White Paper
Tips for overall equipment effectiveness (OEE) in food and beverage production

Maximum availability is not something that happens by chance, it's the result of forward-looking action. Processing food economically and at the right time is absolutely essential. Otherwise there is a risk that production has to be stopped and raw materials are wasted.

Taking overall equipment effectiveness into consideration provides clear guidance on how to maximise productivity, and thus on economic operation of the system. But which influencing factors affect overall equipment effectiveness and how to get started on the path to optimisation?

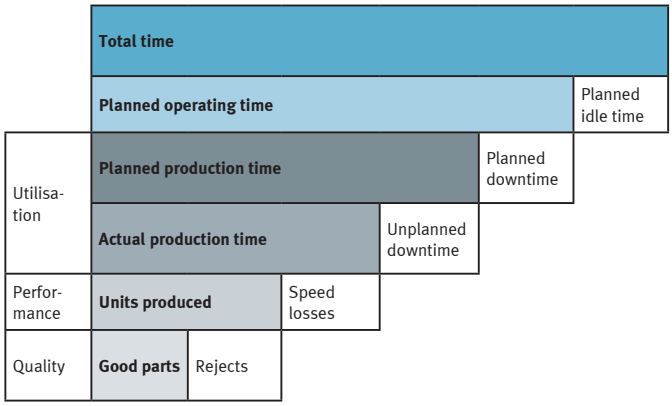
This white paper includes information on:

- The meaning of overall equipment effectiveness (OEE)
- Technical solutions that promote overall equipment effectiveness

The meaning of overall equipment effectiveness (OEE)

Overall equipment effectiveness (OEE) is the measure of a system's value creation. Three factors determine this value:
- Utilisation
- Performance and
- Quality

The value range runs from 0 to 1, or from 0% to 100%. The goal should always be 100%.



Even though the OEE graphic is mainly focused on the production phase, it's very important get started during planning and design engineering in order to achieve high levels of overall equipment effectiveness. Details often dictate in advance whether or not the system will be able to reach an efficiency value near the top of the scale, and thus provide a solid basis for highly efficient operation.

Four main points with which improved overall equipment effectiveness can be attained

As described above, overall equipment effectiveness is based on several parameters. Numerous measures can therefore be taken. This white paper offers detailed explanations of technical tips which contribute to improved overall equipment effectiveness. Other measures are touched upon, but aren't dealt with in depth.

1 Reducing the duration of planned downtime (machine stoppages and system shutdowns)

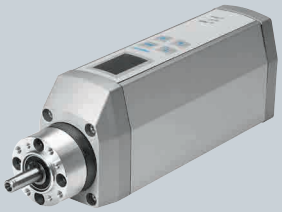
The ideal system or machine would run around the clock. But downtime is unavoidable, and thus it's better to plan for it rather than to wait for a random, typically expensive production stoppage. This also means that staff deployment can be planned in a targeted way.

Planned stoppages are necessary for:
- Format changeovers
- Cleaning the system
- Scheduled maintenance

These tasks consume valuable time. Taking a close look at them often helps to reduce associated downtime.

Tips for reducing planned downtime

- Increase the flexibility of the system:
  A great deal of time can be saved by implementing automatic format changeovers, above all if production has to be flexible due to frequent product or format changeovers. This is made possible through the use of, for example, servo motors MTR-DCI with integrated controller and 16 programmable positions.



Example: servo motor MTR-DCI

- Thorough and quick cleaning is ensured through the use of Clean Design components without edges and corners. Furthermore, the components' self-draining characteristics also facilitate an efficient cleaning process.

Example: Clean Design valve terminal MPA-C

- Components with life-time lubrication contribute to extended maintenance intervals because they don't require regreasing.

- Use dry-running seals for pneumatic drives in the splash zone. These ensure reliable functioning of the components, even if their grease is washed out due to frequent cleaning.

Example: Clean Design drive CRDSNU with dry-running seal

2 Reducing unscheduled downtime

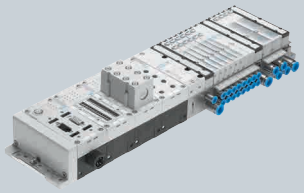
Unscheduled downtime is expensive. Even if only one machine component fails, the entire production system is often brought to a standstill, resulting in the possible loss of raw materials etc. That's why it's best to prevent this situation from arising in the first place.

Unscheduled downtime can be traced back to the following factors:
- Failure of or in system segments
- Material bottlenecks
- Power failures
- Personnel bottlenecks

In the event of a failure, the cause must be quickly identified and the problem eliminated as rapidly and simply as possible.

Tips for fast error detection

- Active diagnostics management for fast error detection – for example with the modular electrical automation platform CPX/MPA. Integrated diagnostics LEDs on all modules help to detect errors quickly. The error messages appear in plain text thanks to the integrated web server.

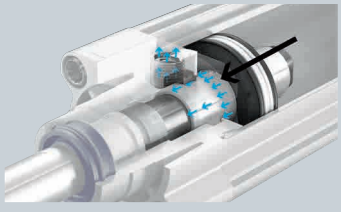


Example: automation platform CPX with valve terminal MPA

- Red/green pressure gauge for fast determination of operating pressure set point deviation.

Tips for quick error elimination

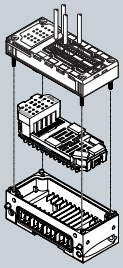
- Use of preconfigured and/or self-adjusting components. For example: self-adjusting pneumatic cushioning PPS for pneumatic cylinders. Supports quick replacement because no adjustment is required – this also rules out the possibility of incorrect adjustment.



Functional principle of PPS

- Hot-swap valve functions are helpful in process automation for quick and easy replacement without shutting down supply pressure or interrupting the process. For example: valve concept with pressure shut-off plate

- Modern, modular component designs help to shorten repair times. Individual elements can be quickly replaced without removing or dismantling the entire component.



Example: when replacing electronic components, the cables are not removed at the contact level. No dismantling is necessary.

3 Maintaining fast machine cycles and combatting speed losses

How do I maintain maximum productivity without overloading the system/machine? There are several points which should be taken into consideration when machine utilisation needs to approach 100%.

For example, under certain circumstances overloading the machine may increase productivity in the short-term, but as a rule it has severe consequences for the system's overall service life. Moreover, maintenance and repair costs are significantly increased as a result.

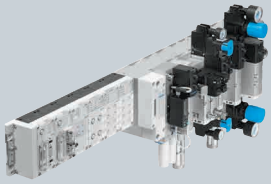
Other causes for speed losses:
- Process bottlenecks
- Inefficient operation of the system
- Operating errors

Tips for supporting fast machine functions and for reducing speed losses

- Reduce impacts within the system, for example through the use of servopneumatic systems with Soft Start and Soft Stop.

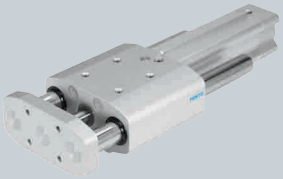
Example: Soft Stop controller SPC 11

- Install valves with optimum flow rates in order to be able to take advantage of speed reserves.



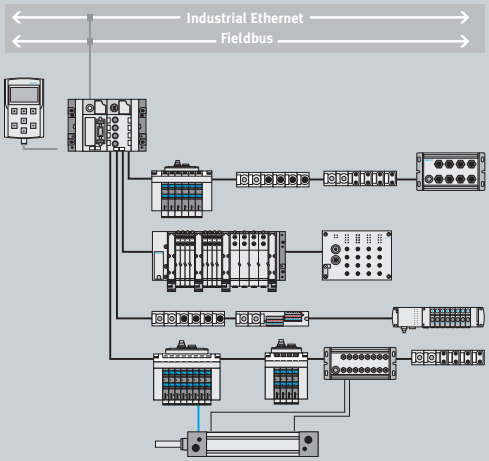
Example: valve terminal VTSA-F

- Identify critical points and weak points which might impair the system's performance, and ask specialists for advice on whether or not design optimisations would pay off.
- Include reserves for moving loads, for example by using components with high load capacities.



Example: Clean Design guided drive DGRF

- Decentralised automation concept: faster, simpler, more energy-efficient



Example of a decentralised installation concept

4 Reducing rejects

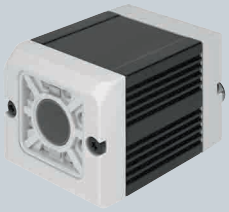
Quality problems such as broken biscuits, as well as over and under-filling in beverage production systems may have various causes. The most important tenet is to achieve uniform quality, and thus to avoid any rework or the loss of the entire product.

Tips for promoting constant manufacturing quality

- Compressed air preparation which fulfils the requirements of the application, for instance in accordance with ISO 8573-1:2010, ensures continuously high product quality – as an advantage for satisfied consumers.

Example: service unit combination MS6

- Vision sensors detect possible defects in the goods and errors in the process before it's too late. They make optimisation possible as a result.



Example: vision sensor SBSI

- Festo Engineering Services for intelligent solutions and expertise for the avoidance of rejects and rework.

Conclusions

A considerable contribution can be made to improving overall equipment effectiveness by incorporating these four points and the related tips into the daily tasks.

It's also important to keep your employees up-to-date with regard to the latest technologies. Well-trained employees who are familiar with production concepts and technologies help to ensure that machines and systems are operated and maintained effectively.

Our recommendation: first check our list of tips, and then decide which action is required for your production systems and find the right partner.

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