

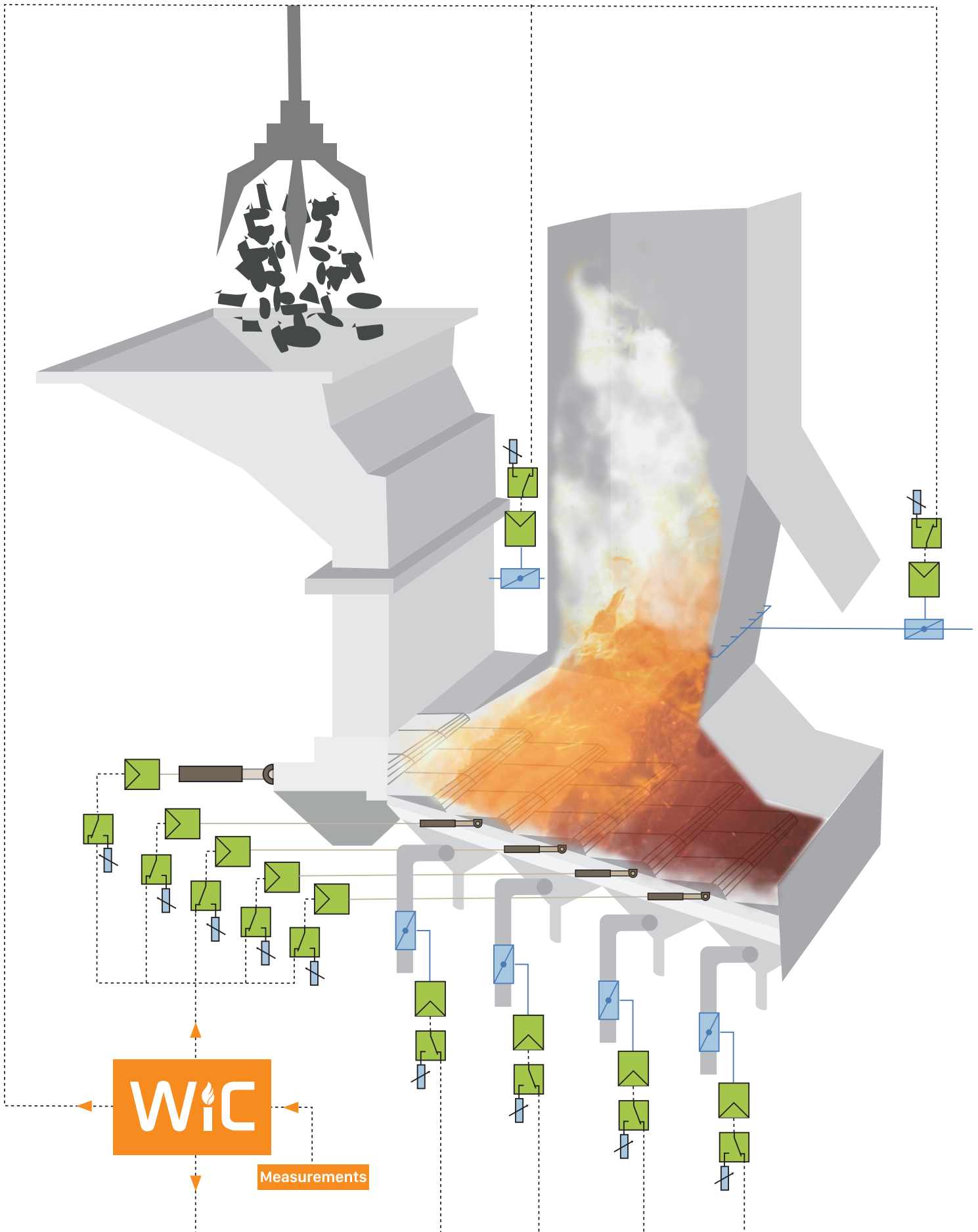


# WiC

COMBUSTION MANAGER

[technikgruppe.com/technology-of-fire](http://technikgruppe.com/technology-of-fire)

 **technik  
gruppe<sup>®</sup>**



# WiC Combustion Manager

## Increase

- Stability of operation
- Production
- Plant availability
- Burn out quality
- Equipment life
- Profits

## Decrease

- Operator interventions
- Unplanned outages
- Corrosion
- Additive consumption
- Operating costs

**WiC**



**TECHNIKGRUPPE****Matthias Lukic**

Technical expert, founder, owner and CEO of Technikgruppe, has more than 25 years of experience in combustion of solid fuels on grates.

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**Do not hesitate to contact us.**

TG is an Austrian engineering company with well trained employees having international experience and worldwide engagement. Due to its long experience in Energy-from-Waste and biomass TG also acts as an independent consultant for technical and commercial issues.

The development of the WIC (Waste incineration Control) is based on more than 25 years of experience in optimisation on forward moving reciprocating grates.

TG has optimised grates of different grate manufacturers and collected great experience in the field of combustion technology.



## TECHNOLOGY OF FIRE WITH FORWARD MOVING RECIPROCATING GRATES

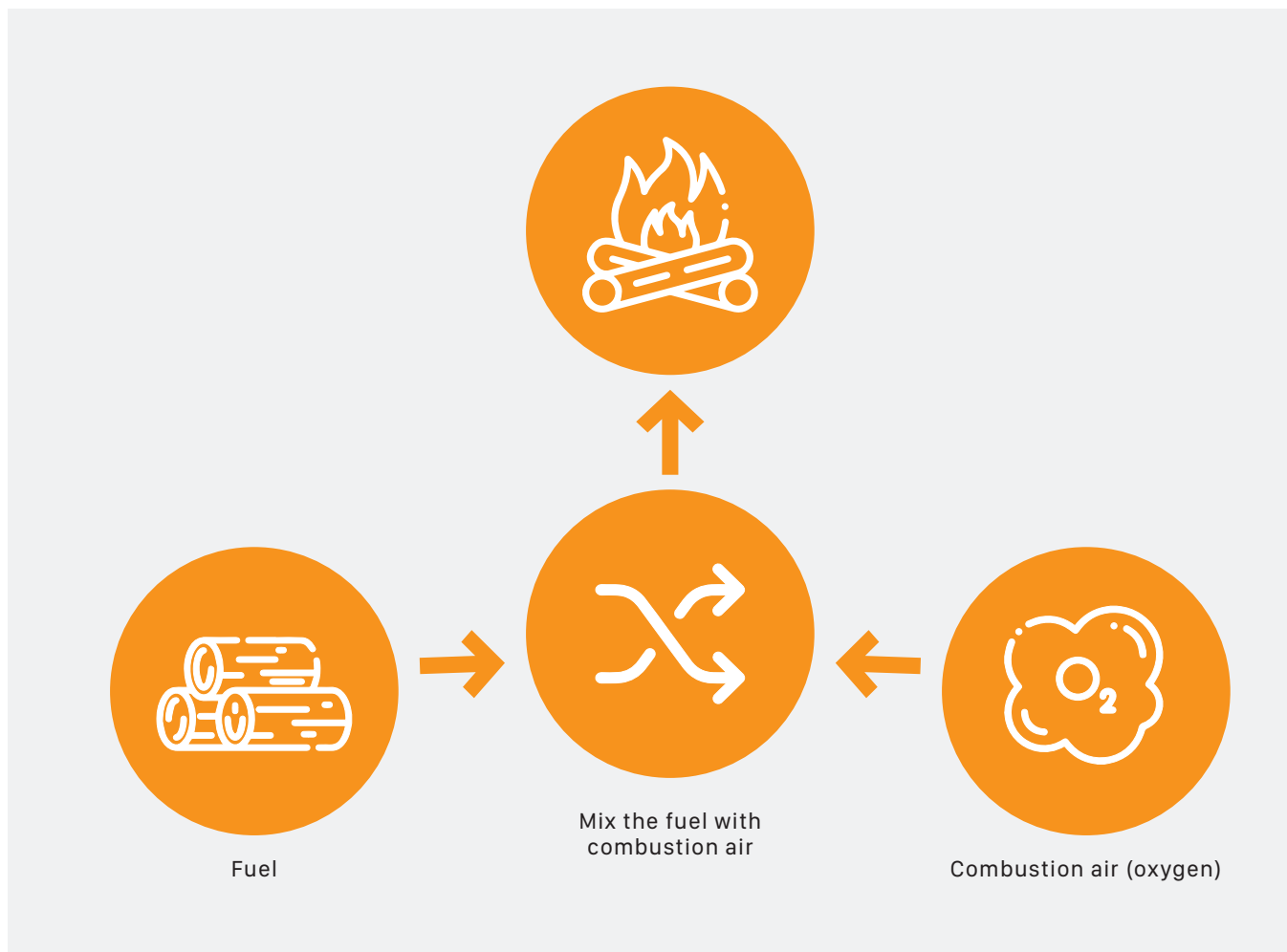


The combustion process in Energy from Waste and Biomass plants is very complex, and the demands on control systems in those plants are very sophisticated. There are many theories about the best techniques to recover the energy out of waste and there are equally many different approaches to find the right solutions.

In most conventional combustion systems there are lots of implemented control algorithms and many arguments how to compare different methods.

Simplistically there are 3 main actions which have influence on the combustion process.

- Adding fuel into the burning chamber
- Blowing oxygen into the fire
- Mixing the fuel with combustion air



## WIC COMBUSTION MANAGER OF TECHNIKGRUPPE

### Waste incineration Control

The application of the WiC can significantly improve the profitability, reliability and availability of Waste-to-Energy and Biomass-to-Energy plants.

Every combustion line is a unique system. TG's WiC Combustion Manager is based on more than 25 years of experience in optimisation. Our technical experts can support your technical team through personal visits or video conferences.

In all of these discussions there are two basic factors that are used in nearly all comparisons:

Which main actions have influence on the quality of the combustion process? Which measured parameters can be accurately compared to estimate the combustion quality?



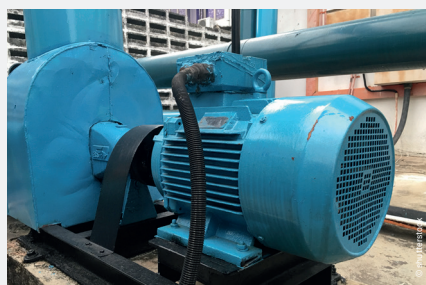
### OUR WAY TO OPERATIONAL OPTIMISATION

#### Basic principles

After more than 25 years of experience in combustion optimisation, we can say that forward-moving reciprocating grates are ideally suited to the application of the 3 basic principles for combustion control.

These 3 main actions involve around 30 actuators. But these actuators offer many possible combinations for fine tuning. If we have 20 actuators and each actuator has 10 possible positions – how many possible combinations do we get??

1	actuator provides	10 combinations	// 0-1-2-3-4-5-6-7-8-9-
2	actuators provide	100 combinations	// 00-01-02-03-04- .....96-97-98-99
3	actuators provide	1000 combinations	// 000-001-002-003-004-005-006-007 .....997-998-999
20	actuators provide	100 000 000 000 000 000 000 000 possible combinations for fine adjustment	// 00 000 000 000 000 000 000 ..... 99 999 999 999 999 999 999

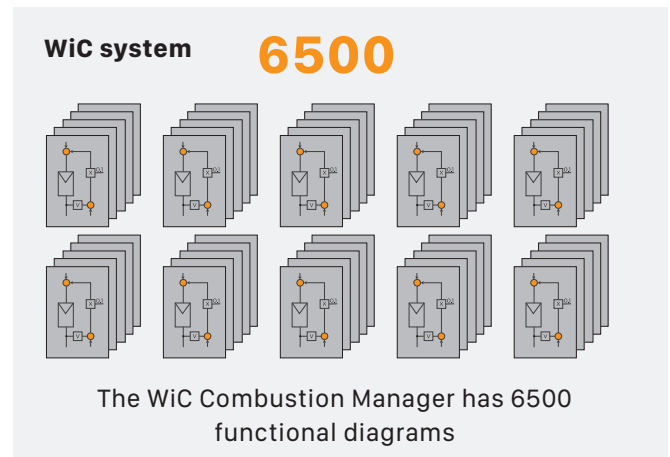
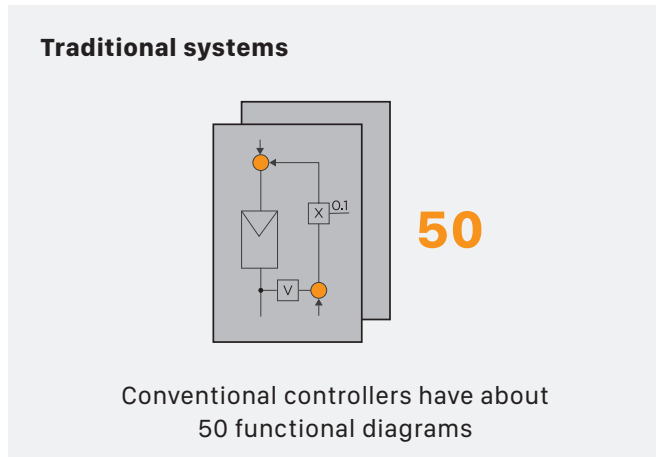


The status of the combustion process is changing every few seconds! That means – every few seconds we need to fine adjust the actuators. It is clear that the definition of appropriate combination every few seconds is a very complex task.

Whereas the checking of combustion quality itself is very simple → see some diagrams of KPI's from a combustion process.

## DIFFERENCE BETWEEN CONVENTIONAL CONTROLLERS AND WiC

### Traditional systems vs. WiC



WiC uses real-time data processing, far more data than traditional systems. WiC processes some 6500 functional diagrams instead of typically 50.

Every plant is unique and for every particular plant the control calculations must be done thoroughly.

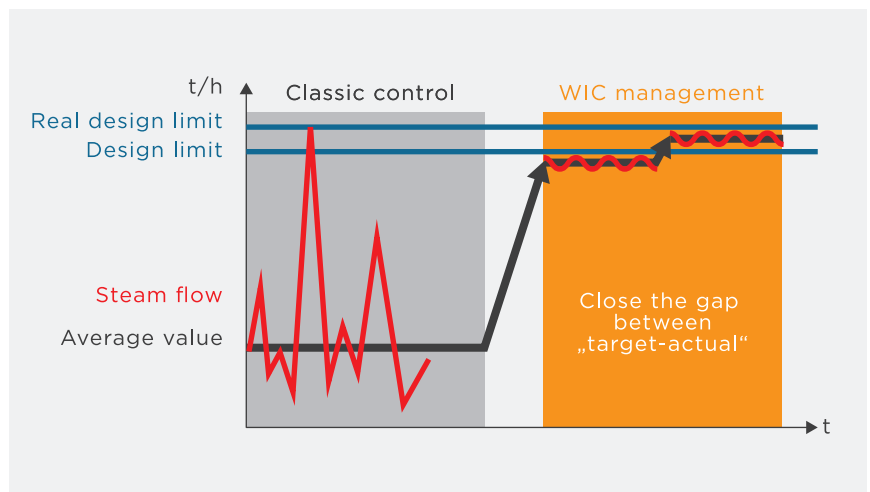
In the combustion control process, it is necessary to calculate many equations simultaneously in real time.

With its 6500 functional diagrams, WiC provides a quality and accuracy which is not possible to reach with classic controllers and classic control strategies.

### Enhancement of steam production towards real design limit

By implementation of classic control, big overshooting of steam production is possible and this is the main reason why the set point (average steam production) is kept below the design limit.

“Classic control” is very likely to produce dangerous overshooting above design limit! Therefore, in most cases, the design limit (MCR) is set below the real design limit. That means, that in most cases the boilers are built with reserves to



cover the overshooting due to lack of combustion control quality. These reserves may be utilised by implementing a more reliable and stable combustion control system. → WiC



## THE KEY BENEFITS OF WIC COMBUSTION MANAGER

### 1. First 100% automated combustion manager on the market

- Utilization of real-time data
- Operator independent
- Elimination of reaction time loss
- Reduction of manual operator interventions
- Fully stable and optimised operation
- NEXT GENERATION State Controller fit for Industry 4.0

Relying on operator eyes, cameras and manual calculations of calorific value are too slow to suit for combustion optimisation.

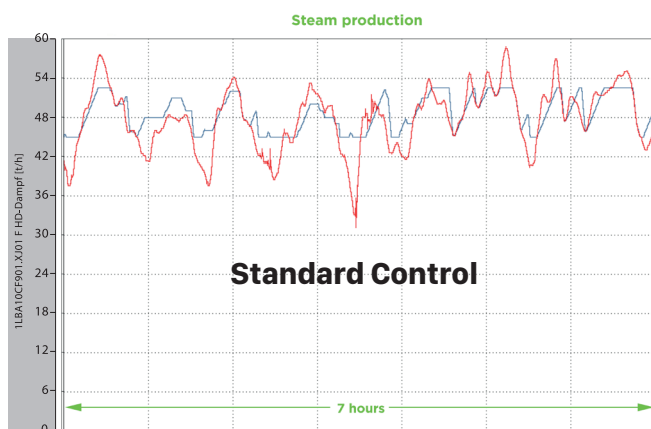
The algorithms used by WiC do not need any implementation of pyrometers or thermal cameras. The implementation of a thermal camera can provide additional information, but this information is not used (because too inexactly and therefore not needed) in WiC algorithms for combustion optimisation. It may just be utilised for detecting bad burn out and as a trigger for counter measures.



### 2. Profitable from Day 1

Below are some graphs of real case improvements that have an impact on profitability, reliability and availability. The integration of the WiC leads to significant additional earnings through:

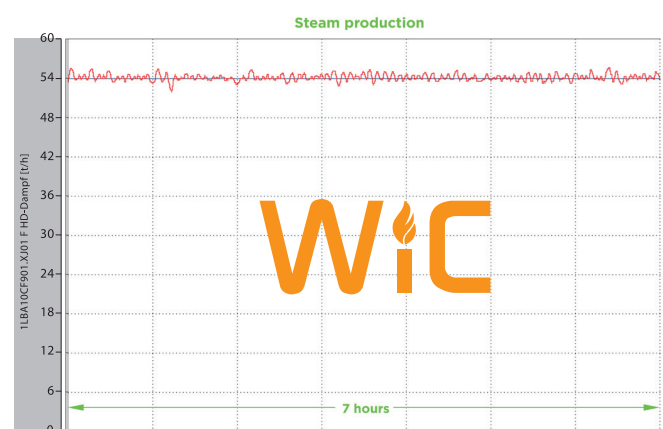
#### (1) Stabilization and enhancement of steam production



Steam production controlled by Standard Control

Stabilization of steam flow brings:

- increased steam production
- increased waste throughput
- increased electricity production
- better burn out quality



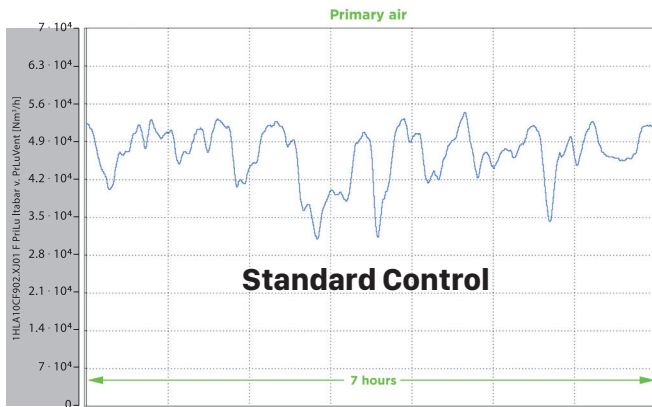
Steam production controlled by WiC (same line)

Please NOTE! In most cases, the boilers are designed with large reserves due to a lack of control accuracy. This fact can offer the possibility of improving the combustion capacity by optimizing the combustion control.

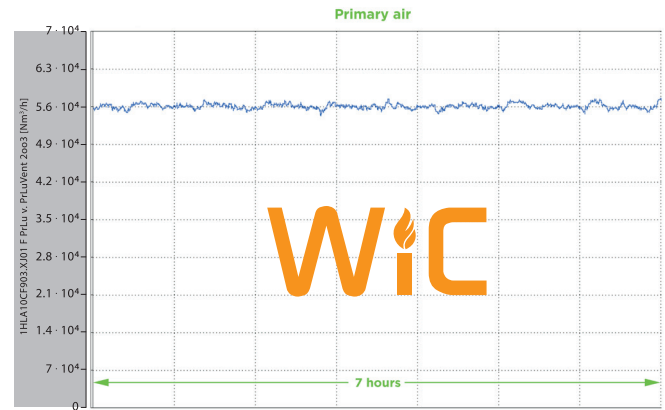
## (2) Stabilization of combustion air flow

Stabilization of combustion air leads to:

- less additives in flue gas cleaning
- less energy and mechanical forces on fans
- less slagging and fouling



Primary air controlled by Standard Control



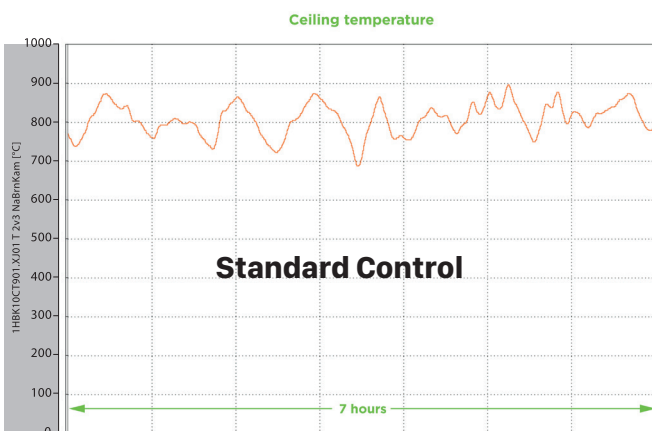
Primary air flow controlled by WiC (same line)

Please NOTE! The higher amount of primary air is related to an increase of waste throughput/steam production

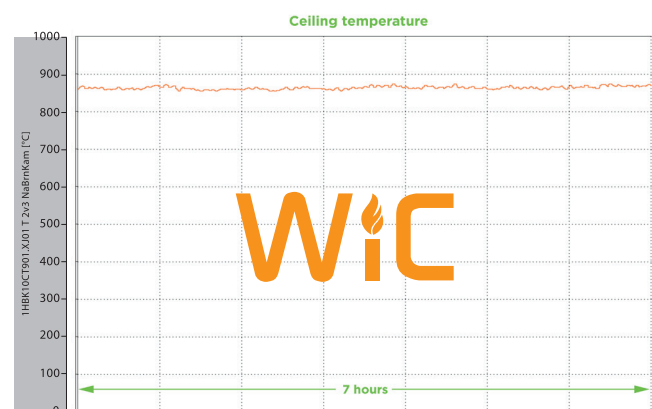
## (3) Stabilization of flue gas temperature (ceiling temperature)

Stabilization of flue gas temperature brings:

- less slagging and fouling
- less wear on refractory
- less corrosion
- less cleaning effort
- lower ceiling temperature
- better heat transfer



Ceiling temperature with Standard Control



Ceiling temperature with WiC (same line)

Please NOTE! The average temperature is, of course higher because of enhancement of waste throughput/steam production

### 3. Quick, simple, safe and proven

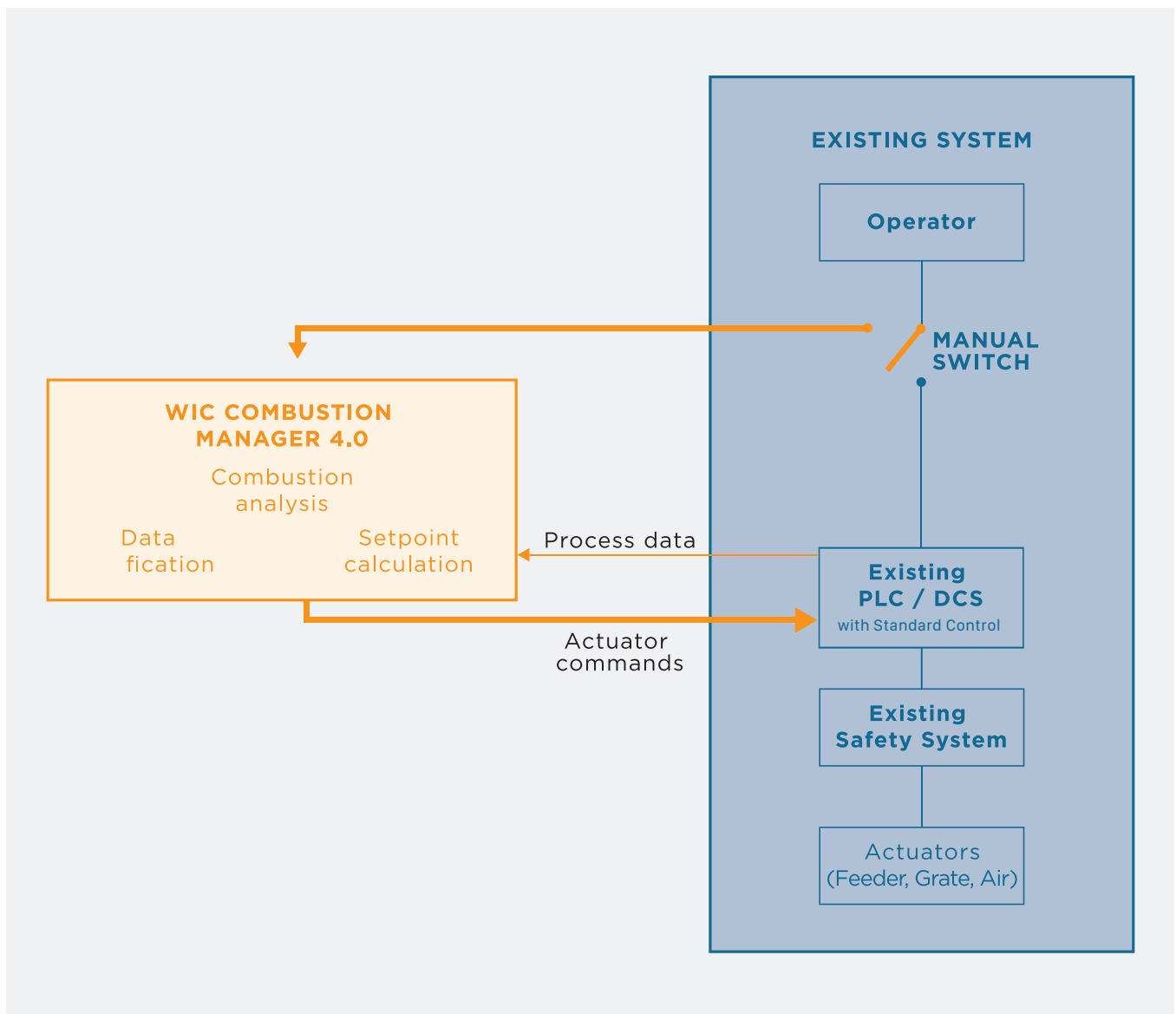
#### How is WiC connected to existing automation systems?

In most applications the WiC is a bypass or an „add-on“ system to the existing combustion control system. It may also be integrated from project start up. The WiC usually comes in a cabinet of 600D x 800W x 2000H mm (24D x 31W x 79H inch) and is placed in the DCS room.

The basic working principle of the WiC is to “listen” to process signals coming from the DCS, calculate appropriate set points for combustion parameters and send them back to the DCS to control the actuators of the combustion system (air dampers, feeder- and grate-hydraulics).

**Note:**

- WiC does not replace the existing system
- WiC is a bypass/add-on system for exact process set point calculations
- WiC does not interfere with the existing safety system
- With a single switch (software and/or hardware) the operator may define the source of set points, utilizing WiC-set-points or DCS-set-points. This is essential for the operators to gain confidence in a „new combustion philosophy“. The operators can, at any time, switch back to their familiar existing system and they can directly compare with the new WiC Combustion Manager.

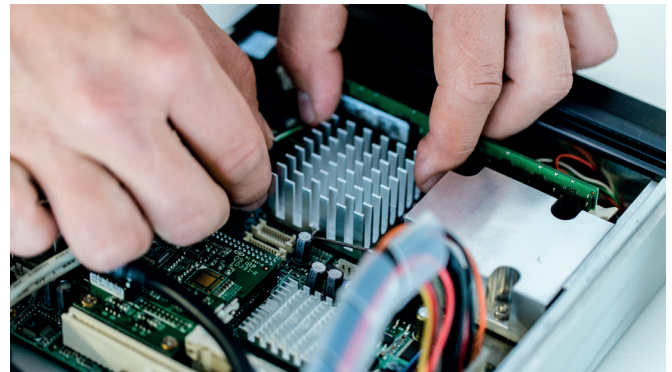




The installation of WiC takes about 4 weeks. The WiC does not interfere with ongoing operation; there will be no disturbance or plant shut down.

After verification of process values, the commissioning of the WiC is finished within 10 minutes. Roughly 30 minutes after commissioning, it is possible to see first benefits of the WiC-system.

**Note:** The WiC can also work as an add-on for any 3rd party combustion optimisation system the customer might have implemented in the past.



#### 4. „No cure, no pay" philosophy

What about the financing model for WiC?



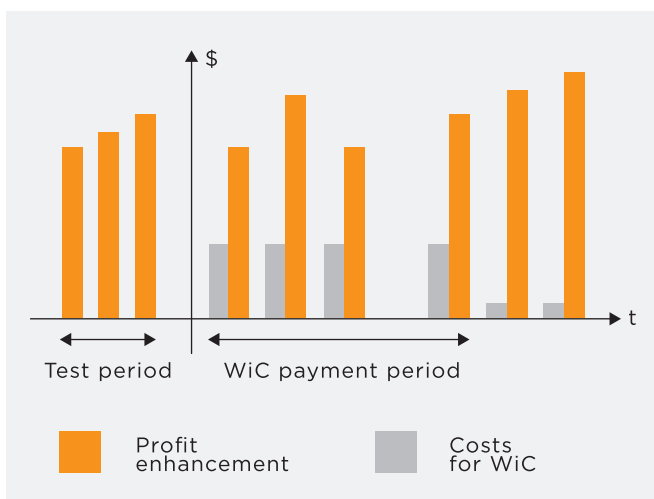
Besides the benefits mentioned above, the WiC provides a considerable additional advantage:

profits from the beginning of installation WiC offers more than all other systems on the market, also in terms of financing.

After TG's feasibility study, TG can assess the possibilities and advantages of the WiC for your particular plant. If the outcome of the feasibility study is positive, TG is able to offer the installation and commissioning free of charge:

- no upfront investment
- test installation and commissioning free of charge
- no technical risk, no commercial risk for you

#### WiC generates additional profits from the beginning of installation



TG has great experience in reliably assessing the advantages of the WiC system on your particular plant.

After commissioning, the customer can immediately measure the short-term benefits of the WiC (financial benefits). At that point the customer can decide freely, without any obligations, whether to go on with a contract for the WiC. The entire risk is on TG.

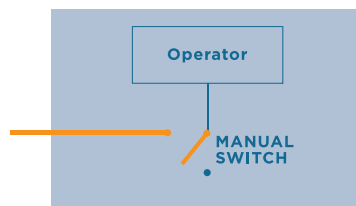
The customer can monthly quit the contract for whatever reason without any further obligations.

## MEASURING THE BENEFITS OF WiC

After the installation of the WiC, one important question comes up: "What is the benefit of the WiC Combustion Manager?" For answering this question, the following procedures will work as simple and reliable testing methods.

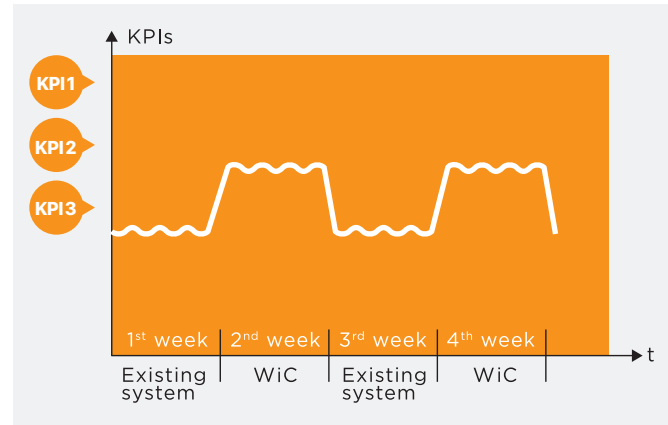
It is necessary to have approximately the same waste quality and then check the KPI's under WiC- and under DCS combustion control.

With one simple switch plant operators can move between the existing system und WiC.



The periods under comparison may be selected according to similar waste conditions.

- The commercially most important criteria are:
- stability of steam production
- amount of steam production
- waste throughput
- amount of additive consumption
- stability of flue gas temperature
- stability of primary and secondary air
- O<sub>2</sub> concentration
- amount of operator interventions



Some criteria are short term, being relevant for a fast initial assessment of the WiC benefits. Long term benefits can be assessed on the basis of process signals over a period of several months after WiC installation.

The WiC is a fully automated system and provides operation without permanent observation (OWPO). Besides that, WiC is also a great help for operators in case of disturbances.

**Note:** For the WiC implementation there is no need for mechanical modifications of the existing combustion system. WiC is an add-on system utilizing the existing equipment.

## A TYPICAL PROJECT SCHEDULE

1. Obtain measurement data, drawings ...  
(may be done remotely/by e-mail)
2. Survey site – interview site team engineering/operations/maintenance
3. Install the WiC – fine adjust combustion
4. Train the operators and staff

Technical information necessary for WiC evaluation:

Trend data from last year (i.e. 1.11.2015 - 1.11.2016 hourly average values in an.xls or.csv or.txt file):

Steam flow [t/h],  
 Steam setpoint [t/h],  
 CO<sub>2</sub> Concentration at boiler outlet [Vol%],  
 Total primary air flow [Nm<sup>3</sup>/h],  
 Total recirculation air flow (if applicable) [Nm<sup>3</sup>/h],  
 Total secondary air flow [Nm<sup>3</sup>/h],  
 CO Concentration at boiler outlet [mg/Nm<sup>3</sup>],  
 Amount of feed water [t/h],  
 Produced electricity [MW],  
 Amount of waste incinerated [t/h]

1. Grate capacity diagram

2. Grate drawings: Grate mechanics, Grate dimensions, Grate slots

3. Grate manufacturer:

4. Grate base, incl. Fotos and/or Drawings of the bars and tiles

5. P&I's

6. Boiler drawings:  
 burning chamber, afterburning chamber  
 P&I's Process & Instrumentation

Type of waste	Percentage	Caloric value	Humidity
	%	kJ/kg	(low, medium, high)
7. Municipal waste	80	8,5	H
8. Hazardous waste	0		
9. Industrial waste	20	14	M
10. Hospital waste	0		

Combustion air system	Fan motor	Fan	Frequency-
	kW	m <sup>3</sup> /h max	Converter
			Yes/No
11. Primary air distribution	90	70000	Yes
12. Secondary air distribution	40	30000	no
13. Cooling air	–	–	–
14. Recirculation air	10	10000	no
15. D-Fan	150	120000	yes

Utilisation of produced steam	Percentage	Power
	%	MW
16. District heating	60	42
17. Electricity	35	11
18. Process steam	5	4



*We would be pleased to advise with our expertise!*



# BENEFITS

- 24/7 service
- Remote support
- Monitoring and data archiving
- Permanent monitoring of combustion process
- Reporting of inconsistencies
- Disturbance analysis
- Improvement suggestions
- Consultancy during planned shut downs
- WiC-maintenance (1 week/year on site)
- Cyclic WiC-Updates



Our data acquisition system, integrated in the WiC, enables our engineers to efficiently analyze the plants combustion process.

TG offers 24/7 support with daily analysis of the combustion process. Our engineers provide reports for your plant and inform you about possible improvements. In case of disturbances, we are able to analyze the collected data to find the source of problems. Our service contract includes full WiC maintenance (including spare parts) and inspection of your plant for one week once a year.





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