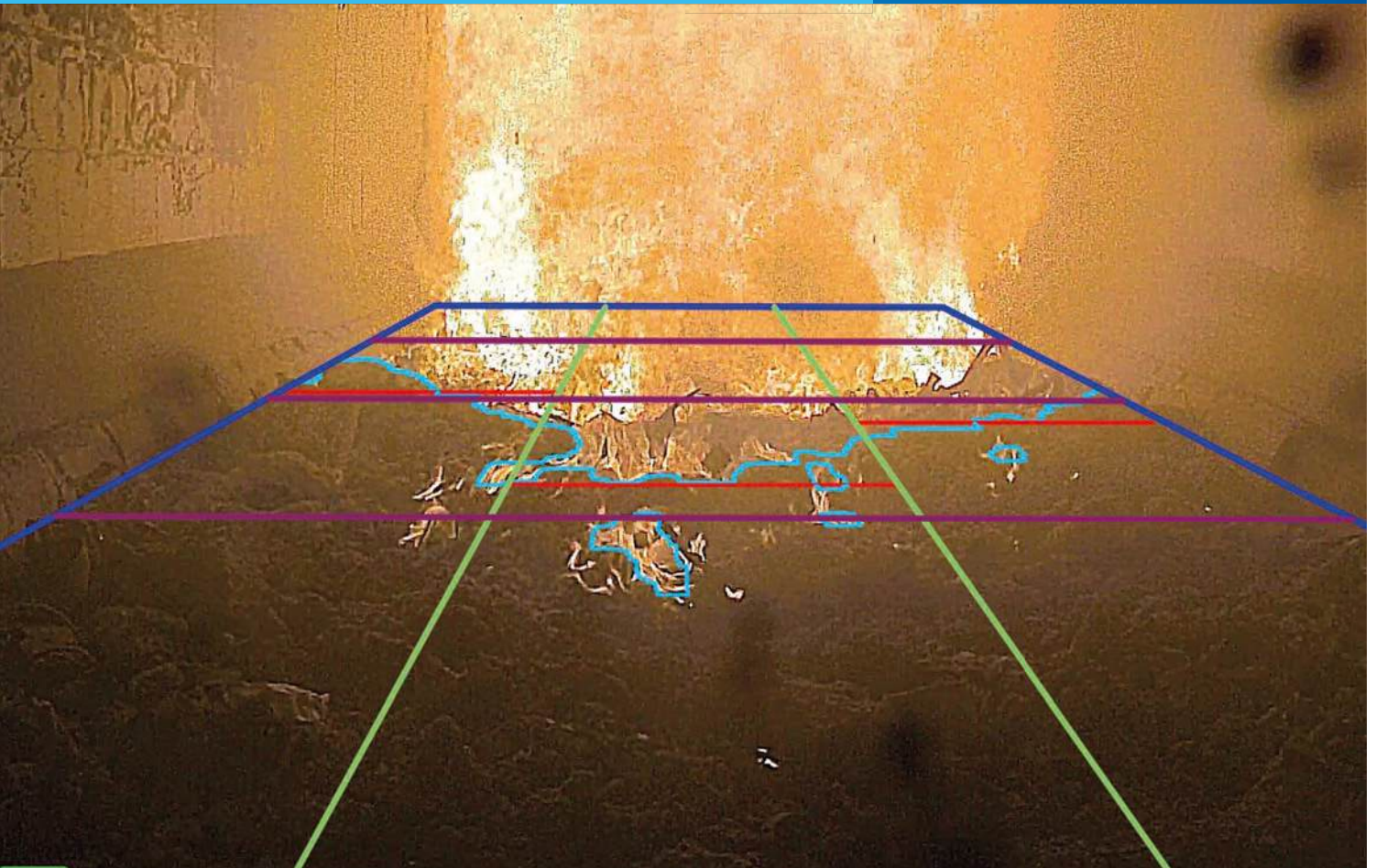




FIRE LENGTH DETECTION 2.0

PROCESS & ENVIRONMENTAL TECHNOLOGY



FLD 2.0

Firelength detection

MOTIVATIONS & GOALS

Waste-to-Energy and thermal recycling plants are constantly facing growing challenges: extensive legal requirements, fluctuating fuel qualities, high cost pressure and social development processes. A higher degree of automation is necessary and thus supports stable and efficient plant operation.

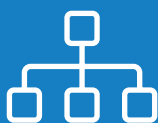
The integration of the **Fire Length Detection (FLD)** into the **SAR Combustion Control System** enables:

- Usage of the entire available grate length
- Even and complete energy output from the waste bed and minimising wear and tear of relevant plant components
- More stable combustion process
- Constant flue gas volume flow
- High bottom ash quality and sufficient bottom ash quality especially with problematic fuel batches
- Support and relief of the operating personnel by increased automation
- Protection against thermal damage to ignition- and burn-out-ceiling, boiler walls and grate bars
- Higher plant availability

REQUIREMENTS FOR THE OPERATION OF THE NEW FLD 2.0



The FLD 2.0 can be operated on a virtual machine (VM) or on a physical computer (e.g. industrial-PC or server). At least one monitor is required for the operator station of the FLD. Depending on the system configuration, a client computer may also be required.



The FLD communicates with the process control system (DCS) via an OPC UA gateway. This gateway communicates with both the programmable logic controller (PLC) and the FLD system, enabling bidirectional data exchange. If suitable, an existing OPC UA server can also be used.



A digital video camera (combustion chamber camera) must be installed in such a way that all primary air zones are fully covered. The installation position, and in particular the installation angle of the camera, has a significant influence on the accuracy of the evaluation. SAR can support the process of selection, specification and positioning of suitable combustion chamber cameras.

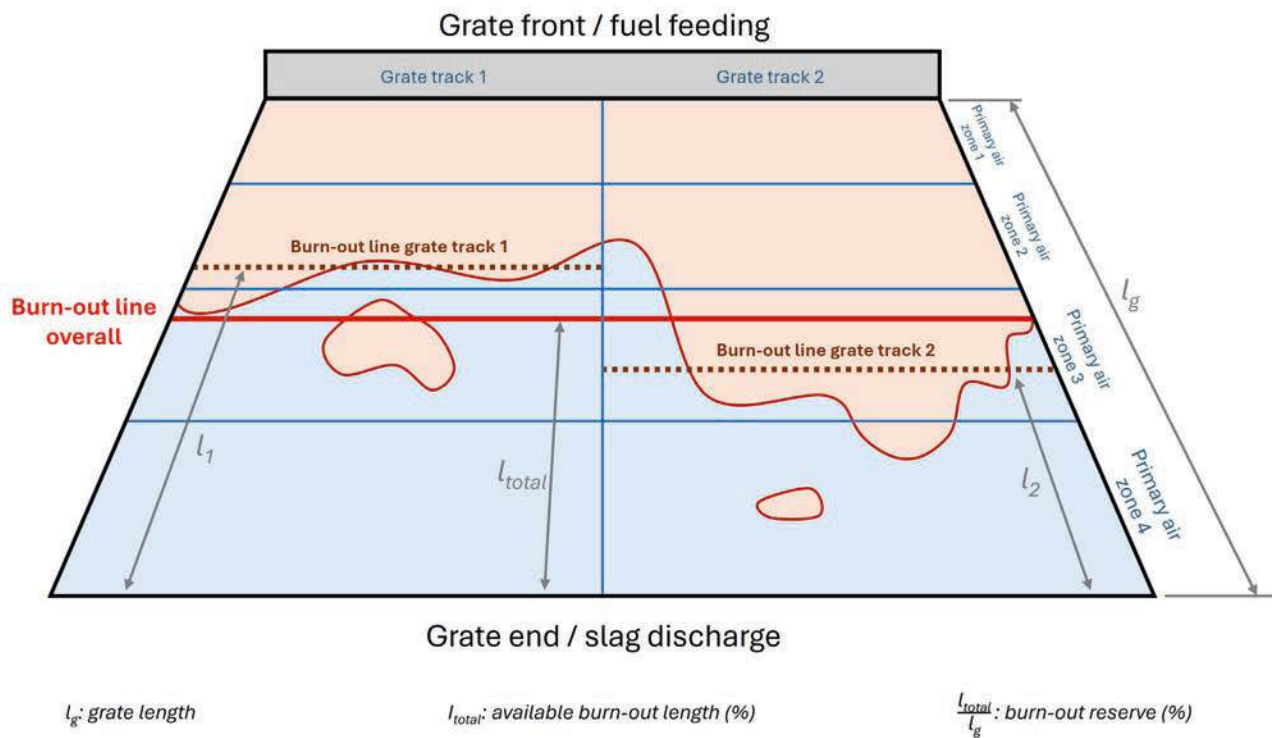
HOW IT WORKS

The FLD 2.0 analyses the image of a combustion chamber camera and recognises the relevant areas in the combustion chamber and on the grate via several image processing steps. By specifying a pattern that depicts the geometry of the combustion grate, the burn-out line is determined – the transition between active combustion and already burnt-out fuel.

Ideally, the calibration of the pattern should be carried out during a plant shutdown with an empty grate. The grate geometry can be freely parameterised, and the burn-out line can be divided into several grate tracks.

Isolated flames are also detected and, depending on the parameterisation, included in the rating of the burn-out quality. From all the image information, the system calculates the burn-out reserve, which describes the remaining length on the grate for burn-out from 0 to 100 %.

Several combustion lines can be realised on a single system. Furthermore, wide grates with two combustion chamber cameras can also be implemented.



Schematic illustration of the burn-out reserve

The burn-out reserve is calculated both per grate track and for the entire grate and transferred to the SAR Combustion Control System via interface. This is enhanced by the independent control loop „Fire Length“, the influence of which can be individually adapted and optimised to the existing actuators with weighting matrices.

After commissioning, FLD 2.0 and the SAR Combustion Control System work together optimally. This significantly improves overall combustion control and at the same time reduces subjective operator interventions (e.g. individual level of knowledge and experience) on the combustion and control process.

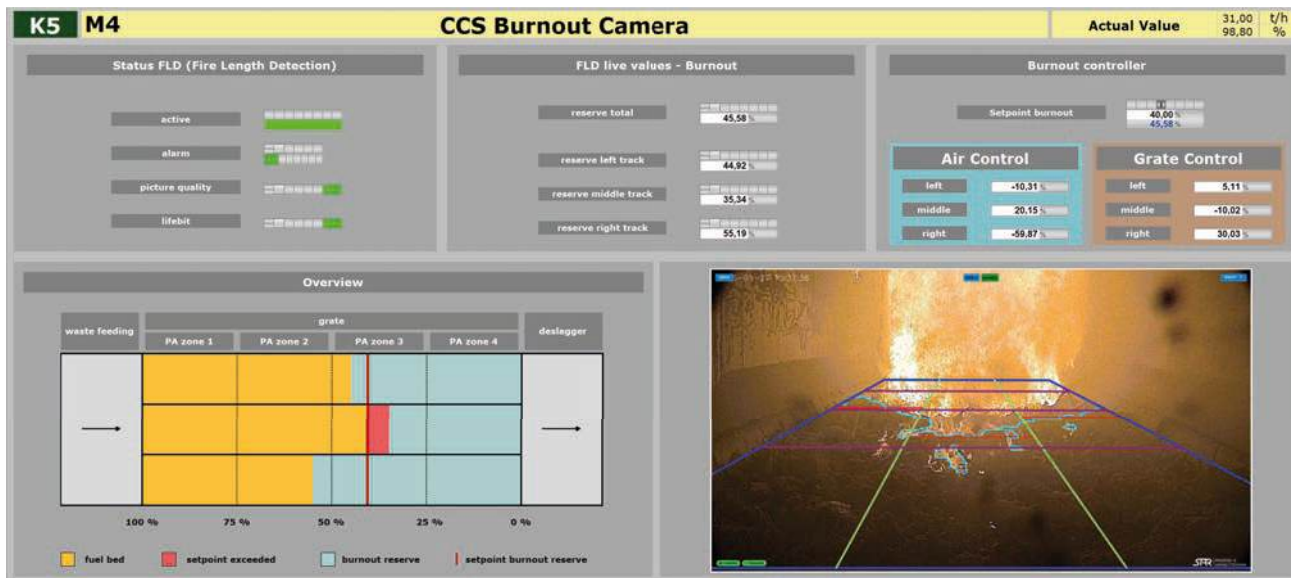
PRESENTATION OF THE SOFTWARE

The FLD software offers a modern and clear user interface with multiple views for quick and clear assessment of the actual fire length on the grate.

In the **main view**, the image of the combustion chamber is overlaid with a pattern that visualises grate geometry, grate tracks, air zones, burn-out reserves and burn-out line. This gives the operator all the information relevant to decision-making at a glance.

The software also offers practical operating functions such as creating and saving Screenshots – ideal for later analysis of special events or for assessing possible adjustments.

In addition to the user interface, **visualisation in the process control system (DCS)** is also possible.



The top view shown there provides a quick overview of the current fire length along the entire grate.

Primary air zones and the fuel occupancy on the grate are highlighted in colour. Critical fire lengths are recognisable at a glance and make it clear that the operator may need to act.

IT SECURITY

FLD 2.0 focuses on IT and OT security also. When connected via a **separate gateway**, physical network separation is ensured. The communication between FLD and gateway is **encrypted (X.509 certificates)** and additionally protected by username and password.

Optionally, the connection can be designed as redundant – in combination with a redundant PLC – to ensure high availability.

The FLD works completely **offline**:

- No internet connection required
- No cloud data storage
- Exclusively local operation

Integration into existing **firewall concepts** is possible without any problems. The underlying system is **hardened** and meets current IT security requirements.



EDITED IMAGE OF THE CAMERA

An increase in contrast and image brightness enables both a better representation of the flames and a more reliable evaluation.

TRANSFORMED VIEW

The transformed view shows the real dimensions of the combustion grate.

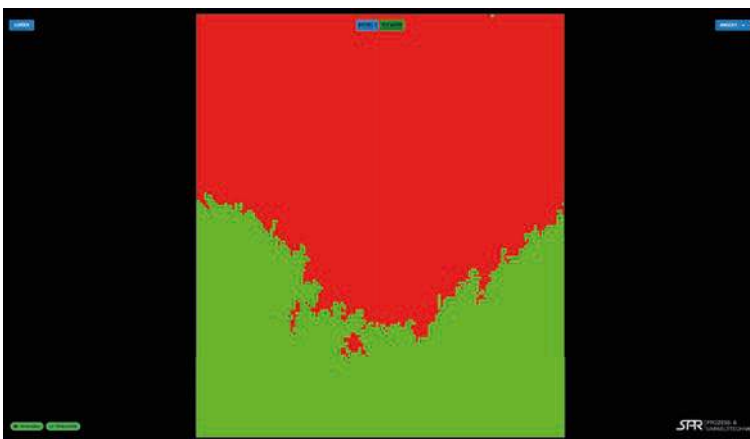
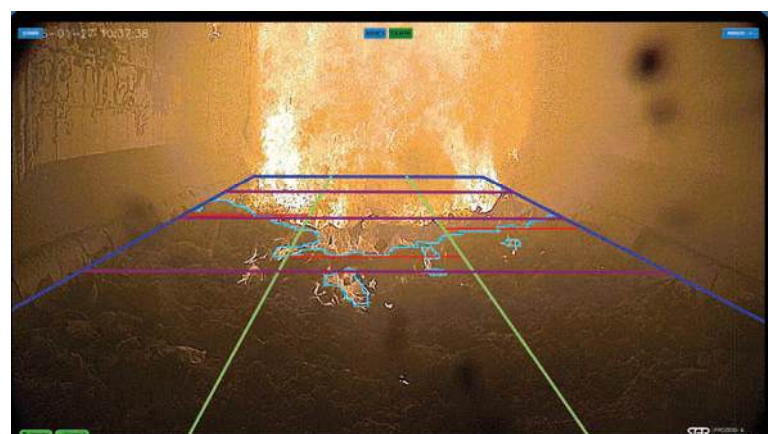


IMAGE SEGMENTATION

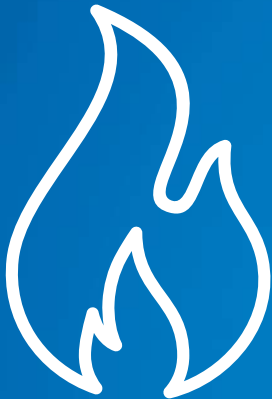
A transformed view into two areas is created to determine the burn-out line. This forms the basis for calculating the fire length and the burn-out reserve.

COMPLETE GRATE PATTERN

Blue: grate geometry
Violet: primary air zones
Green: grate tracks
Turquoise: burn-out line
Red: burn-out reserve per grate track



EXPERIENCE MEETS INNOVATION



Back in 2014, SAR successfully launched the fire length control system on the market – as an extension of the proven Combustion Control System with an additional parameter to further optimise combustion processes in thermal recycling plants.

The development was driven by increasing requirements due to strongly fluctuating calorific values as a result of decreasing fuel qualities and insufficient homogenisation.

After more than ten years of practical experience and continuous development, the system has been fundamentally redesigned – based on extensive operating experience and the current state of the art.

PLEASE FEEL FREE TO CONTACT US!

We would be pleased to present the functions and advantages of the FLD 2.0 to you during a personal meeting on site.

As part of a brief on-site assessment, we examine the existing conditions and can reliably evaluate the specific added value that FLD 2.0 offers for your plant operation.



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