

## Implementing OEE using Datalyzer Spectrum

October, 2014

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## 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 DataLyzor 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.

**OEE Registration**

Team: \_\_\_\_\_ Date: \_\_\_\_\_

Start run: \_\_\_\_\_ End run: \_\_\_\_\_

Product: \_\_\_\_\_ Machine rate: \_\_\_\_\_

Parts produced: \_\_\_\_\_ Parts rejected: \_\_\_\_\_

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	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	Total Minutes
Morning ( )									
Afternoon ( )									
Night ( )									
Planned downtime									
Planned maintenance									
No orders									
Waiting time									
No personnel									
Unplanned downtime									
No material									
Pause									
Breakdown cause 1									
Breakdown cause 2									
Setup time									
Change over									

Figure 1: Data registration form for the shop floor

## 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 DataLyzor system

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

## 7. Provide feedback

When data is entered in DataLyzor 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

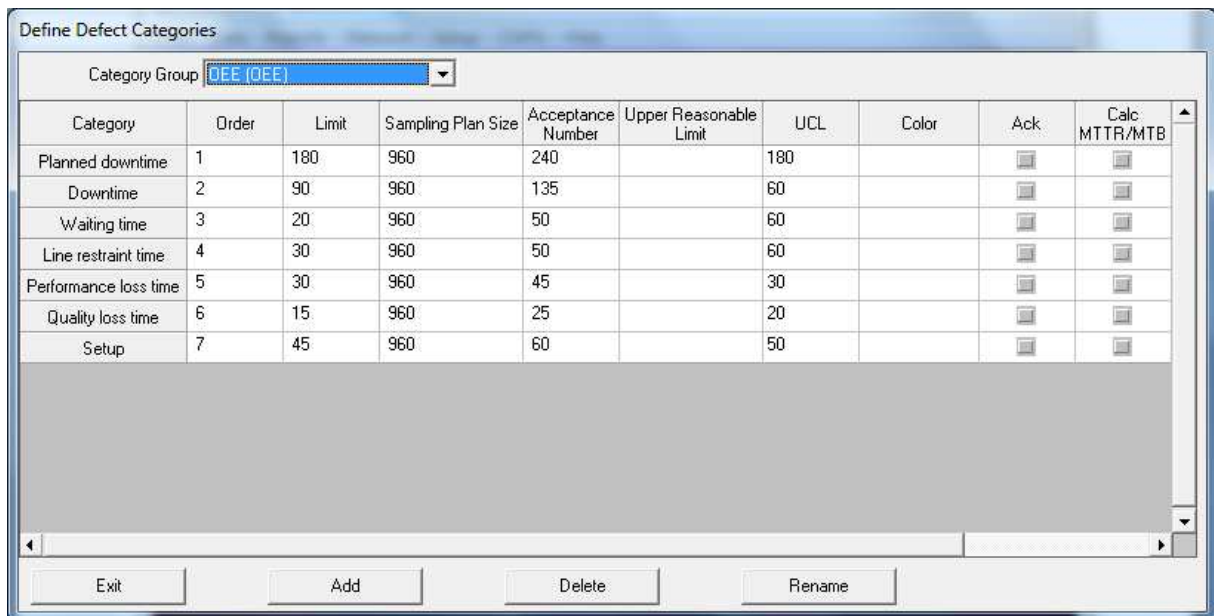
In DataLyzer Spectrum the OEE registration will be setup using categories and attribute control charts. Categories are organized in groups. If you create a category group you need to select if it is an OEE group.



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.

A screenshot of the "Define Defect Categories" dialog box. The "Category Group" dropdown is set to "OEE (OEE)". Below is a table with columns: Category, Order, Limit, Sampling Plan Size, Acceptance Number, Upper Reasonable Limit, UCL, Color, Ack, and Calc: MTTR/MTB. The table contains 7 rows of data.

Category	Order	Limit	Sampling Plan Size	Acceptance Number	Upper Reasonable Limit	UCL	Color	Ack	Calc: MTTR/MTB
Planned downtime	1	180	960	240		180		<input type="checkbox"/>	<input type="checkbox"/>
Downtime	2	90	960	135		60		<input type="checkbox"/>	<input type="checkbox"/>
Waiting time	3	20	960	50		60		<input type="checkbox"/>	<input type="checkbox"/>
Line restraint time	4	30	960	50		60		<input type="checkbox"/>	<input type="checkbox"/>
Performance loss time	5	30	960	45		30		<input type="checkbox"/>	<input type="checkbox"/>
Quality loss time	6	15	960	25		20		<input type="checkbox"/>	<input type="checkbox"/>
Setup	7	45	960	60		50		<input type="checkbox"/>	<input type="checkbox"/>

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.

**OEE registration : Machine 1 OEE**

File Part Characteristic Options Preferences

Characteristic Description

Plant/Department: \_\_\_\_\_ Part Number: \_\_\_\_\_ Resp engineer: \_\_\_\_\_

Characteristic: Machine 1 OEE Special Field Title: \_\_\_\_\_  
Special Field Contents: \_\_\_\_\_

Comment: \_\_\_\_\_

Operator Information

Control Plan Reference: \_\_\_\_\_

Measuring Instructions: \_\_\_\_\_

Attachments

Use Defect Instructions

Frequency: 0  Use DPMO  Use References  Plot DPMO  
 Hide characteristic on network status screens

Display

Use Single Defects  Use Categories OEE  None

Specifications

Subgroup Size: 480 Upper Scale: 100 Input Method:  Totals  Tally

Inspection Unit: \_\_\_\_\_  Force P-chart Upper Reasonable Limit: \_\_\_\_\_

#	OEE Loss Name	Cost	Order	Category	Measuring Instruction
1	Planned maintenance		1	Waiting time	Enter down time in mi
2	No orders		2	Unscheduled dow	Enter down time in mi
3	No personnel		3	Waiting time	Enter down time in mi
4	No material		4	Unscheduled dow	Enter down time in mi
5	Pause		5	Unscheduled dow	Enter down time in mi
6	Breakdown cause 1		6	Downtime	Enter down time in mi
7	Breakdown cause 2		7	Downtime	Enter down time in mi

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 :

Expected output = (the total production time – sum of all lost time (excluding quality and speed losses)) \* machine rate.

(Expected output – real output) / machine rate = speed loss time

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

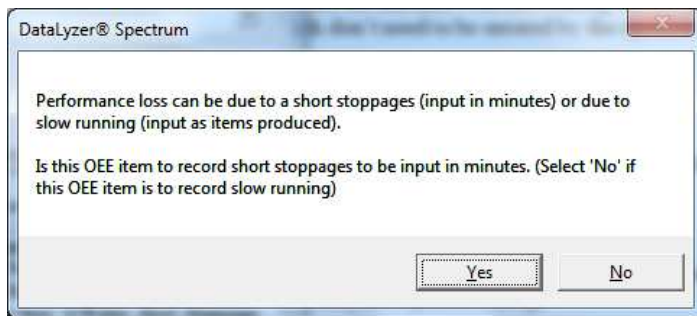


Figure 4: Setup performance loss window

If you select No the following window appears:

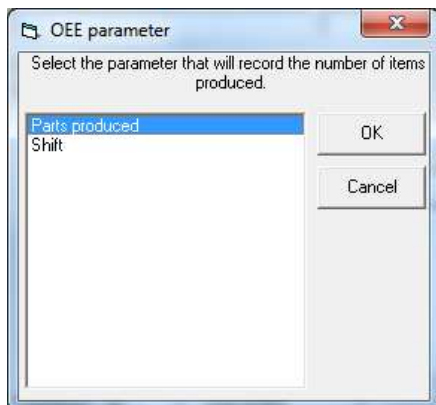


Figure 5: Setup OEE parameter

You select the parameter and press Ok. Then the following window will appear where you select the machine rate parameter.

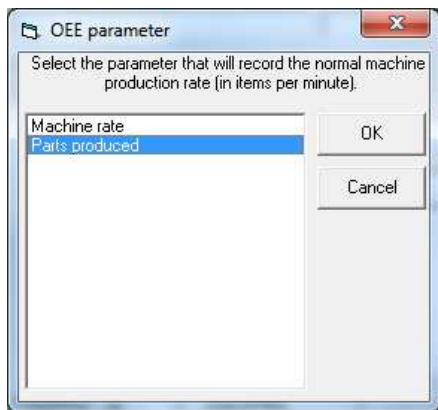


Figure 6: Setup machine rate parameter

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.

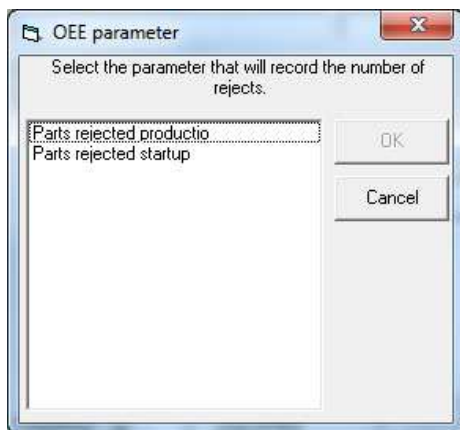


Figure 7: Setup quality loss parameter

## 4. Entering process data in DataLyzr

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

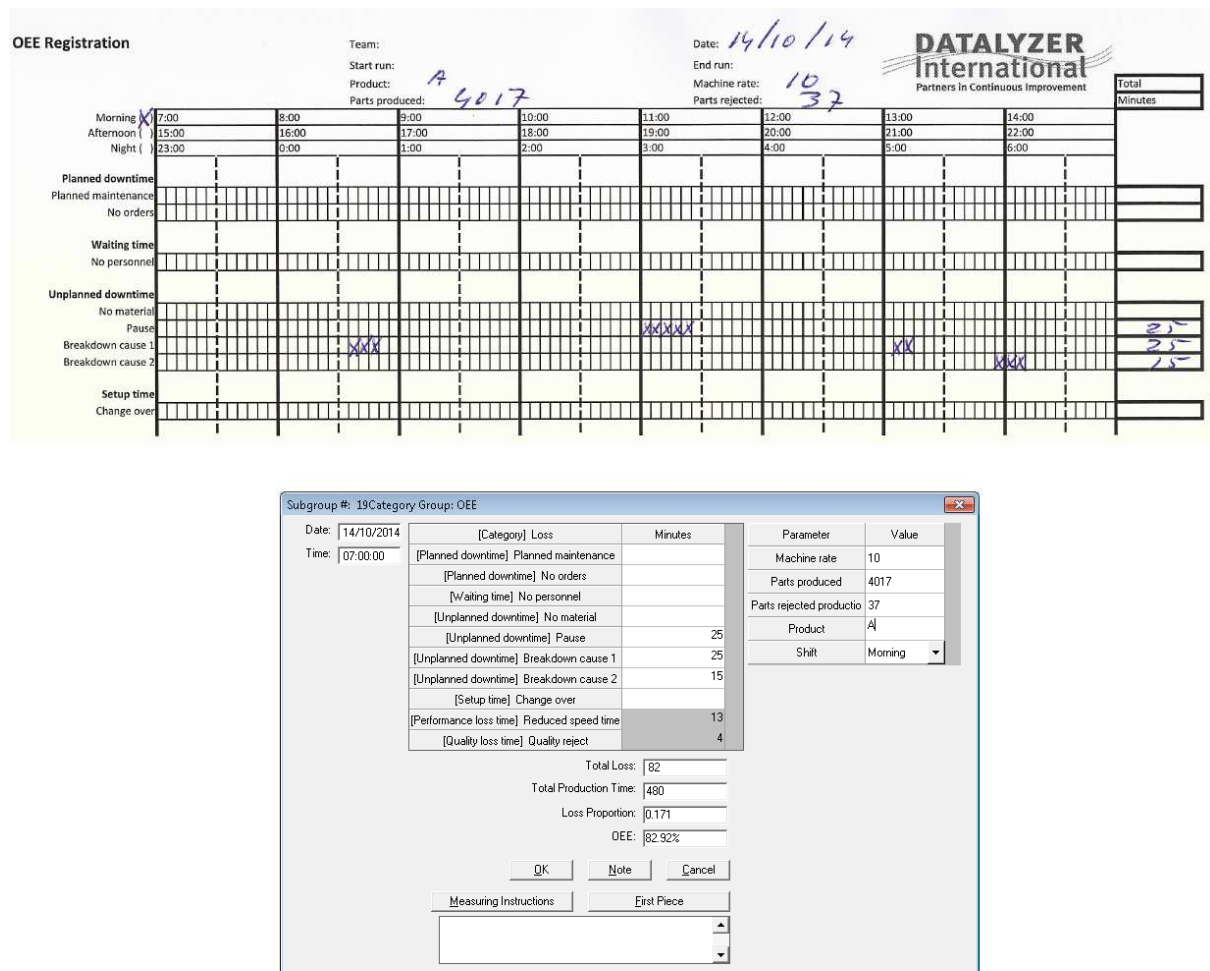


Figure 8: Data entry in DataLyzr

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.



## 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.

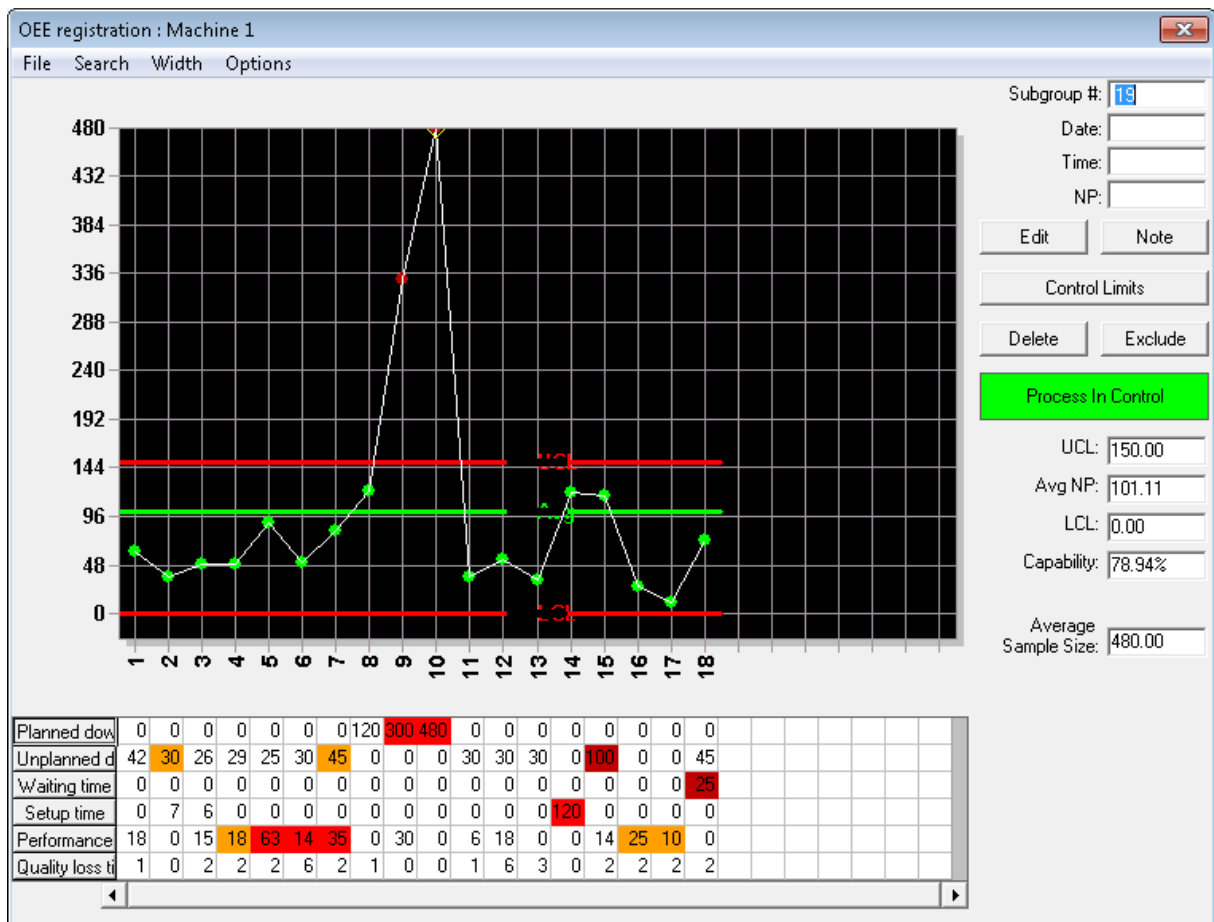


Figure 9: OEE attribute chart

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.

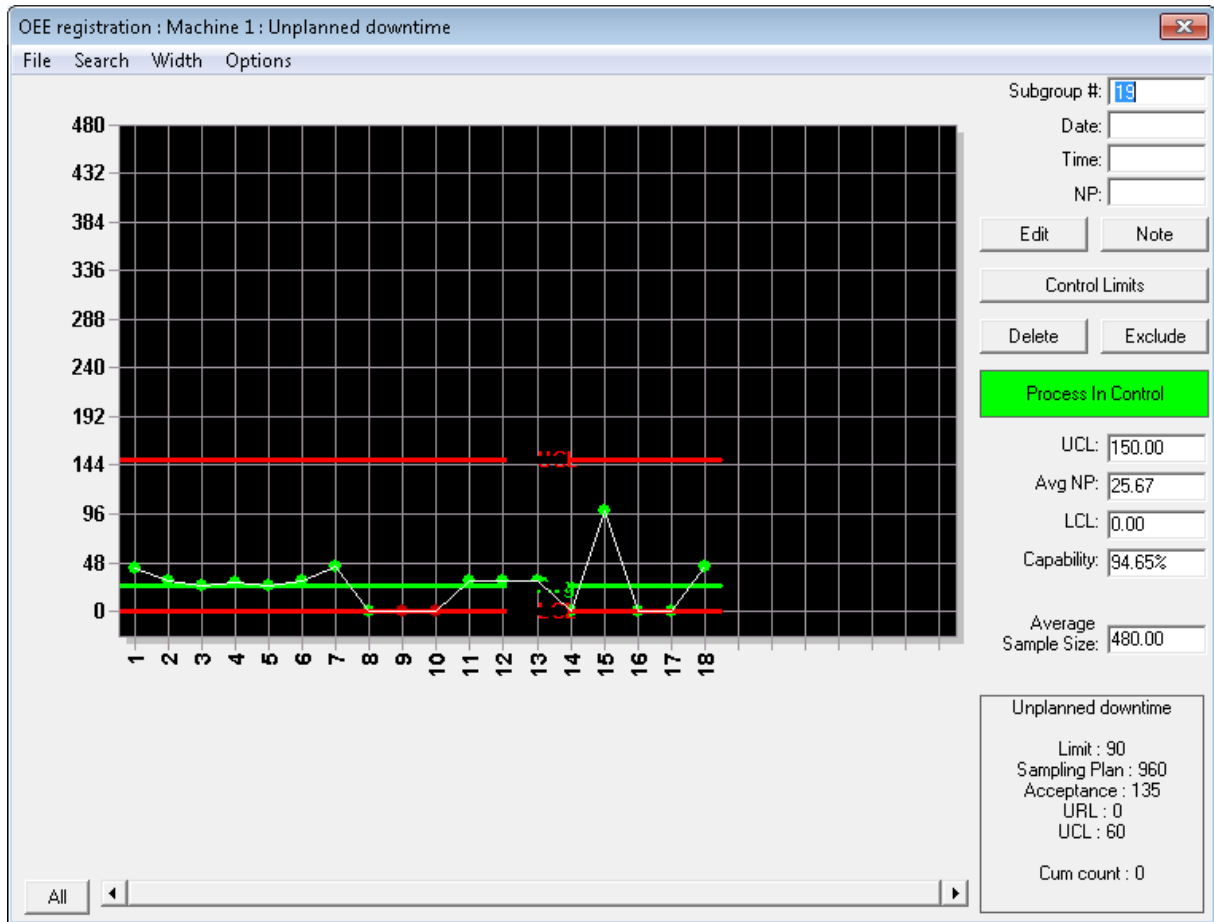


Figure 10: Attribute OEE chart for unplanned downtime loss

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

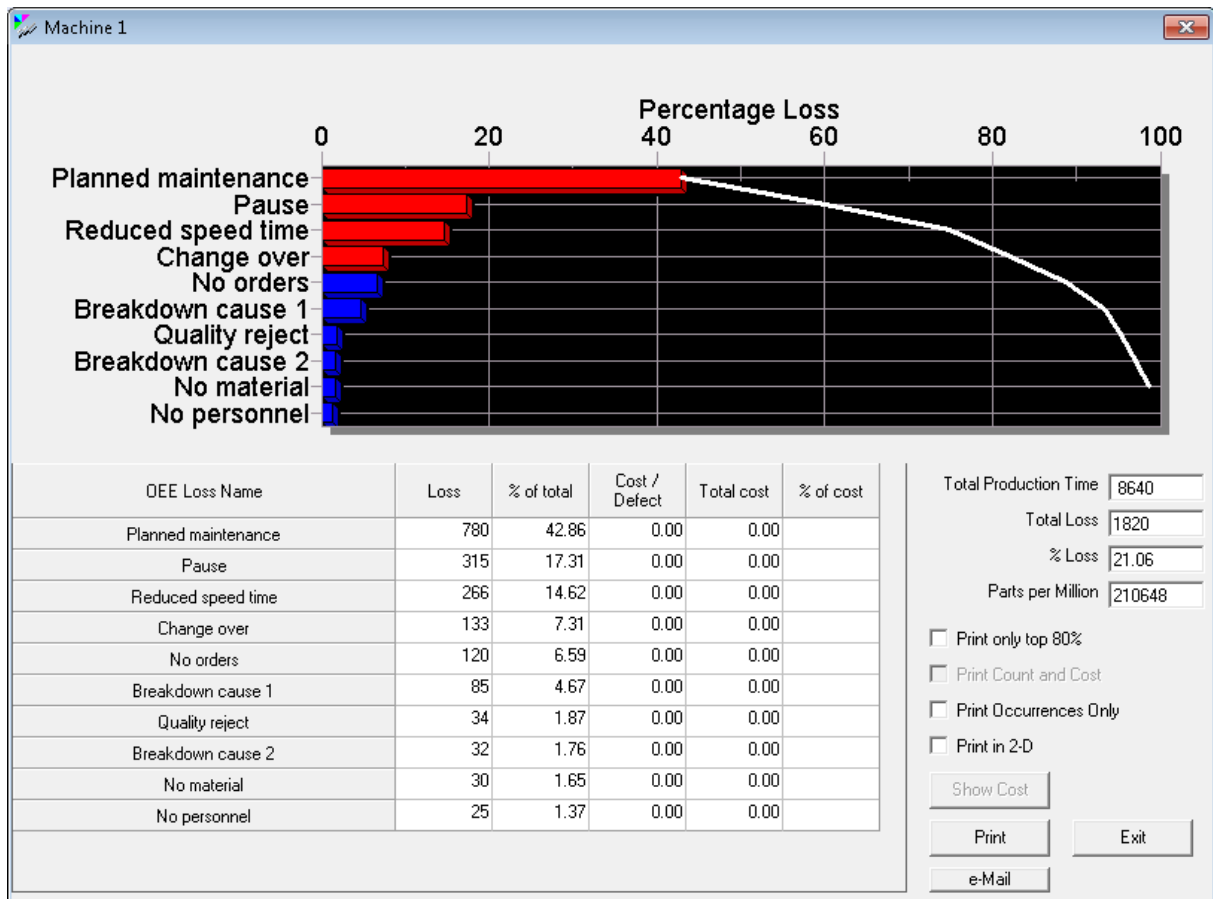


Figure 11: Pareto graph for different losses

## 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.

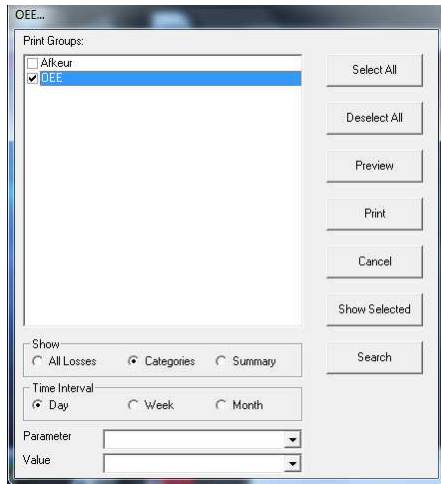


Figure 12: OEE history report selection screen

OEE History							
File							
Report:	OEE	Summary:	Day	Dates:	7-10-2014	to	13-10-2014
Characteristic:	Machine 1			Characteristic# :	1	of	1
	1	2	3	4	5	6	7
Date	8-10-14	9-10-14	10-10-14	11-10-14	12-10-14	13-10-14	
Day		Wednesday	Thursday	Friday	Saturday	Sunday	Monday
<b>Production time</b>	<b>1440</b>	<b>1440</b>	<b>1440</b>	<b>1440</b>	<b>1440</b>	<b>1440</b>	<b>1440</b>
<b>Total Planned downtime</b>	<b>0</b>	<b>120</b>	<b>780</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Planned production time</b>	<b>1440</b>	<b>1320</b>	<b>660</b>	<b>1440</b>	<b>1440</b>	<b>1440</b>	<b>1440</b>
<b>Total Unplanned downtime</b>	<b>80</b>	<b>75</b>	<b>30</b>	<b>60</b>	<b>100</b>	<b>117</b>	
<b>Total Waiting time</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>25</b>	
<b>Total Setup time</b>	<b>6</b>	<b>0</b>	<b>0</b>	<b>120</b>	<b>0</b>	<b>7</b>	
<b>Availability</b>	<b>94.03%</b>	<b>94.32%</b>	<b>95.45%</b>	<b>87.50%</b>	<b>93.06%</b>	<b>89.65%</b>	
<b>Total Performance loss time</b>	<b>96</b>	<b>49</b>	<b>36</b>	<b>18</b>	<b>49</b>	<b>18</b>	
<b>Performance</b>	<b>92.91%</b>	<b>96.06%</b>	<b>94.29%</b>	<b>98.57%</b>	<b>96.34%</b>	<b>98.61%</b>	
<b>Total Quality loss time</b>	<b>6</b>	<b>9</b>	<b>1</b>	<b>9</b>	<b>6</b>	<b>3</b>	
<b>Quality</b>	<b>99.56%</b>	<b>99.28%</b>	<b>99.84%</b>	<b>99.29%</b>	<b>99.55%</b>	<b>99.77%</b>	
<b>OEE</b>	<b>86.94%</b>	<b>89.92%</b>	<b>89.85%</b>	<b>85.63%</b>	<b>89.24%</b>	<b>88.19%</b>	
Percentage Loss	13.06%	17.57%	58.82%	14.38%	10.76%	11.81%	
Previous				Next			

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](mailto:sales@datalyzer.com)