DynaScan
Botec F1 process automation
The camera sees everything: visual inspection in the closed fermenting tank

Best beer quality is not only a question of ingredients. Utmost attention must also be devoted to the fermentation process. This is not so easy when using cylindro-conical tanks... In the fermenting tank, it is particularly important to convert the fermentable wort extract into alcohol and CO₂ and it is just as important to have a controlled build-up and decomposition of fermentation by-products at shortest possible storage times and quick yeast sedimentation.

The visual monitoring of the fermentation process and the tank cleaning via the KRONES DynaScan provides continuous information about the fermentation stage and safe cleaning of the tank.

At a glance
− Continuous recording of the fermentation stage and fill level inspection
− Optimisation of the cleaning process through reductions in rinsing times
− Connection to the Botec F1 process control system for automated process steps
Functions – what does DynaScan have to offer?

- Visual monitoring for the operator
- Individual images (manual or time controlled)
- "Live stream"
- Data archiving
- Automatic functions for continuous monitoring of the fermentation stage, fill level, spraying device and CIP status
Systems for safe tank monitoring: digital image processing

The use of digital image processing in the fermenting cellar and storage cellar
– offers the view into the modern tank system,
– allows for the optimisation of the image taken,
– extracts characteristics from the image,
– combines the characteristics and uses them to calculate a value which describes the process status.

1. Camera
2. Lighting unit
3. Foam cover
4. Green beer
5. Process and image analysis system
What information does DynaScan provide about the fermentation stage?

- Automatic monitoring of the fermentation stages and feedback to the process sequence
- Visual convection monitoring
- Provision of detailed process information
- Quick detection of problems during the fermentation

Digital image processing in the fermentation stage

Each process status supplies "typical" images with specific characteristics. These characteristics must be determined per brewery and type. The image processing system extracts and combines the characteristics and uses them to determine the fermentation stage.
What information does DynaScan provide about the fill level?

- Recording of the fill level through the control system and also through DynaScan in addition
- Increased safety aspect
- Improvement of product quality

Digital image processing for fill level inspection
The system detects the liquid level and measures the image diameter. The image processing program uses this diameter to calculate the fill level. The green ring marking the average fill level is the reference point for this calculation.
What information does DynaScan provide about the spraying device?

- Detection of submerge situations
- Adjustment of the brew volume to the optimum tank occupancy
- Safe CO$_2$ recovery
- Improved efficiency of the fermenting cellar

**Digital image processing for spraying device monitoring**

The position of the spraying device cannot be changed and is recorded as a coordinate in the system. Fixed contours and light reflections act as characteristics for the detection of the spraying device.
What information does DynaScan provide about the CIP status?

− Visual and automated inspection of the cleaning effect
− Basics for the optimisation of the cleaning process and reduction of rinsing times
− Starting points for saving water and cleaning time
− Detection of problems during cleaning

**Digital image processing for the CIP status**

The system marks contaminated areas in the tank. This is what the monitoring of successful cleaning is based on analogue to the image processing technology of an inspection system in the filling field.
System landscape

Communication with the Botec F1 process controller
- Request of the image analysis via Botec F1
- Image taking and analysis via DynaScan
- Transmission of the results via DynaScan to Botec F1
- Adjustment of the process parameters via Botec F1 based on the image analysis

Connection of the DynaScan to the process controller
- Low acquisition and operating costs
- Simple integration in the Botec F1
- Quick extensibility via a modular component system
- Digital transmission technology
- Easy maintenance
DynaScan – next development steps

- Type-dependent image processing
- Improvement in the image characteristics used
- Improvement in image preparation before analysis (e.g. lighting effects, focus, etc.)
- Knowledge-based process monitoring with the aid of neuronal networks
- Creation of a "marker" using a laser, thus allowing the characteristics to be extracted better
- Heat image
Benefits at a glance

**Precise data**
The digital image processing continuously provides traceable and precise data on the process status inside the fermenting tanks. This guarantees high safety during the fermentation process and an online efficiency control for the CIP cleaning process.

**Automatic process control**
The image processing system detects significant conditions of the fermentation process and sends the respective data to the process control system for automatic process control.

**Easy inclusion of the process control system**
Thanks to the modular set-up of the image processing system, a quick integration into the existing process control system is possible.
We do more.