Implementing OEE using Datalyzer Spectrum
Implementing OEE using DataLyzer Spectrum

1. Introduction

This document describes how to implement OEE with the help of DataLyzer Spectrum (version 3.05). For the theoretical background of OEE check the whitepaper Integrating SPC and TPM on the website: http://www.datalyzer.com/white-papers/

In this document we only describe manual data entry without using the real-time OEE module. It is also possible to automatically import data and put it in the OEE chart with the DataLyzer real-time OEE module. The possibilities for automatic import are not described in this document.

The content of this document can also be viewed in a tutorial on the web:
http://www.datalyzer.com/oee-implementation/

2. Implementing OEE

When implementing OEE the following 8 step approach can be used:

1. Select the pilot machine
2. Establish OEE definitions
3. Design a registration form for the shop floor
4. Train the team
5. Register data on the shop floor
6. Enter data in the DataLyzer system
7. Provide feedback
8. Report to management

1. Select the pilot machine

Make sure the first machine is not the most complicated machine. In theory you best start OEE on the bottle neck but it is more important that the first machine has a highly motivated team responsible for improvement.

Make sure the first implementation will be a success.
2. **Establish OEE definitions**

In the second step you define the categories and downtime losses. In this step you also need to establish the maximum speed of production (machine rate) for each product.

3. **Design a registration form for the shop floor**

Because data is entered at the end of a production run you need a registration form to register data on the shop floor.

Contact DataLyzer or your distributor for the following template which you can adapt to your own needs. The template allows you to register downtimes in blocks of 5 minutes.

![Figure 1: Data registration form for the shop floor](image.png)

4. **Train the team**

When the preparation steps are done you can train the team. The training depends on the knowledge available.

5. **Register data on the shop floor**

It is important that OEE is immediately started after the training. The registration form can be used to register downtimes and production information.

6. **Enter data in the DataLyzer system**

At the end of a run the data should be entered in the DataLyzer system.

7. **Provide feedback**

When data is entered in DataLyzer different reports can be made. Establish which reports will be made and organize feedback to the team. Make sure the team is supported to work on process improvements.
8. Report to management

Management needs to set targets for improvement and facilitate the organization to realize the improvements. To manage the OEE improvement process management needs regular reports.

3. Establishing OEE definitions

In DataLyzer Spectrum the OEE registration will be setup using categories and attribute control charts. Categories are organized in groups. If you create a category group you need to select if it is an OEE group.

If you create a OEE group DataLyzer will create 4 standard categories for this group. Each category is assigned to a loss type. The 4 loss types are

- Planned downtime loss
- Unplanned downtime loss
- Performance loss
- Quality loss

You can edit the category or assign it to a different loss type. You can also add other categories to accommodate the definitions to your company standard.

Figure 2: Categories for OEE calculation
In the next step we create the attribute control chart for the machine where we want to setup the OEE registration. You have to select Use categories and select the specific OEE setup you want to use.

![Image of OEE registration setup]

**Figure 3: Example setup OEE registration**

The specific setup of the attribute chart is strongly depending on the company and type of process. An example setup is shown in figure 3.

At the end of a shift the operator enters the relevant data in the subgroup. For each attribute (loss) the operator enters the number of minutes the machine was not running due to the cause. This information can be taken from the registration form. However there are 2 attribute types which don’t need to be entered by the operator because the loss time needs to be calculated.
These 2 losses are:

- Reduced Speed loss (time lost due to running a speed below target speed)
- Reject time (time lost due to producing bad products)

These times are calculated based on the values entered in the optional parameters machine rate, parts produced, parts rejection production, parts rejected startup.

The formula for the speed loss calculation is:

$$\text{Expected output} = (\text{the total production time} - \text{sum of all lost time (excluding quality and speed losses)}) \times \text{machine rate}.$$  

$$(\text{Expect output} - \text{real output}) / \text{machine rate} = \text{speed loss time}$$

This can be setup in the chart. When the category performance loss is selected DataLyzer shows the following window.

![Figure 4: Setup performance loss window](image)

If you select No the following window appears:

![Figure 5: Setup OEE parameter](image)

You select the parameter and press Ok. Then the following window will appear where you select the machine rate parameter.
Based on the settings DataLyzer has enough information to calculate the reduced speed loss.

If you select the category quality loss DataLyzer will ask which parameter is related to the specific attribute. You can have multiple quality losses but normally you only have one.
4. Entering process data in DataLyzer

At the end of a production run or shift the data from the registration form can be entered in DataLyzer. Figure 8 shows how data is taken from the registration form and entered in DataLyzer.

The header information is transferred to the optional parameters. The downtimes on the right side are entered in the losses. The reduced speed time loss, quality loss and OEE are automatically calculated.

Figure 8: Data entry in DataLyzer
5. Analysis of OEE results

When the data is stored the chart with the downtime data is available. Figure 9 shows a typical OEE attribute chart.

![OEE attribute chart](image)

*Figure 9: OEE attribute chart*

The graph shows the minutes of downtime or percentage downtime. The spreadsheet below the graph shows the downtime minutes per category. The color indicates if a predefined limit is exceeded.

If you want to analyze a specific category you can simply click on the specific category.

For example if you click on unplanned downtime the chart looks like figure 10.
Figure 10: Attribute OEE chart for unplanned downtime loss

For the individual losses Pareto analysis can be made for every time period (Figure 11).
6. Reports

OEE can be reported by selecting the OEE history report. In the OEE history report you select the relevant printgroup and you select the time period: day, week or month. You can select a parameter like for example a shift. You can select 3 different reports.

- All losses shows you all individual attributes.
- Categories shows you the summary of the categories and the OEE ratio’s
- Summary only shows you the OEE ratio’s.

Figure 11: Pareto graph for different losses
### OEE History

**Report:** OEE  
**Summaries:** Day  
**Dates:** 7/10/2014 to 11/10/2014  
**Characteristic:** Machine  

<table>
<thead>
<tr>
<th>Date</th>
<th>Day</th>
<th>Production time (min)</th>
<th>Total Planned downtime (min)</th>
<th>Planned production time (min)</th>
<th>Total Unplanned downtime (min)</th>
<th>Total Waiting time (min)</th>
<th>Total Setup time (min)</th>
<th>Availability (%)</th>
<th>Total Performance loss time (%)</th>
<th>Total Quality loss time (%)</th>
<th>OEE (%)</th>
<th>Percentage Loss (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8-10-14</td>
<td>Wednesday</td>
<td>1440</td>
<td>0</td>
<td>1440</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>94.03%</td>
<td>96.91%</td>
<td>99.56%</td>
<td>86.94%</td>
<td>13.06%</td>
</tr>
<tr>
<td>9-10-14</td>
<td>Thursday</td>
<td>1440</td>
<td>120</td>
<td>1320</td>
<td>75</td>
<td>30</td>
<td>0</td>
<td>94.32%</td>
<td>96.06%</td>
<td>99.28%</td>
<td>89.92%</td>
<td>10.08%</td>
</tr>
<tr>
<td>10-10-14</td>
<td>Friday</td>
<td>1440</td>
<td>780</td>
<td>1440</td>
<td>60</td>
<td>60</td>
<td>0</td>
<td>95.45%</td>
<td>94.20%</td>
<td>99.04%</td>
<td>89.63%</td>
<td>10.37%</td>
</tr>
<tr>
<td>11-10-14</td>
<td>Saturday</td>
<td>1440</td>
<td>0</td>
<td>1440</td>
<td>0</td>
<td>0</td>
<td>120</td>
<td>95.50%</td>
<td>98.57%</td>
<td>99.29%</td>
<td>93.08%</td>
<td>6.92%</td>
</tr>
<tr>
<td>12-10-14</td>
<td>Sunday</td>
<td>1440</td>
<td>0</td>
<td>1440</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>95.87%</td>
<td>96.34%</td>
<td>99.55%</td>
<td>89.05%</td>
<td>10.94%</td>
</tr>
<tr>
<td>13-10-14</td>
<td>Monday</td>
<td>1440</td>
<td>0</td>
<td>1440</td>
<td>0</td>
<td>0</td>
<td>7</td>
<td>93.06%</td>
<td>98.61%</td>
<td>99.77%</td>
<td>89.19%</td>
<td>10.81%</td>
</tr>
</tbody>
</table>

*Figure 12: OEE history report selection screen*

*Figure 13: Example OEE history report categories*
7. Results and next steps

The described method offers you a possibility to start with OEE quickly. You can improve OEE by taking the necessary improvement steps. The result will be that OEE will improve and people will understand the OEE methodology.

It might also be helpful to add more specific losses to get better information on specific downtimes.

When OEE is successful on the pilot machine you can expand the same methodology to other machines and other teams.

If OEE improves manual registration might have limitations.

- Registrations forms need to be copied at the end of the shift
- You cannot register exact downtimes
- Log information cannot be added to a downtime
- You cannot register short stoppages
- You cannot have a real-time dashboard of the status and the speed of the machine
- With many downtime causes manual registration will not work anymore
- It is hard to distinguish between waittime and downtime when a technician is required to solve an issue

To make registration easier it is possible to expand DataLyzer OEE registration to real time or even full automatic registration but starting manually is recommended in most situations to make sure people understand what they are doing.

If you need more information or help to get started with OEE contact DataLyzer at sales@datalyzer.com