

AUTOMOTIVE ELECTRONICS MANUFACTURING

# **OEE : More Than Just a Metric- A Path to Greater Profitability**

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## Business Context

Automotive electronics manufacturing consists of PCB (Printed Circuit Board) Assembly in SMT (Surface Mount Technology) lines followed by assembly of the PCBA (PCB Assembly) in a housing and finally testing of the finished product. The highest value addition happens in the SMT process.

SMT lines are made up of a series of highly automated machines performing at high speed, complex operations (solder paste printing, component placement, optical inspections etc.). SMT lines call for high capital expenditure (2 to 3 million USD). Hence, they must operate at high levels of efficiency. Since SMT lines typically feed multiple final assembly and test lines, the efficiency of the whole plant is determined by the efficiency of SMT lines. The complexity of the SMT line makes them prone to losses caused by breakdowns, changeovers and Micro-stops (intermittent short duration stoppages) that often accounts for a surprisingly high share of total losses.

An OEE (Overall Equipment Effectiveness) of 80 to 85% is considered good. (OEE of 82.5% is roughly TEEP of 70% based on the 24x6 working pattern). However, achieving 80 to 85% OEE is a formidable task.

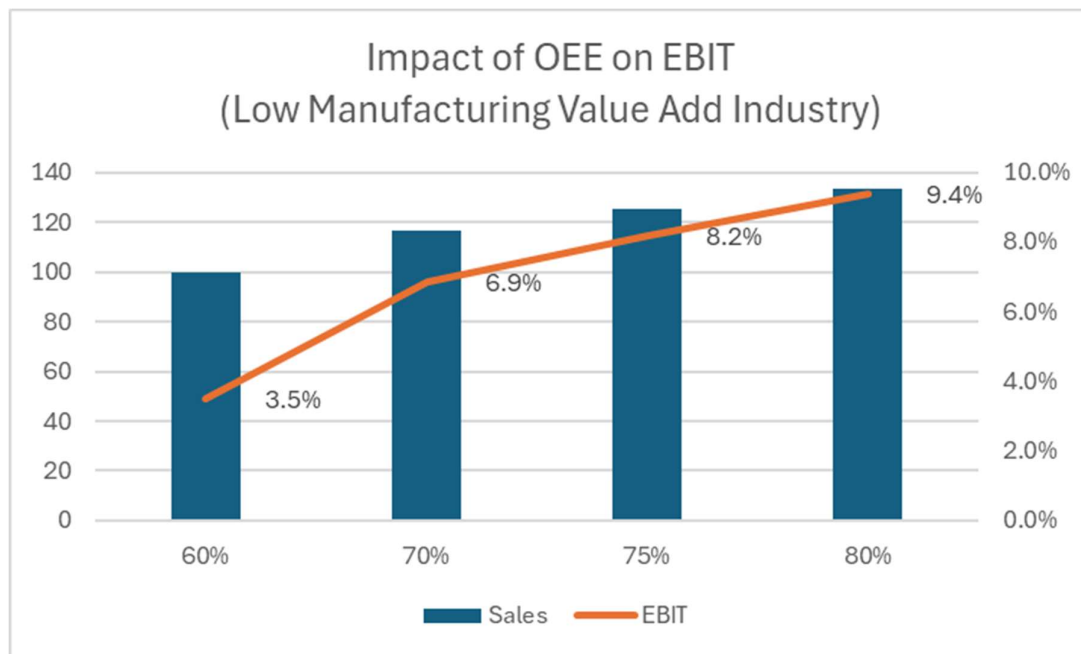
The other factors impacting OEE are workforce capability and process quality. Plants need to orchestrate multiple aspects of operations such as production planning and scheduling, material planning and logistics, maintenance, process engineering, stability and motivation of human resources etc. Trained workers moving between jobs create severe inefficiencies. Largely, plants adversely impacted by an unstable workforce and weaker business processes, operate between 60 to 70% OEE. This is especially relevant for manufacturing operations in emerging economies where workforce turnover is a natural consequence of the growing demand for skilled labor coupled with high wage inflation.

## What is the impact of low OEE?

A low OEE does not merely translate to higher manufacturing costs. A 10% lower OEE is not just a 10% increase in manufacturing cost. If that were true, assuming conversion costs to be 10% of sales (a reasonable assumption), the profitability impact of a 10% lower OEE will be 1% of sales. But the impact, in fact is much higher.

Here is an example to help us understand the actual impact of low OEE. The numbers used are representative of the automotive electronics industry which is characterized by high pass-through material cost and low manufacturing value addition.

Industries with Low Manufacturing Value Addition				
		OEE Improvement		
OEE	60%	70%	75%	80%
OEE Improvement		10%	15%	20%
Sales	100	117	125	133
Variable Costs	74.5	86.4	92.4	98.3
Material	70	81.7	87.5	93.3
Direct Labor	3	3	3	3
Freight	1	1.17	1.25	1.33
Royalties	0.5	0.58	0.63	0.67
Contribution Margin	25.5	30.3	32.6	35.0
<b>Contribution Margin</b>	<b>25.5%</b>	<b>25.9%</b>	<b>26.1%</b>	<b>26.3%</b>
Fixed Costs	8.00	8.25	8.38	8.50
Indirect Labor	3	3	3	3
Manufacturing costs	3	3.25	3.38	3.50
Depreciation	2	2	2	2
Gross Margin	17.50	22.0	24.3	26.5
<b>Gross Margin</b>	<b>17.5%</b>	<b>18.9%</b>	<b>19.4%</b>	<b>19.9%</b>
R&D	8	8	8	8
SG&A	6	6	6	6
EBIT	3.50	8.0	10.3	12.5
<b>EBIT</b>	<b>3.5%</b>	<b>6.9%</b>	<b>8.2%</b>	<b>9.4%</b>



The above example shows that ***improving OEE from 60% to 75% can improve EBIT by 470 basis points.***

In addition to the impact on profit, non-achievement of planned OEE levels result in extended working hours, missed shipment schedules with associated high costs incurred in overtime and expedited freight. In extreme cases this can result in customer disruption and severe dissatisfaction.

It should be obvious that continuous monitoring and improvement of OEE is a powerful lever for improving business performance.