

# ADVANCED ENGINEERING SERVICES

Schmidt + Clemens Group



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A range of

A man in a white shirt is looking at a computer monitor. The monitor displays a software interface with various graphs and data points. The background is slightly blurred, showing what appears to be a laboratory or office setting.

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Hardware optimization

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Integrated optimization

S+C services at your disposal

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FIRSTLY

# THANK YOU

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FOR CONSIDERING US!

We at SCHMIDT + CLEMENS have more than 140 years of experience in the field of metallurgy and have been the market leader in high-alloyed steel and Ni-based components for high temperature applications, such as steam crackers, steam reformers and direct reduction for decades.

However, manufacturing high quality products is not enough. To this effect, we established our own specialized RESEARCH & DEVELOPMENT SERVICES department in 2009.

With our ADVANCED ENGINEERING SERVICES, we aim to offer customer support that goes beyond the product.

Our know-how, technical abilities and state-of-the-art equipment and software speak for themselves!

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WE STAND FOR

PASSION

INNOVATION

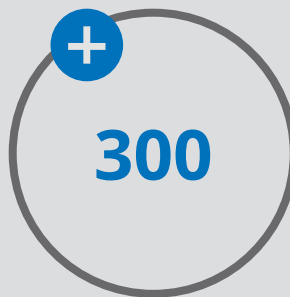
TRADITION

# SIMPLE FACTS ABOUT US



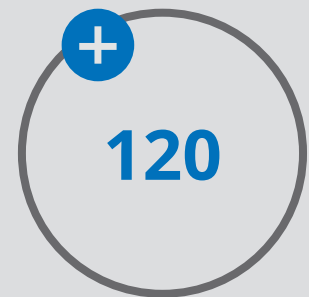
### Successful Projects

Our success is our customers' success. It is as simple as that!



### Satisfied Clients

We put a great deal of care into promoting an open, collaborative and customer-oriented relationship with our clients. And it shows!



### Patents Filed

The number of patents filed by our department says a lot about us. We are passionate about innovation!

## OUR DEPARTMENT IN NUMBERS



skilled people working as a team



years of achievements



of space for innovation



current research projects

IN-HOUSE CERTIFIED

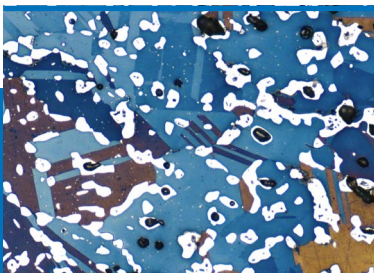
# LABORATORY SERVICES

Our certified laboratory offers independent destructive and non-destructive metal testing services based on current standards.

Working with high-end, state-of-the-art testing and investigation equipment, we are able to use our know-how and experience to deliver precise and understandable results, as well as advise you according to your particular needs.



## METALLURGICAL INVESTIGATIONS



- + Visual examination
- + Microstructure analysis:
  - Purity
  - Volume fractions
  - Carbide content
- + Macroetching
- + Grain size test
- + Weld seam analysis



## CORROSION TESTING



- + Critical pitting test
- + Intergranular corrosion test
- + Cyclic corrosion test
- + High temperature corrosion:
  - reducing
  - nitriding
- + Steam cracking condition test rig:
  - oxidizing
  - carburizing



## MECHANICAL TESTS



- + Tensile tests up to 1100°C
- + Compressive tests
- + Creep tests up to 1250°C
- + Bending tests
- + Charpy impact tests
- + Hardness tests
- + Heat treatment tests up to 1200°C

Our  
**IN-HOUSE LABORATORY**  
 not only  
**SAVES TIME,**  
 it delivers  
**CONSISTENT,**  
**PRECISE**  
 and  
**UNDERSTANDABLE**  
**RESULTS.**



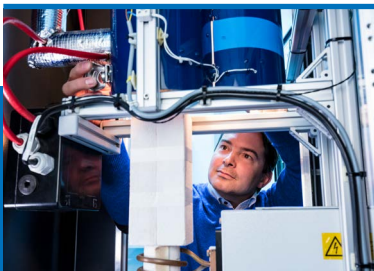
**CHEMICAL  
 ANALYSES**



**SPECTRAL  
 ANALYSES**



**CERTIFIED  
 LABORATORY**



- + Unalloyed, low alloyed and high alloyed steels
- + Special alloys
- + Cast-iron, nickel and cobalt based alloys (by OES)
- + Combustion analysis of S, C, N, O, H



- + High resolution Scanning Electron Microscopy (SEM) with element analysis by energy and wavelength dispersive X-Ray spectroscopy
- + Optical Emission Spectroscopy (OES)



**EXCELLENCE LABORATORY  
 Technical Compliance  
 LEVEL III:**

- + DIN EN ISO 9001
- + DIN EN ISO 14001
- + OHSAS 18001
- + ISO 50001
- + DIN EN ISO 17025

# METALLURGICAL INVESTIGATIONS



## OUR TRADITION

Metallurgy is our core competence and tradition.

Part of our success as a manufacturer and supplier is rooted in the excellent support we offer our customers. Providing further services is only a natural development!

We can investigate components with regards to their condition or in case of failure. We offer a variety of sample testing for different industries and offer customized service packages.

Contact us to discuss your service needs!



# INVESTIGATIONS



## STEAM CRACKERS

We usually investigate:

- + Brittle fractures
- + Creep
- + Overheating
- + Carburization / Nitration
- + Coke analysis
- + Thermal shock



## STEAM REFORMERS

We typically investigate:

- + Creep
- + Overheating
- + Thermal shock
- + Brittle fractures



## DIRECT REDUCTION

Our unique DRI reformer testrig can investigate:

- + Creep
- + Thermal shock
- + Overheating
- + Metal dusting



## HEAT RESISTANT APPLICATIONS

We also investigate:

- + Furnace rollers
- + Rotary kilns
- + Retort furnaces
- + Pusher tubes
- + Gas inlet nozzles
- + Lances



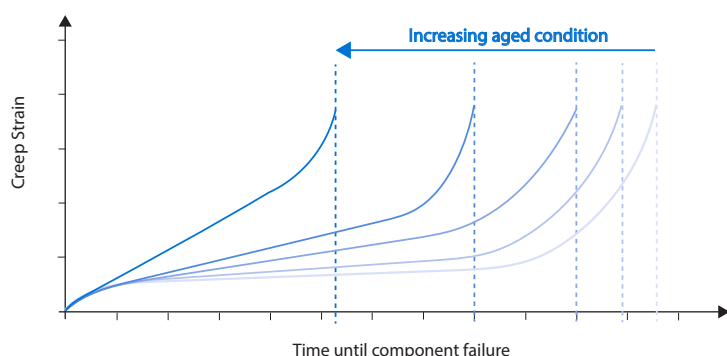
## CRITICAL SITUATIONS

Our decades long expertise in high temperature applications and our excellent staff and equipment are here to help you find the reasons behind a possible furnace event or avoid it completely.

We are factual in our reporting and take a customer-centric approach, meaning that we act quickly on time-sensitive issues.

# REMAINING LIFE ESTIMATIONS

Remaining Life Estimation  
Creep Test



Here the main focus lies in evaluating the aged condition of components and their remaining life, by means of several tests, such as:

- + Visual inspections
- + Micro and macrostructure analyses
- + Carbon/Nitrogen profiles + Chemical analyses
- + Tensile tests
- + Creep tests (see example)

# PARAMETER OPTIMIZATION

## OUR PASSION FOR EFFICIENCY

We know how demanding the steam cracking process can be on radiant coils.

And we also know that different customers have different concepts of performance and optimization.

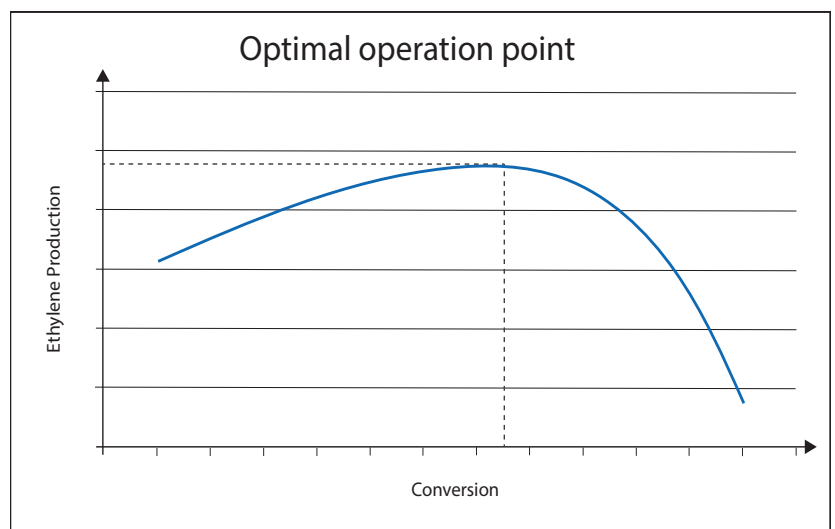
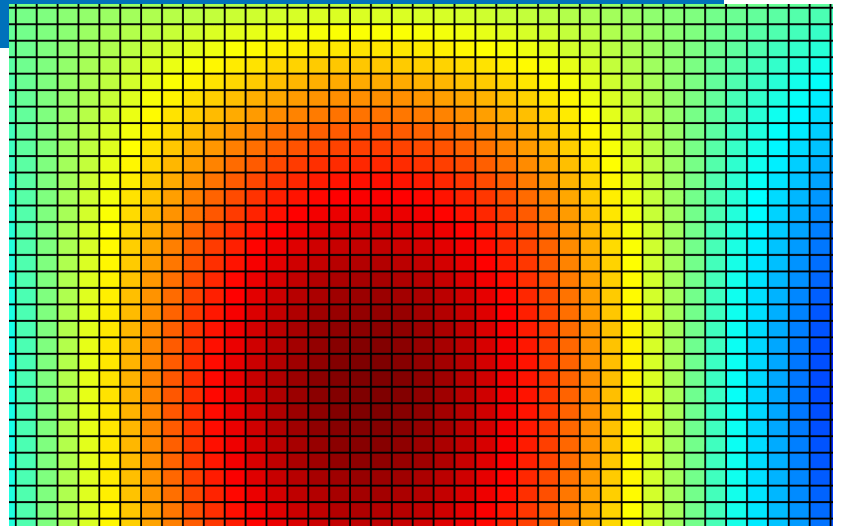
However, a good example of what we can offer you in terms of optimization is the **optimal operation point** shown below.

After defining the current status and creating a mathematical model of your radiant coil design, we can find the optimal conversion point regarding ethylene production.

We can, of course, also focus on other parameters. This is entirely based on your requirements and optimization goals.

With us you have a long-lasting partner, that is always glad to lend a helping hand.

Contact us and find out more!





## CURRENT STATE DEFINITION

### Your process data is part of the system.

Starting with a clear definition of your requirements and the raw data provided, we proceed to clean it.

We identify and correct unsuitable data formats, merge the datasets and filter out errors and implausible measurements.

This results in a data masterfile.



## ANALYSIS

### The key to understanding.

Armed with the masterfile, we apply several statistical analysis processes to derive a mathematical model.



## SIMULATION

### The key to optimizing.

Once we have translated the operation data into a mathematical model, we can then run simulations.

These simulations allow us to find key parameters which can be optimized, of course always based on your specific requirements.



## OPTIMIZATION

### The finish line is only the start.

Based on the mathematical model simulations and your particular requirements, we can predict which key parameters could have the highest impact on furnace operation.

Or we can simply focus on other optimization targets of your choice!

# HARDWARE OPTIMIZATION

## OUR PASSION FOR INNOVATION

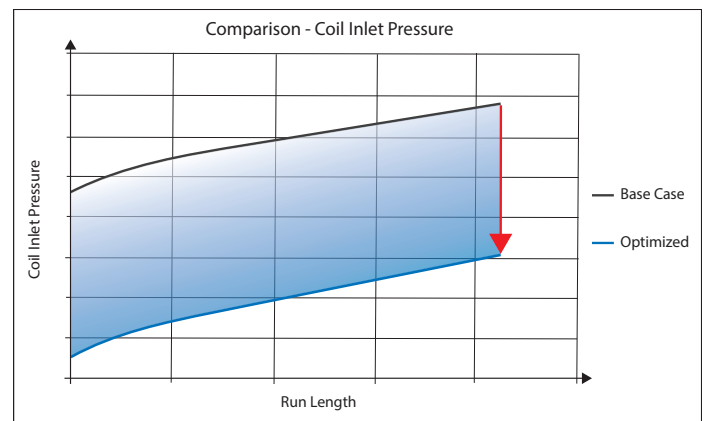
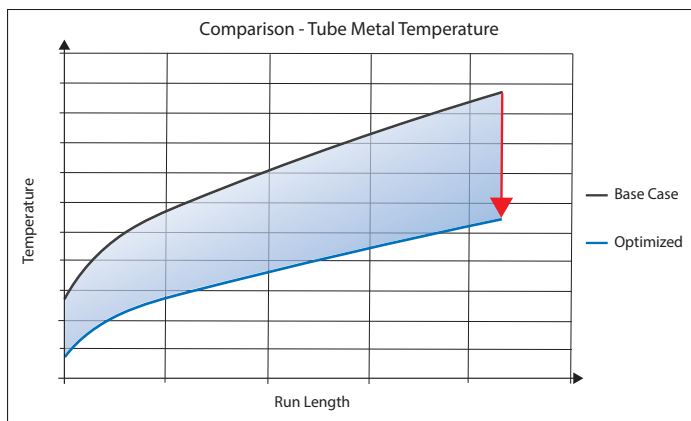
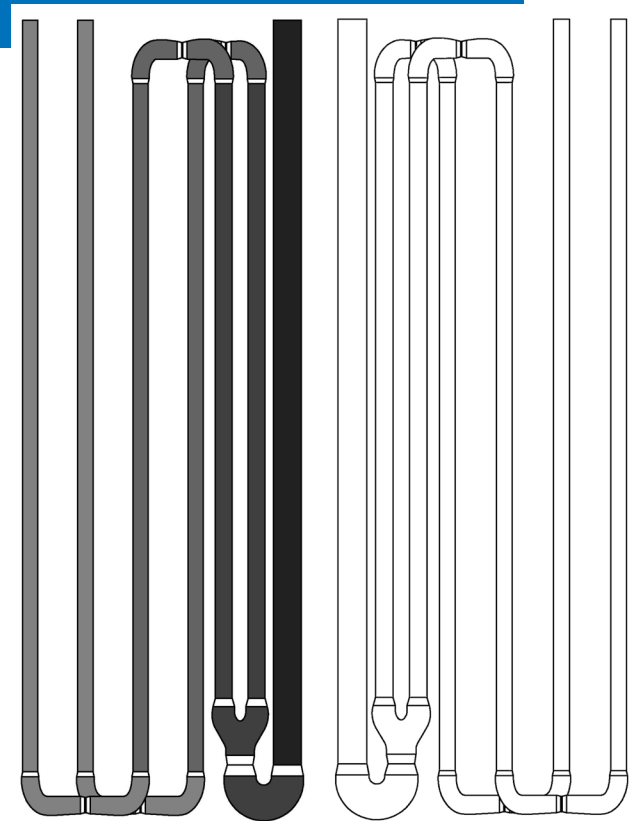
As the manufacturer of ground-breaking alloys and inner profile technologies, we are very confident in their proven benefits.

And we are glad to show you the **optimal configuration** of these cutting-edge products within your radiant coil design.

All based on your particular requirements!

We can prepare **several configurations** and **comparisons**, and show you their **benefits**, as exemplified by the images below.

Contact us to discuss these services in more detail and find out just how much potential there is to your new S+C radiant coil.





## CURRENT STATE DEFINITION

### Understanding through communication.

In order to optimize we must understand your needs and wants.

Through close communication we can gather information about your current configuration and gain an overview of your system and requirements.



## COMBINATION OF TECHNOLOGIES

### Iteration leads to solution.

Different coil passes have different requirements regarding material and profile choice. Here we define these needs and create several models with different combinations.



## OPTIMIZATION

### Your coil, your best fit.

Through simulation and different iterations, we are able to show you the benefits of using our materials and profile technologies.

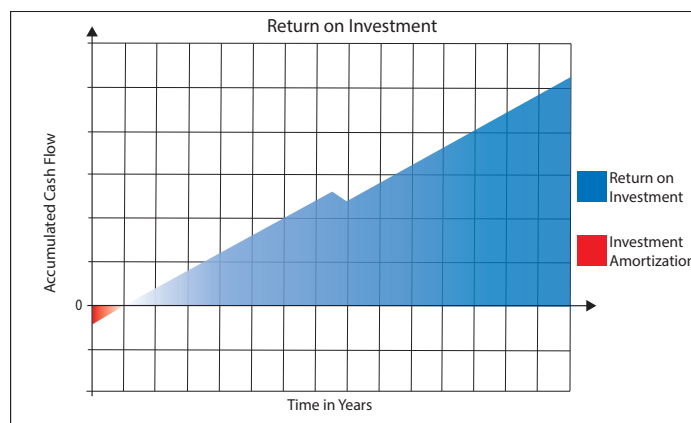
This ultimately leads to a tailored coil configuration that fits your needs, whether they are costs, reliability, performance or yield.



## SIMULATION

### Information leads to modeling and to simulation.

Using this overview and the information gathered, we create models of your coil using state-of-the-art software.



# INTEGRATED OPTIMIZATION



## OUR PASSION FOR COMPLETE OPTIMIZATION

Here we combine **all our investigative efforts** and **know-how** with our **broad process and material knowledge**, as well as **software**, to offer you the best possible and most **tailored solution** to **your coil configuration**.

It is an all-encompassing process which requires open and direct communication to achieve the best results.

Consolidating parameter and hardware optimization requirements, vastly **increases** the **efficiency** and production **potential** of **your radiant coil design**.

Let us show you the true benefits of our products and services within your furnace!



## CURRENT SYSTEM ANALYSIS

### The first step is always to understand the current situation.

Since we are keen on finding a custom solution, we always analyze the current system and its process data.

This will allow us to ultimately choose the most effective combination of materials and technologies for your coil.



## DEFINITION OF REQUIREMENTS

### Communication and open discussions are key here.

In order to best serve your needs we have to discuss them with you.

Only a solid definition of your requirements will ultimately lead to a successful optimization.



## OPTIMIZATION

### This is the complicated bit in which we excel.

Combining all our know-how we run process simulations, iterate and then analyze the results. Correlating these simulations with insight gathered from mechanical investigations done on aged samples leads us to the next step.



## CUSTOM SOLUTION

### One customer, many tailored solutions.

Needless to say, our custom solutions always fit the furnace in question and your specifications.

Armed with optimal process parameters and the most effective combination of alloys and technologies for your particular radiant coil, we have confidence in your success.

Let us show you the potential of a custom solution!



CONTACT US,  
WE ARE GLAD TO ASSIST YOU!

@ [salespetro@schmidt-clemens.de](mailto:salespetro@schmidt-clemens.de)

 [www.schmidt-clemens.com](http://www.schmidt-clemens.com)

