BUFFER MANAGEMENT IN TAKT PLANNING – AN OVERVIEW OF BUFFERS IN TAKT SYSTEMS

Janosch Dlouhy, Marco Binninger & Shervin Haghsheno
Introduction into Takt Planning
## Time Reduction in Taktplanning

<table>
<thead>
<tr>
<th>Icons</th>
<th>Calculation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>① 📊</td>
<td>((1 + 50 - 1) \times 1 \text{ week} = 50 \text{ weeks})</td>
<td>(nothing parallel)</td>
</tr>
<tr>
<td>② 📊</td>
<td>Normal schedule 25 weeks</td>
<td>(50% parallel)</td>
</tr>
<tr>
<td>③ 📊</td>
<td>((5 + 10 - 1) \times 1 \text{ week} = 14 \text{ weeks})</td>
<td>(first Taktplanning)</td>
</tr>
<tr>
<td>④ 📊</td>
<td>((10 + 10 - 1) \times 0.5 \text{ week} = 9.5 \text{ weeks})</td>
<td>(Lotsitzreduction 50%)</td>
</tr>
<tr>
<td>⑤ 📊</td>
<td>((20 + 10 - 1) \times 0.25 \text{ week} = 7.25 \text{ weeks})</td>
<td>(Lotsizereduction 50% again)</td>
</tr>
</tbody>
</table>
# Mechanism that affect the Buffers

## active Mechanism
- Buffer-optimization
- Lot size reduction
- Parallelization, Simul. Engineering
- Flow-focused Repetition
- Harmonization
- Wagonizing
- Partial Handover

## passive Mechanism
- Synergies of Work
- Short cycled Quality control
- Transparency
- Communication and Cultur
- Flexibility and Client orientation
- Balancing
Overview of Types of Buffers

0: Systemic Buffer
1: Empty Takt
2: Start-up Buffer
3: Decay Buffer
4: Partial-Handover-End-Buffer
5: Takt Time Buffer
6: Buffer-Waggon
7: Waggon-Buffer Time
8: Buffer Takt
9: Calculated End Buffer
Lot Size Reduction
Side Effects - Lot Size Reduction

Duration of a train with ten wagons (in days) vs. Number of takts to be controlled (in takts).

Number of size reductions (50%)
PARALLELIZATION

Two trains running

Lotsizeduction

Packaging of Workpackages

Syncnizing of not takted work

Synonizing of not takted work

Workable Backlogs
The parallelization means that more work packages are completed simultaneously either in the same Takt area or Takt period. A high concentration of work, caused by high levels of parallelization, can lead to a disruption of individual work processes.
ALL OVER USAGE OF BUFFERS
HARMONIZATION
SIDE EFFECTS - HARMONIZATION

Improper harmonization inevitably leads to under- or overuse of workers. Underuse creates waiting times, alternate work, as well as requires increased control effort. Waiting times lead to the consumption of buffer times and alternate work can disturb the work of other trades.
FLOW-BASED REPETITION
SIDE EFFECTS - FLOW-BASED REPETITION

While repetition provides the benefit of learning from- and preparing for future Takts, it can also lead to an oversimplified routine for the workers. This can result in mental fatigue, especially at short Takt cycles.
WAGONISATION

Takttime

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>S</td>
<td>T</td>
<td>V</td>
<td>W</td>
<td>X</td>
<td>Y</td>
<td>Z</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Takttarea

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>S</td>
<td>V</td>
<td>X</td>
<td>Z</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td></td>
<td></td>
<td>W</td>
<td>Y</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td></td>
<td></td>
<td>T</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
SIDE EFFECTS - WAGONISATION

Incorrect wagonisation may cause interferences between the trades working together, which may have an effect on their performance.
LONG LEAD MECHANISM
SIDE EFFECTS - WAGONISATION

The prioritization of long running processes restricts the customer prioritization of areas and can lead to technical problems in the process.