must be aware of the importance of very high reliability when reorganizing into a Lean Manufacturing set up. The old parallel production philosophy with large value of WIP and intermediate stocking points made it possible to cover up for all sorts of disturbancies in the manufacturing line. One could then always run all machines not affected by the problem and build an intermediate stock. Arranging the production as a line and minimizing the WIP and abolishing all intermediate stocking points makes the line far more vulnerable. If one machine stops, the whole line is stopped. Purely mathematically the overall availability drops from 75% to 32%.

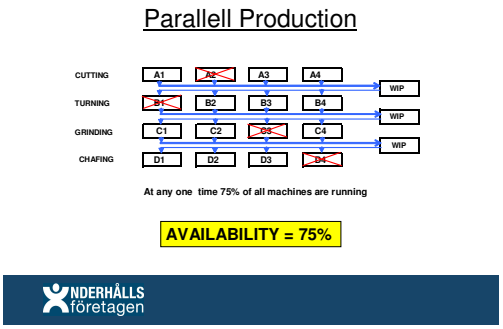

Figure 5a Parallell Production

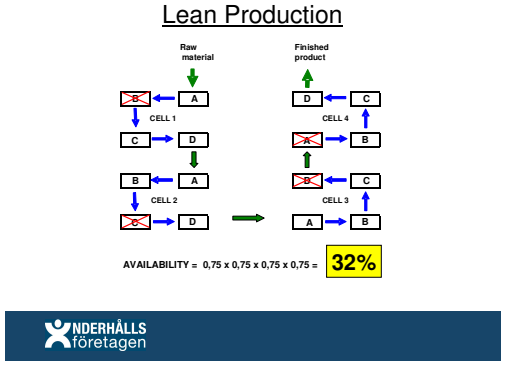

Figure 5b Lean Production

The conclusion here is that before thinking about introducing Lean, the reliability of the plant must be considerably raised. In fact each cell must have an availability of 93% in order to reach an overall value of 75%.

5 Using the OEE indicator as an evaluation tool

The Overall Equipment Efficiency Indicator gives a very good picture of the Inner Efficiency in any manufacturing unit or plant. It describes well if the plant is well organized, well taken care of and kept under efficient control. Combining in a diagram the Profitability, which can be said to describe the Outer Efficiency, with the OEE value describing the Inner Efficiency, all plants can be plotted. Four quadrants will appear

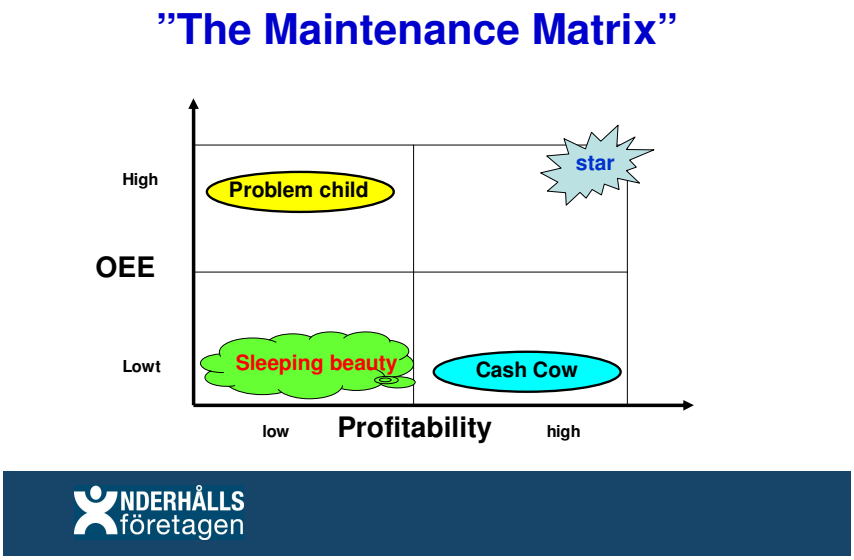

Figure 6 “The Maintenance Matrix”

The upper right hand quadrant STAR — high OEE and high profitability = An extremely well run company

The lower right hand quadrant CASH COW — low OEE and high profitability = A badly run company with a very good product and improvement potentail

The lower left hand quadrant SLEEPING BEAUTY	low OEE and low profitability =	A badly run company with a large potential
The upper left hand quadrant PROBLEM CHILD	high OEE and low profitability =	A well run company with a bad product

For investors this ought to be of high interest, since it reveals a lot about the internal situation and the potential to improve.

6 Conclusion

In general there is a large improvement potential in most industries around the globe. The reliability issue has not yet received the same attention as the Quality Concept did receive some 20 years ago. Reliability has to become a fixed point on all agendas in board rooms as well as in top management meeting rooms. The improvement potential is very large – if the OEE indicator can be raised to 75% from todays mediocre level of 60% it means a profit improvement in Swedish industry of about 80 billion SEK ($ 10 billion). This is equal to almost twice as high a profit as today.

The reliability must increase and maintenance must focus on getting rid of all unplanned stops and use modern high-tech equipment to be able to foresee and plan all activities. Conditioned based maintenance is the best way to improve from a time-planned situation.

The international competition is hard and to be a winner it is all about finding “the hidden factory”.

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