Dashboards for data based decisions

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Opel Szentgotthard Ltd.
Unit manager, Machining
Content

About OPEL Szentgotthard

Planning - Tool set - Execution
- Business environment
- Data – Measure - KPI
- Data processing, forums
- Reports

Results
1. Family 1 engine plant
   22,500 m²
   630,000 unit per year

2. Flex engine plant
   65,426 m²
   645,000 unit per year

3. Cylinder-head plant
   15,500 m²
   625,000 unit per year

13. Transmission Remanufacturing
    1,100 m²
    11,700 unit per year

4-5. Offices
6. Outbound Transportation Hall
7. Warehouse
8. Energy centre
9. Truck gate
10. Personal Entrance 2
11. Social Building
12. Main Entrance / Offices
13. Reman
14. Knowledge Center
Cars with Family1 engines

Chevrolet Aveo/Sonic  Chevrolet Cruze

Opel Corsa  Opel Astra NB  Chevrolet Trax

Opel Zafira  Opel Insignia  Opel Mokka X
Cars with Flex engines

- Opel Insignia
- Opel Zafira
- Opel Astra
- Chevrolet Equinox
- Chevrolet Cruze
- Chevrolet Malibu
- Opel Adam
- Opel Cascada
Flex machining lines & capacity

Existing Plant

New Plant/Extension

CRK1
MDE 275 K/Y

CRK2
SGE MGE 275 K/Y

CBL1
MGE (Cast Iron) 100 K/Y

CBL2
SGE MDE (Alu) 180 K/Y

CBL3
MDE/SGE (Alu) 280 K/Y

Ch2
Fam1 MGE 100 K/Y

CHM1
SGE / MDE 180 K/Y

CHM2
SGE / MDE 280 K/Y

Assy1
MGE/SGE 285 K/Y (+ 85 K/Y)

Assy2
MDE 275 K/Y (+95 K/Y)

CRK1
MDE 275 K/Y

CRK2
SGE MGE 275 K/Y

CBL1
MGE (Cast Iron) 100 K/Y

CBL2
SGE MDE (Alu) 180 K/Y

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MDE/SGE (Alu) 280 K/Y

Ch2
Fam1 MGE 100 K/Y

CHM1
SGE / MDE 180 K/Y

CHM2
SGE / MDE 280 K/Y

Assy1
MGE/SGE 285 K/Y (+ 85 K/Y)

Assy2
MDE 275 K/Y (+95 K/Y)

CRK1
MDE 275 K/Y

CRK2
SGE MGE 275 K/Y

CBL1
MGE (Cast Iron) 100 K/Y

CBL2
SGE MDE (Alu) 180 K/Y

CBL3
MDE/SGE (Alu) 280 K/Y

Ch2
Fam1 MGE 100 K/Y

CHM1
SGE / MDE 180 K/Y

CHM2
SGE / MDE 280 K/Y

Assy1
MGE/SGE 285 K/Y (+ 85 K/Y)

Assy2
MDE 275 K/Y (+95 K/Y)

CRK1
MDE 275 K/Y

CRK2
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CBL1
MGE (Cast Iron) 100 K/Y

CBL2
SGE MDE (Alu) 180 K/Y

CBL3
MDE/SGE (Alu) 280 K/Y

Ch2
Fam1 MGE 100 K/Y

CHM1
SGE / MDE 180 K/Y

CHM2
SGE / MDE 280 K/Y

Assy1
MGE/SGE 285 K/Y (+ 85 K/Y)

Assy2
MDE 275 K/Y (+95 K/Y)

Coolant Block

Indirect store

Hot Test

Logistic

Coolant head

Coolant crank
Example: Cylinder block machining line 3
Throughput- Planning

As a function...

\[ \text{Throughput} = f(a, b, c, d, \ldots, t) \]

- \(a\): # of characteristics,
- \(b\): # of machines,
- \(c\): # of spindles (stations),
- \(d\): # of spindles (stations) per operation,
- \(e\): # of conveyance routes,
- \(f\): # of cycle times,
- \(g\): # of measuring points,
- \(h\): # of planned, unplanned tool change,
- \(i\): # of interventions by operators,
- \(j\): # of breakdowns,
- \(k\): # of impacts of other machines, gantries, conveyors, adapters, etc.,
- \(l\): # of types, type changes,
- ...
Data → Information
Manufacturing process → visualisation

Component production

Uptime

Process

Measure

KPI

Layered reporting

Visualisation

Produced parts


SAT = Output / (Running Time + Downtime) [JPH]

Uptime = \( \sum_{i=1}^{n} \frac{O_i \cdot T_i}{t_L} \) [%]

Uptime = Net Output / (Scheduled Hours / Cycle Time_{purch}) [%]
Data management, BI

DATA - DATA PROCESSING – REPORTS

Requirements

• Proper data quality in time
• One data once entered
• Tracking changes in time (target changes)
• Be capable to
  • aggregate
  • identically defined measures
• Fast response
• Layered reports
• Shared BI
• Sharing
Business intelligence and OLAP

“Business Intelligence is a set of methodologies, processes, architectures, and technologies that transform raw data into meaningful and useful information used to enable more effective strategic, tactical, and operational insights and decision-making.”

Evelson, Boris (21/11/2008)
Multidimensional data structure

**OLAP cube**

Manufacturing cube; # of produced parts
Data sources, systems

- PMC
- Flexnet
- Qs-Stat

TL, SL

CMM report

Manufacturing cube; # of produced parts

OLAP
Tabular
System structure

Data

Browser

OLTP Database

Data Warehouse

Measures, KPIs, BI

OLAP Cubes

Reports

Special reports

Shiftreports

Dashboards

Shared BI

Input:

Scheduling
PMC
MGO
Flexnet
PAS

ME MySQL
Data Collection

FACS
Flex (Assy)

Schneider
Energy
Mgmt

AVL
(Hottest)

Output:

4000
3500
3000
2500
2000
1500
1000
500
0

2013-07-26
2013-07-26
2013-07-26
2013-07-26

2013-07-17
2013-07-17
2013-07-17
2013-07-17
### Reporting Examples

#### Shared BI – New Report

**Weekly Report**

**Production Dashboard**

**Reporting Examples**
Systematic forums & reports

- **Daily**
  - Daily production meeting
  - TIP

- **Weekly**
  - Weekly production meeting
  - TIP
  - Uptime action plan update

- **Monthly**
  - Weekly production meeting
  - TIP
  - Cost management review
  - BPD review

- **>Monthly, Annual**
  - LRP, CIP plan
  - Manuf Staff Mtg, PPRM

**TIP:** Throughput Improvement Process
**BN:** Bottleneck
**SAT:** Standalone Throughput = Output / (RunningTime + Downtime)
**LRP:** Loss Reduction Project
WEB interface shiftly, manual supported by PM&C on-line
Shared BI, database connections

=CUBEVALUE("ProductionCube","[Measures].["&H$3&"],","[Dim Lines].[Short Line Name].All.["&B37&"],"Slicer_Time_Hierarchy,Slicer_Date_Of_Shift_Start")

<table>
<thead>
<tr>
<th>Year</th>
<th>Month</th>
<th>Date of shift start</th>
<th>Last refreshed: 29-May-2017 07:39</th>
<th>Uptime MTD Machining: 84.6%</th>
<th>Bottleneck SAT daily - weekly - monthly</th>
<th>Downtime</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Year</td>
<td>CHM1</td>
<td>CHM2</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Abseentism Rate</td>
<td>Safety incident</td>
<td>Planned/ scheduled</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0%</td>
<td>0%</td>
<td>708</td>
</tr>
<tr>
<td>2017</td>
<td>5</td>
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<td></td>
<td>0%</td>
<td>0%</td>
<td>2645</td>
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<td>1%</td>
<td>12094</td>
<td>12650</td>
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<td></td>
<td>2%</td>
<td>74453</td>
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<tr>
<td>2017</td>
<td>5</td>
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<td>18472</td>
<td>18077</td>
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<td>115245</td>
<td>114397</td>
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</table>
# Daily reports

## Last refreshed: 29-May-2017 07:39

### Uptime MTD Machining: 84.6%

<table>
<thead>
<tr>
<th>CHM1</th>
<th>Absenteeism Rate</th>
<th>Safety incident</th>
<th>Planned/scheduled</th>
<th>EOL produced</th>
<th>ΔEOL produced</th>
<th>Uptime</th>
<th>JPS</th>
<th>FTQ</th>
<th>Material scrap %</th>
<th>EOL buffer</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017-05-29</td>
<td>0%</td>
<td>708</td>
<td>710</td>
<td>2</td>
<td>89%</td>
<td>270</td>
<td>97%</td>
<td>0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>WTD</td>
<td>0%</td>
<td>2645</td>
<td>3046</td>
<td>401</td>
<td>88.8%</td>
<td>269</td>
<td>98%</td>
<td>0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>MTD</td>
<td>1%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>YTD</td>
<td>2%</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

### Bottleneck SAT daily - weekly - monthly

<table>
<thead>
<tr>
<th>Downtime</th>
</tr>
</thead>
</table>

### CHM2

<table>
<thead>
<tr>
<th>Absenteeism Rate</th>
<th>Safety incident</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017-05-29</td>
<td>0%</td>
</tr>
<tr>
<td>WTD</td>
<td>0%</td>
</tr>
<tr>
<td>MTD</td>
<td>0%</td>
</tr>
<tr>
<td>YTD</td>
<td>2%</td>
</tr>
</tbody>
</table>

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### CHM2

<table>
<thead>
<tr>
<th>Product</th>
<th>Problem</th>
<th>Problem MTD</th>
<th>EOL Buffer</th>
<th>Problem Description</th>
<th>Data</th>
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</thead>
<tbody>
<tr>
<td>ASSY1</td>
<td>[Status]</td>
<td>[Status]</td>
<td>[Status]</td>
<td>[Status]</td>
<td>[Status]</td>
</tr>
<tr>
<td>ASSY2</td>
<td>[Status]</td>
<td>[Status]</td>
<td>[Status]</td>
<td>[Status]</td>
<td>[Status]</td>
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</table>

### CRK1

<table>
<thead>
<tr>
<th>CRK1</th>
<th>CRK2</th>
<th>CHM1</th>
<th>CHM2</th>
<th>CBL1</th>
<th>CBL2</th>
<th>CBL3</th>
</tr>
</thead>
</table>

### CRK1

<table>
<thead>
<tr>
<th>CRK1</th>
<th>CRK2</th>
<th>CHM1</th>
<th>CHM2</th>
<th>CBL1</th>
<th>CBL2</th>
<th>CBL3</th>
</tr>
</thead>
</table>

---

Graphs and charts showing downtime,Absenteeism, Weekend, Upset, Uptime, Uptime MTD, Mean machine breakdown, Mean presence, Breakdown, Breakdown MTD,
<table>
<thead>
<tr>
<th>CHM1</th>
<th>Abs</th>
<th>Inc</th>
<th>Planned</th>
<th>EOL</th>
<th>Δ EOL</th>
<th>Uptime</th>
<th>JPS</th>
<th>FTQ</th>
<th>MatScrap</th>
<th>Buffer</th>
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</thead>
<tbody>
<tr>
<td>2017-05-24</td>
<td>0%</td>
<td></td>
<td>2193</td>
<td>2302</td>
<td>109</td>
<td>88.7%</td>
<td>269</td>
<td>97%</td>
<td>0.0%</td>
<td>0.1%</td>
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<tr>
<td>WTD</td>
<td>0%</td>
<td></td>
<td>11642</td>
<td>11906</td>
<td>264</td>
<td>88.0%</td>
<td>267</td>
<td>97%</td>
<td>0.0%</td>
<td>0.1%</td>
</tr>
<tr>
<td>MTD</td>
<td>1%</td>
<td></td>
<td>73065</td>
<td>72962</td>
<td>103</td>
<td>86%</td>
<td>261</td>
<td>98%</td>
<td>0.0%</td>
<td>0.1%</td>
</tr>
<tr>
<td>YTD</td>
<td>2%</td>
<td></td>
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<td></td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>CHM2</th>
<th>Abs</th>
<th>Inc</th>
<th>Planned</th>
<th>EOL</th>
<th>Δ EOL</th>
<th>Uptime</th>
<th>JPS</th>
<th>FTQ</th>
<th>MatScrap</th>
<th>Buffer</th>
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</thead>
<tbody>
<tr>
<td>2017-05-24</td>
<td>0%</td>
<td></td>
<td>1251</td>
<td>1175</td>
<td>-76</td>
<td>84%</td>
<td>392</td>
<td>98%</td>
<td>0.5%</td>
<td>14</td>
</tr>
<tr>
<td>WTD</td>
<td>0%</td>
<td></td>
<td>3582</td>
<td>3201</td>
<td>-381</td>
<td>86.1%</td>
<td>403</td>
<td>98%</td>
<td>0.8%</td>
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</tr>
<tr>
<td>MTD</td>
<td>1%</td>
<td></td>
<td>17428</td>
<td>16908</td>
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<td>87.3%</td>
<td>409</td>
<td>98%</td>
<td>0.4%</td>
<td></td>
</tr>
<tr>
<td>YTD</td>
<td>2%</td>
<td></td>
<td>112609</td>
<td>112228</td>
<td>619</td>
<td>84%</td>
<td>392</td>
<td>98%</td>
<td>0.1%</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>CBL1</th>
<th>Abs</th>
<th>Inc</th>
<th>Planned</th>
<th>EOL</th>
<th>Δ EOL</th>
<th>Uptime</th>
<th>JPS</th>
<th>FTQ</th>
<th>ProdScrap</th>
<th>Buffer</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017-05-24</td>
<td>7%</td>
<td></td>
<td>235</td>
<td>237</td>
<td>2</td>
<td>91%</td>
<td>152</td>
<td>99%</td>
<td>2</td>
<td>30.4%</td>
</tr>
<tr>
<td>WTD</td>
<td>8%</td>
<td></td>
<td>829</td>
<td>958</td>
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<td>86.0%</td>
<td>144</td>
<td>99%</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>MTD</td>
<td>3%</td>
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<td>1819</td>
<td>2148</td>
<td>329</td>
<td>85.5%</td>
<td>143</td>
<td>99%</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>YTD</td>
<td>2%</td>
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<td>16433</td>
<td>16049</td>
<td>-384</td>
<td>82%</td>
<td>138</td>
<td>98%</td>
<td>126</td>
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</table>

<table>
<thead>
<tr>
<th>CBL2</th>
<th>Abs</th>
<th>Inc</th>
<th>Planned</th>
<th>EOL</th>
<th>Δ EOL</th>
<th>Uptime</th>
<th>JPS</th>
<th>FTQ</th>
<th>MatScrap</th>
<th>Buffer</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017-05-24</td>
<td>0%</td>
<td></td>
<td>776</td>
<td>788</td>
<td>12</td>
<td>90%</td>
<td>274</td>
<td>95%</td>
<td>0.0%</td>
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</tbody>
</table>

Last refreshed: 01-Jun-2017 15:43
Uptime MTD Machining: 84.9%

Bottleneck SAT
daily - weekly - monthly

Downtime
Weekly reports
## Reporting Examples

### Safety & People

<table>
<thead>
<tr>
<th>Incident</th>
<th>Daily (WTD, MTD, YTD)</th>
<th>Weekly</th>
<th>Monthly</th>
</tr>
</thead>
<tbody>
<tr>
<td>report</td>
<td>dashboard</td>
<td></td>
<td></td>
</tr>
<tr>
<td>where</td>
<td>ProdMeeting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>freq</td>
<td>daily</td>
<td></td>
<td></td>
</tr>
<tr>
<td>resp</td>
<td>SL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>deviation</td>
<td>reason (prevention)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Absenteesm total</th>
<th>Daily (WTD, MTD, YTD)</th>
<th>Weekly</th>
<th>Monthly</th>
</tr>
</thead>
<tbody>
<tr>
<td>report</td>
<td>dashboard</td>
<td></td>
<td></td>
</tr>
<tr>
<td>where</td>
<td>ProdMeeting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>freq</td>
<td>daily</td>
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<td></td>
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<tr>
<td>resp</td>
<td>SL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>deviation</td>
<td>reason (prevention)</td>
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</table>

### Quality

<table>
<thead>
<tr>
<th>Scrap</th>
<th>Daily (WTD, MTD, YTD)</th>
<th>Weekly</th>
<th>Monthly</th>
</tr>
</thead>
<tbody>
<tr>
<td>report</td>
<td>dashboard</td>
<td></td>
<td></td>
</tr>
<tr>
<td>where</td>
<td>ProdMeeting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>freq</td>
<td>daily</td>
<td></td>
<td></td>
</tr>
<tr>
<td>resp</td>
<td>SL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>deviation</td>
<td>reason (prevention)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Scrap, rework</th>
<th>Daily (WTD, MTD, YTD)</th>
<th>Weekly</th>
<th>Monthly</th>
</tr>
</thead>
<tbody>
<tr>
<td>report</td>
<td>WeeklyProdRep</td>
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<td></td>
</tr>
<tr>
<td>where</td>
<td>WeeklyProdMeeting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>freq</td>
<td>weekly</td>
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</tr>
<tr>
<td>resp</td>
<td>AM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>deviation</td>
<td>prevention</td>
<td></td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>FTD</th>
<th>Daily (WTD, MTD, YTD)</th>
<th>Weekly</th>
<th>Monthly</th>
</tr>
</thead>
<tbody>
<tr>
<td>report</td>
<td>WeeklyProdRep</td>
<td></td>
<td></td>
</tr>
<tr>
<td>where</td>
<td>WeeklyProdMeeting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>freq</td>
<td>monthly</td>
<td></td>
<td></td>
</tr>
<tr>
<td>resp</td>
<td>AM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>deviation</td>
<td>prevention</td>
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### On-going capability

<table>
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<tr>
<th>Report structure</th>
<th>Uptime, JPS, PMC</th>
<th>FTQ, Scrap, Rework</th>
<th>Measuring room</th>
<th>Buffer</th>
<th>Cycle time</th>
<th>Downparts, SAT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety &amp; People</td>
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<td>Quality</td>
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</tbody>
</table>
Monthly reports

Action plans
Other reports

Throughput Time

Time from operator call to maintenance arrival

Manufacturing CPU

Manufacturing cost percentage

Range key:  Range step (hour): 1
range slider

17% 14% 11% 10% 9% 16% 16%
Uptime improvement result

Uptime - *Flex machining lines*

The bar chart shows the uptime improvement over the years 2015 to 2017 for 'Flex machining lines', with a clear upward trend indicating increased uptime.
THANK YOU FOR YOUR ATTENTION!

NEW INSIGNIA

WE MAKE IT MOVE!

Opel Szentgotthárd

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