Workshop information and registration:
www.opopworkshop.com

19–20 April 2023 Conference Aston, Birmingham

OPERATIONAL OPTIMISATION

For waste-to-energy and biomass plants

Energy from Waste

In association with EfW Net

Organised by Recycling

Operational Optimisation

For waste to energy and biomass plants

19-20 April 2023 Conference Aston, Birmingham

Improving profits today; future-proofing plants for tomorrow

technikgruppe®

COMBUSTION MANAGEMENT

It is our great pleasure to invite you on TECHNIKGRUPPE'S presentation, round table discussion and exhibition booth. SEE YOU IN BIRMINGHAM UK!

www.technikgruppe.com/technology-of-fire

In this **WORKSHOP** basic principles of unique methods for combustion optimization on forward moving reciprocating grates will be explained. Practical results will be analysed. Technical / commercial experts from TECHNIKGRUPPE will contribute in their presentations and **round table discussion** to a better understanding of improvement and modernisation in Waste to Energy and Biomass plants.

Participants are kindly invited to visit **www.technikgruppe.com/technology-of-fire**
If you need additional information please contact Mr. Damir Zibrat **damir.zibrat@technikgruppe.com**

Target audience:

- **plant managers**
- **operational managers**
- **maintenance managers**
- **performance improvement engineers**
- **plant engineers**
- **plant operator supervisors**
- **plant operators**

Key words:

- **technology of fire**
- **combustion optimisation**
- **retrofitting of WtE and BtE plants**
- **forward moving grate**
- **new grate technology**
- **reliability**
- **profitability**

Technology of fire

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 combustion technologies to use and there are equally many different approaches to find the right solutions.

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

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

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

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

1. Adding fuel into the burning chamber
2. Blowing oxygen into the fire
3. Mixing the fuel with combustion air

20th April
11:35 – 12:20

Session 4 – Combustion optimisation
Matthias Lukic, CEO, Technical Expert, **Technikgruppe**
Damir Zibrat, Business Development Manager, **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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Damir Zibrat, Business Development Manager of Technikgruppe, has more than 25 years of experience in international strategical selling and marketing.

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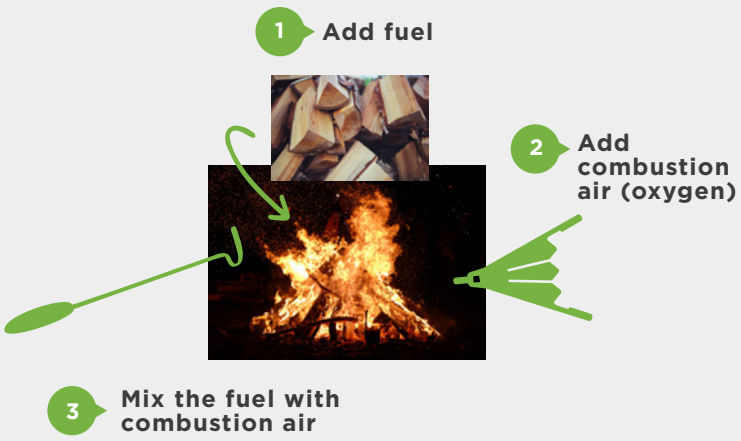
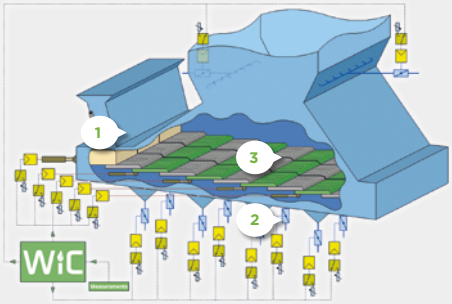




1. **Feeder = Add fuel**
2. **Primary/Secondary air = Add combustion air (oxygen)**
3. **Grate = Mix the fuel with combustion air**

After more than 25 years of experience in combustion optimization, 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.

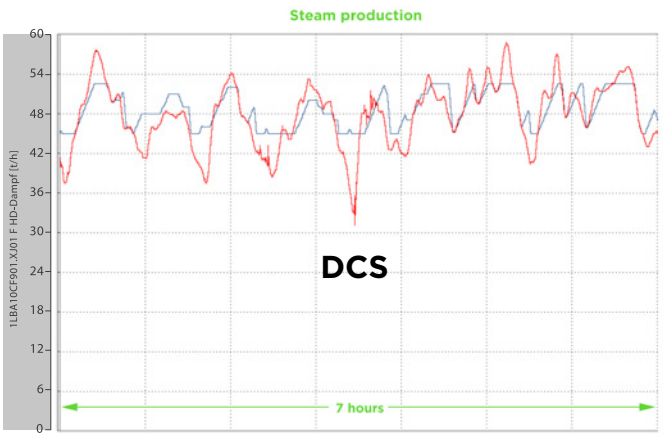
If we have 20 actuators and each actuator has 10 possible positions - **how many possible combinations do we get??**

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 possible combinations for fine adjustment //
00 000 000 000 000 000 000 ..... 99 999 999 999 999 999 999

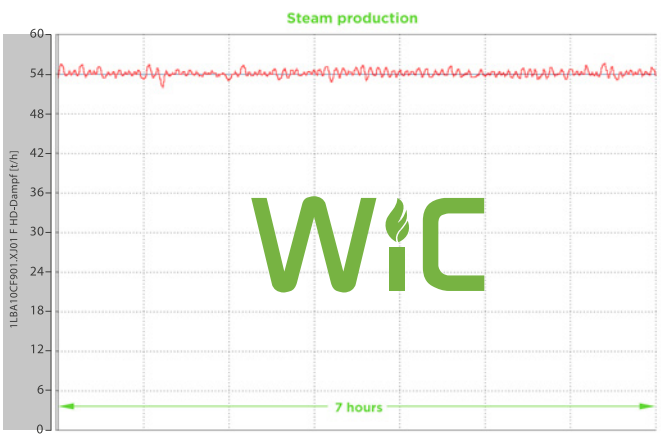
The status of the combustion process is changing every few seconds! **That means - every few seconds we need to fine adjust the actuators.** It is clear that the definition of appropriate combination every few seconds is a very complex task.

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

Stabilization and enhancement of steam production



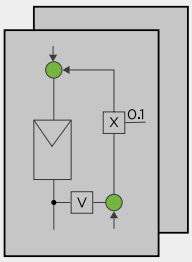
Steam production controlled by DCS



Steam production controlled by WiC (same line)

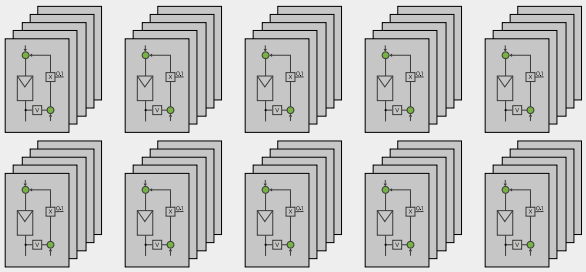
What is the difference between conventional controllers and WiC ?

Traditional systems **50**



Conventional controllers have about 50 functional diagrams

WiC system **6500**



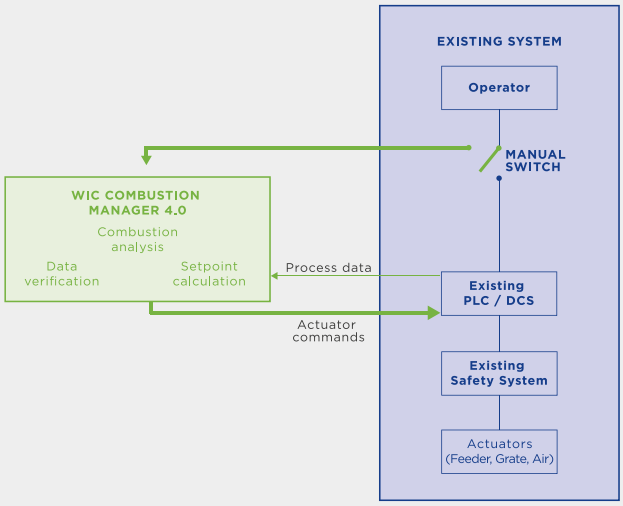
The WiC Combustion Manager has 6500 functional diagrams

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.

How is the 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.

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.

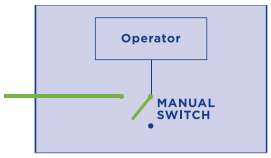
Note:
The WiC can also work as an add-on for any 3rd party combustion optimization system the customer might have implemented in the past.

Measuring the benefit of the 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
- O2 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.

What about the financing model for the WiC?

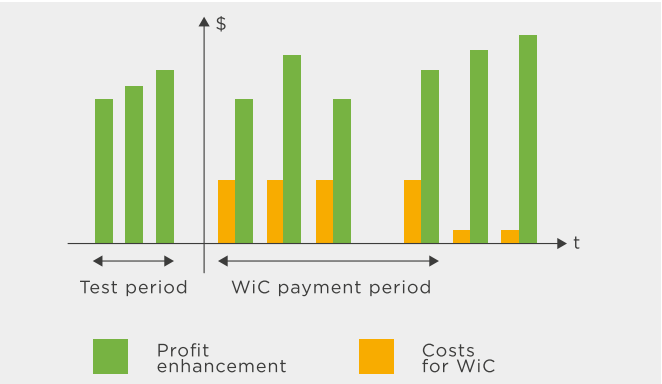
Besides the benefits mentioned above, the WiC provides a considerable additional advantage:

- **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**

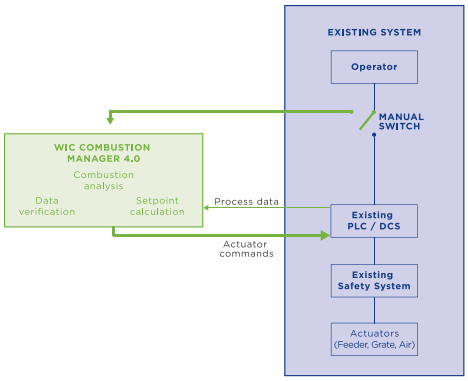
WiC generates additional profits from the beginning of installation

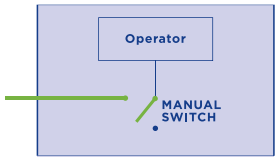


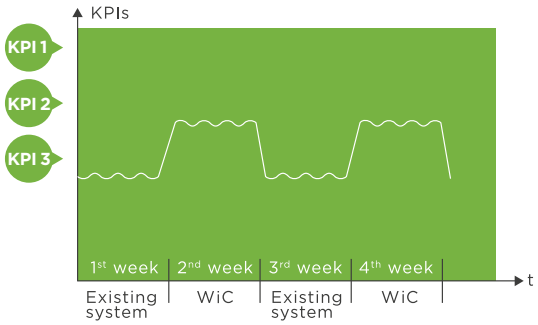
TG has great experience in reliably assessing the advantages of the WiC system on your particular plant.

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.

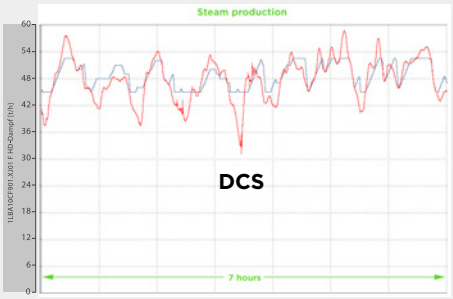
How to measure the financial and technical benefit of the WiC?



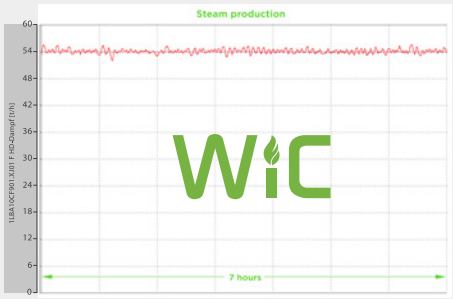




(1) Stabilization and enhancement of steam production



Steam production controlled by DCS

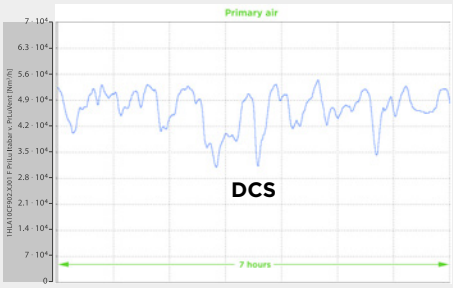


Steam production controlled by WiC (same line)

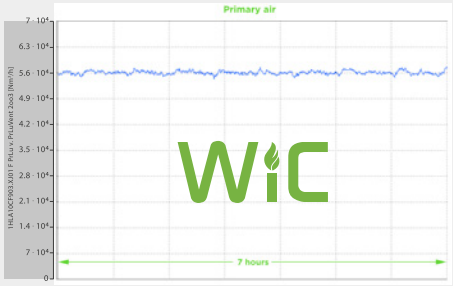
Stabilization of steam flow brings:

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

(2) Stabilization of combustion air flow



Primary air controlled by DCS



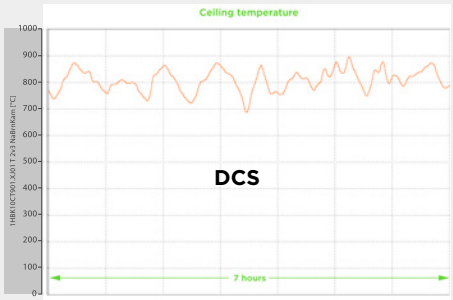
Primary air flow controlled by WiC (same line)

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

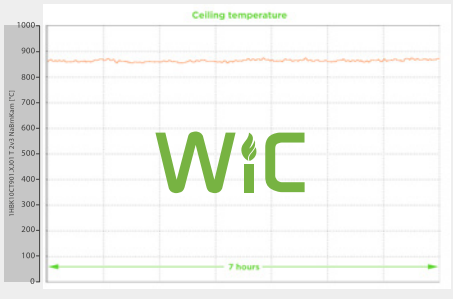
Stabilization of combustion air brings:

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

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



Ceiling temperature with DCS



Ceiling temperature with WiC (same line)

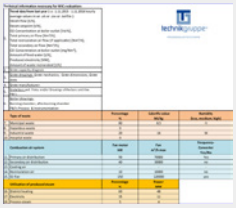
Please NOTE! The average temperature is, of course higher because of enhancement of waste throughput/ steam production

Stabilization of flue gas temperature brings:

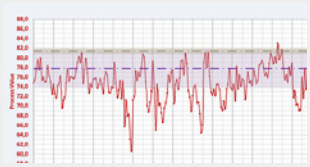
- less slagging and fouling
- less wear on refractory
- less corrosion
- less cleaning effort
- lower ceiling temperature
- better heat transfer

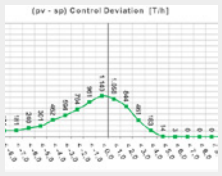
A typical project schedule would be:

1. Obtain measurement data, drawings ...
(may be done remotely/by e-mail)



2. Make data analysis and feasibility study

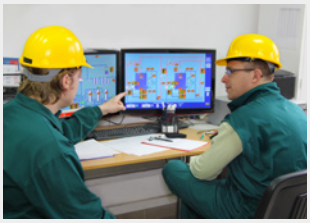




3. Survey site – interview site team engineering/operations/maintenance

4. Install the WiC – fine adjust combustion

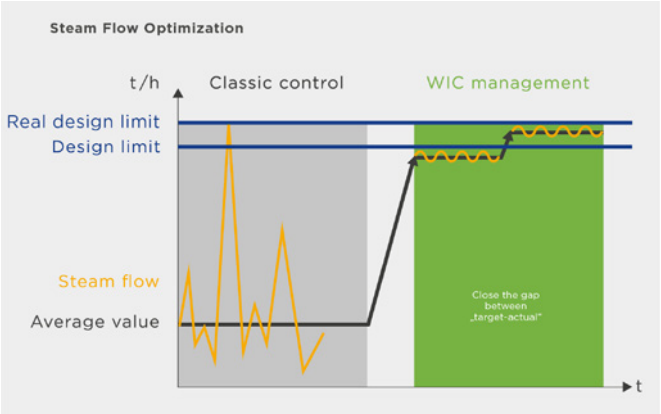
5. Train the operators and staff



The application of the WiC can significantly improve the profitability, reliability and availability of Waste-to-Energy and Biomass-to-Energy plants. If TECHNIKGRUPPE's feasibility study states that WiC delivers the best technical and financial results compared to other systems, TG offers you a free test installation including operator training on the terms „No Cure No Pay".

Payment is made in 36 (60) monthly rates, which are in any case less than the increase in profit through WiC.

Enhancement of steam production towards real design limit



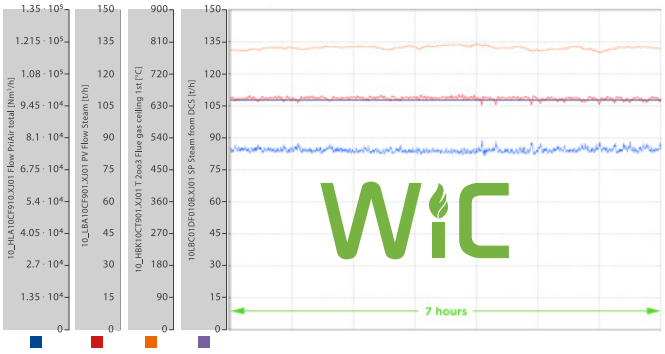
By implementation of classic control, big overshooting of steam production is possible and this is the main reason why the set point (average steam production) is kept below the design limit.

"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

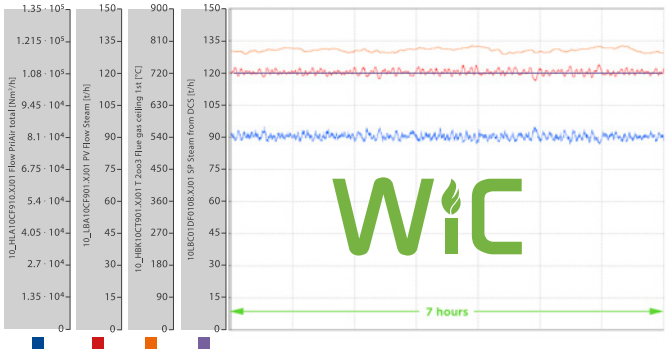
Enhancing combustion capacity without mechanical changes

Standard load – 109 t/h



After stabilization of steam production, the real capacity could be determined.

Increades load – 120 t/h



This finally led us to a load increase of 10 % from original MCR

It is important to note, that even after increasing steam production from 109 t/h to 120 t/h the steam production is still stable.

In the afternoon/evening of 19th April there will be enough time for talks and discussions. It will be a pleasure to start with English Five O´Clock Tea.

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