

AICHELIN Services

for your heat treatment plants
from AICHELIN and other manufacturers



Current Information on AICHELIN service products at www.aichelin-service.com

AICHELIN SERVICES



CONTENT

■ Annual maintenances	2
■ Safety checks	3
■ Training	4
■ Seminars & forums	7
■ Recommissioning services	9
■ Plant inspection	11
■ Software changes/Upgrades	12
■ Tests and measurements (SAT, TUS, Gas...)	13
■ Emergency service operations	15
■ Contact	16

ANNUAL MAINTENANCES

MAINTENANCE OF HEAT TREATMENT PLANTS

- Full maintenance performed by trained AICHELIN personnel to ensure plant availability. Supervisory maintenance involving the customer's personnel is also an option.
- Preserving the manufacturer warranty by performing maintenance according to the manufacturer's specifications
- Predictable maintenance intervals to ensure production specifications
- Minimize unscheduled plant shutdowns

THE AICHELIN ANNUAL MAINTENANCE CONCEPT



- A concept that has been successfully implemented many times
- Proven procedure consisting of
 - **Maintenance**
 - **Inspection** with diagnosis
 - Condition-based and **preventative maintenance**
 - **Documentation** of implemented work in the maintenance report
- Preplanned spare part packages supplied by request with take-back guarantee for unnecessary, unstockable spare parts
- Experienced service technician crew with **many years of experience** in service and maintenance work (> 10 years)

YOUR ADVANTAGES

- Optimal **plant availability** and safety
- Reduced maintenance times and maintenance expenses (if applicable)
- **Perfect process organization** incl. systematic spare part delivery and take-back
- Exchange of know-how through cooperation based service concept
- **Safety and reliability** from a consistent and experienced partner

YOUR RELIABLE PARTNER

- Proven service concept unique to the market consisting of maintenance, inspection and condition-based and preventative maintenance
- Simple and comprehensive maintenance and plant documentation
- Perfect coordination between maintenance work and stocking of spare parts
- Maintenance according to the manufacturer's specifications with warranty
- All work performed by a single provider if desired
- Scope of maintenance can be expanded (burner maintenance, testing according to BGV A3, TUS, etc.)

PROCESS OPTIMIZATIONS

ISSUES WITH THE HEAT TREATMENT PROCESS

With the necessary **heat treatment processes**, there are often **a variety of potential problems** that can arise. On the one hand, **reproducible quality** of the components to be heat-treated has **top priority**, and on the other hand, **high plant availability and reliability** is essential as well. Possible problems are, for instance:

- **Variations in the quality** of the components, i.e. inconsistent hardening results within a batch
- **Necessary process adaptations** due to new products or capacity increases
- **Unexpected process changes** (disruptions), i.e. due to defective jacket pipes, changes in upstream processes or changes to the energies and fluids of the plant (i.e. biogas instead of natural gas)
- **Changes in the heat treatment behavior** due to changes to the thermal processing plant such as a different thermal insulation
- **Undesirable surface conditions** after the heat treatment process
- **Increased soot development** inside the thermal processing plant
- Unsatisfactory **washing results**
- **Inconsistent temperature distribution** inside the heat treatment plant

THE AICHELIN SOLUTION

An **experienced AICHELIN technician** will be sent to you to try to solve the problem on site through **adjustment measures**. If the desired result cannot be achieved this way, the problem will undergo more in-depth **analysis** to define the correct **remedial actions**. As a next step, a **concept for the solution of the problem** will be designed (i.e. through measurements or material checks etc.). The process will then be coordinated with you, and you will receive an offer based on that.

YOUR ADVANTAGES

- **Fast reaction times** thanks to AICHELIN's extensive service network
- Benefit from the technical **know-how** within AICHELIN Group
- **One-stop service**: Process optimization and, if needed, rebuilding
- **Safety and reliability** thanks to a stable and experienced partner
- **Efficient implementation** thanks to targeted and well-organized operation

YOUR RELIABLE PARTNER

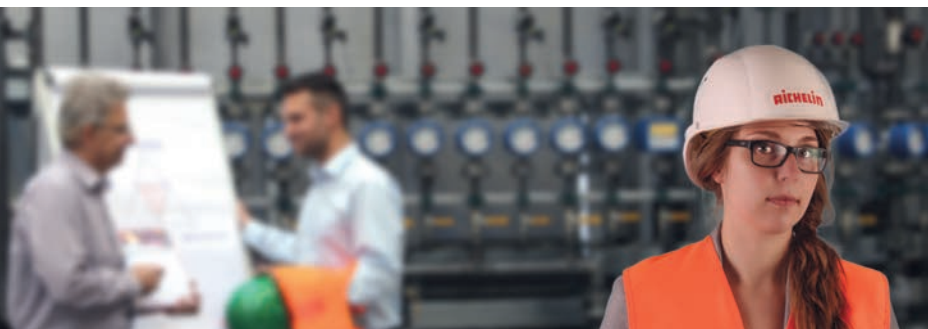
- Ultimate **flexibility** while considering customer requests (deadline, scope and extras)
- High **competence** regarding plant modernizations: **Safety** for human and machine has **utmost priority**
- Consistent and **reliable partners** for project implementation
- Your project is in the **safe hands** of a market leader in heat treatment.

TRAINING

OPERATOR TRAINING (IN-HOUSE)

Operating training takes place at your plant and features **theory** and **practice**. In addition, a production shift is accompanied, during which your operating personnel can ask very specific questions. The following topics are taught:

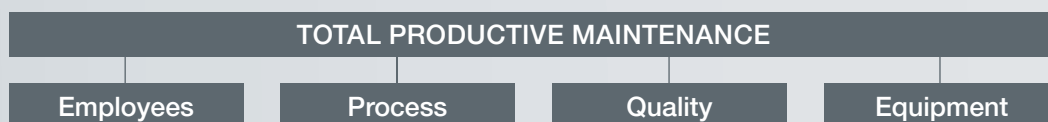
- Instructions on how to operate the plant
- Instructions on the plant's safety functions
- Explanation of locking mechanisms
- Explanation of fault messages and possible remedies
- Instructions on the disassembly/assembly of parts for which special knowledge is required
- Explanation of maintenance work and intervals
- Explanation of the system documentation



MAINTENANCE PERSONNEL TRAINING (IN-HOUSE)

Ongoing **maintenance and improvements of your plant** contribute significantly to the productivity of your plant. On the one hand, we will show you how to best maintain and repair your plant, while on the other hand we will train your maintenance staff in "first aid" for your furnace in the event of problems. Recognizing dangers and taking quick actions is an important step towards prevention and maintenance. With this training, your maintenance department will learn **how to service and repair individual parts of the plant themselves**. The following topics will be covered:

- Documentation of the plant
- General characteristics of maintenance work
- Special safety aspects during maintenance
- Troubleshooting and failure analysis for your plant
- Plant basics – Design and function



BURNER TRAINING (INHOUSE OR TRAINING CENTER)

The **aim** of the event is to teach the employees/trainees the **basic operator know-how** on how to use, operate, and service **industrial gas burners** and radiant tubes.

- Design, mode of operation, structural characteristics of burners and burner control units
- Burner assembly, disassembly, installation and maintenance instructions, leak testing, packaging and transport
- Starting the burners, settings and shutdown the burners, burner faults, troubleshooting and fixing faults
- Energy-efficient burner operation, recognizing and taking advantage of savings potentials

AICHELIN TRAINING CENTER (ATC)

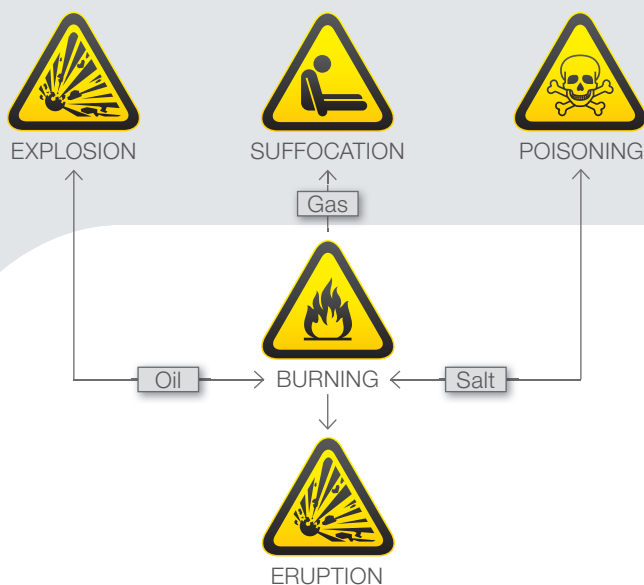
More than ever, international competition makes the **acquisition and development of expertise and skills a fundamental requirement for all employees.**

The **AICHELIN Training Center** is here to meet this demand. It offers the following advantages:

- The **courses offered by the AICHELIN Training Center** focus on knowledge-based services for employees and business partners and thus make an **important contribution to the further strategic orientation and further development.**
- Current offers for customers and partners can be found on our homepage (<https://www.aichelin.at/en/career/training-center>).

SAFETY TRAINING (IN-HOUSE)

The authorities view **safety training** as one of the **most critical aspects of occupational safety**, and this course is used to impart on trainees the **proper behavior patterns** and a **sense of responsibility. Before starting work** and at least **once a year**, every employee must be taught about dangers that may occur during his/her work and the measures that can be taken to avert them.



The advantages of our targeted training:

- **Minimization** of dangers such as **explosions, eruptions, poisoning** and **suffocation** and their interactions when working with thermal processing plants
- **Time- and cost-saving**
- Based on our own specific **experience with furnaces**
- On **your** plant
- **Targeted topics** or
- creation of an individual **training program**, optimized to your needs

TRAINING

TRAINING FOR INDUCTION HARDENING

Within the AICHELIN Group, **EMA Indutec** is the competence center for induction hardening. EMA Indutec offers customers the opportunity to gain user know-how on plants, converters, and other components. The aim is to **use EMA induction hardening machines optimally** and teach the **theory of induction**. Two options are available to learn about the basics of induction technology:

- **Option 1** offers the following theoretical basics in a **one-day course**:
 - Induction theory
 - Electromagnetic properties
 - Science of materials
 - Induction hardening
 - Inductor design – industry-leading elements
 - Inductor types
 - Inductive tempering
- **Option 2** combines theory and practice in a **two-day course**. The theory as listed under Option 1 is presented on the first day. The second day will take a look at practical matters with the following topics:
 - Experiments with different inductor concepts (feed, shoot, sheeting) on EMA Indutec GmbH lab equipment
 - Analysis of lab tests and discussion of results

YOUR ADVANTAGES: COMPETENCE – SAFETY – RELIABILITY

The **aim** of our training is for **participants** to recognize the **special requirements** and **accident risks** when using thermal processing plants and to be able to operate them safely at any time.

- Our **documentation** also serves as **proof of training** for you as a manager or employer.
- **Protection of employees**
- **Protection of the used plant**
- **Protection of production**

YOUR OPPORTUNITIES

- Valuable **training opportunities** that **add value to your company**
- **Know-how** from a **competent partner**
- You meet your **legal requirements**
- Joint development of an **individual** training program that is **customized to your requirements and wishes**, taking into account all specifics of your plants
- Select the content that matters to you from our **training portfolio**
- Incorporation of training into your relevant **shift system**

SEMINARS & FORUMS

OUR CLAIM TO SEMINARS AND FORUMS

Customer contact and the **exchange of experience** within the industry are very important to us. This provides the foundation for **solid, long-term partnerships**. This is why we started holding forums. The immense demand demonstrates their success.

Heat treatment is a science that is characterized by vast theoretical knowledge. Through the **experience** gained over generations and many trials and test plants, AICHELIN is the perfect **partner** to share this knowledge in the course of seminars.

AICHELIN MAINTENANCE FORUM

- Our surveys have shown: **Maintenance departments are under increasing pressure to ensure the efficiency and safety of machinery and equipment!** Good maintenance staff faces these challenges head-on and help improve them.
- Take advantage of the AICHELIN Maintenance Forum to learn **how to operate thermal processing plants safely and service them efficiently**.
- You can expect interesting presentations and discussions on the issues of **maintenance methods, secure thermal processing plants & safe maintenance** as well as **training & knowledge retention** in maintenance.
- As is commonplace at our maintenance forums, you can apply the presented theory to **practical examples** and thus deepen your knowledge. Benefit from our experience, the technical contributions of experts and discussions with maintenance professionals from other companies.



SYSTEM PLANNER SEMINAR

This seminar is designed specifically for **planners of heat treatment plants** and is becoming more and more popular. Numerous participants from the automotive industry, bearing industry, and mechanical engineering took part in the last seminar in order to gain and exchange new information for the planning of heat treatment plants and to share practical tips. The following topics are dealt with, among others:

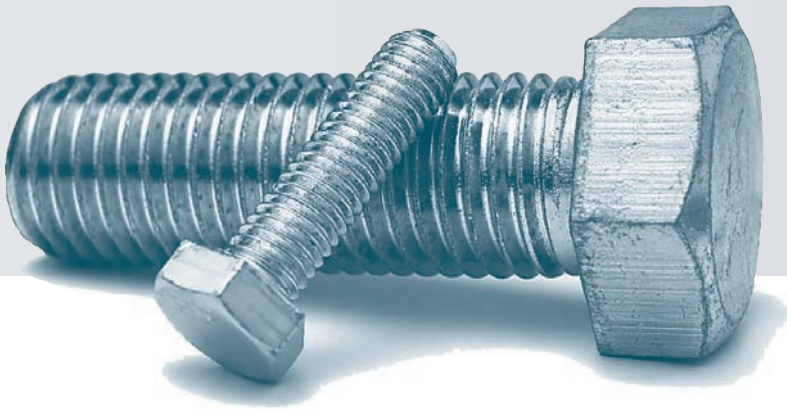
- **Economic and technical selection criteria** for plants with maximum customer use
- **Efficiency** and savings potential in heat treatment plants
- **Plant safety**
- **C_{pK} - and C_{mK} values** for heat treatment plants
- Customized services over the entire life cycle of the plant

SEMINARS & FORUMS

AICHELIN BOLTS FORUM

With this event, the AICHELIN Group is providing a platform to exchange knowledge with and between our customers, specifically those from the fastening technology industry. This forum is geared particularly towards heads of production and/or heat treatment who want to learn all about the latest options and trends. We also want to provide plenty of opportunity to **exchange knowledge and experiences**. Here are just a few of the topics on the agenda:

- Heat treatment of aluminum connection elements with modern wire-link belt furnaces
- **Operating experience** with belt furnaces
- **Quenching systems** and **quenching media** for screws and fasteners
- Plants and **processes** for bainite heat treatment
- Furnace plants that **preserve** the parts
- Improving the **toughness** of screws through optimized heat treatment
- TOP performance with the right service



HEAT TREATMENT SEMINAR

Our Heat Treatment Seminar aims to convey the theory of the inside of materials. The effect of the time/temperature sequence on the material structure is investigated in particular. Our specialists from the AICHELIN research and development department as well as external speakers will offer you sound knowledge on **hardening, tempering, annealing, austempering, energy efficiency** and other current topics. The speakers will share their experience and practical tips with the seminar participants. In addition to gaining useful practical knowledge, another important aspect of the forum is that the participants can share their experiences.

YOUR ADVANTAGES

- Interesting **technical lectures**
- Platforms to **exchange experiences**
- **Hands-on** topics and challenges
- **Further develop** your personal **expertise**

YOUR RELIABLE PARTNER

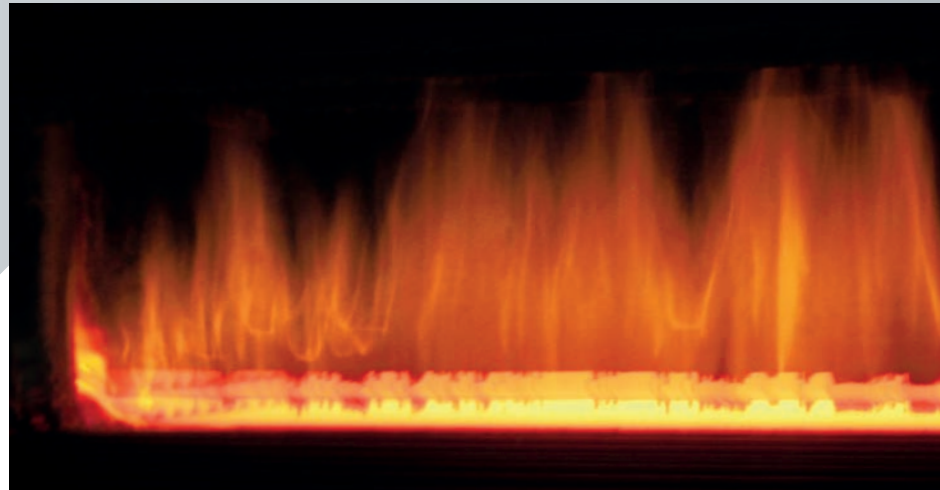
No other company can offer you such a broad range of equipment and extensive experience as the AICHELIN Group. Get first-hand information!

RECOMMISSIONING SERVICES

BURN-OUT

A **must for trouble-free operation** of the plants over a long period of time: repeated **burn-outs** of the plants with removal of carbon deposits through targeted feeding of air/oxygen into the heating chamber.

- Burn-out at **different intervals** depending on the furnace type and process parameters (e.g., chamber furnace every 2 to 3 weeks; pusher type furnaces every 1 to 2 months)
- Indicator if a burn-out is needed: Carbon level controllability of the plant
- In plants without an automatic burn-out device, burn-outs have to be performed manually
- Must only be performed by an **expert**



RECOMMISSIONING AFTER MAINTENANCE OR REPAIR

- Performing a **cold** and a **hot test** after
 - Maintenance (disassembly, dismantling, and reassembly of the drives)
 - Lining work in the area of the drives and their traverse paths
- Creating a **homogeneous furnace atmosphere** through proper restoration of the gas supply

COLD TEST ON THE FURNACE

- **Elimination** of a majority of possible **error sources**
- Checking the **functionality** of each individual **drive**, paying special attention to the thermal expansion in the furnace
- Checking the **limit switch settings** of all drives
- Checking the **interlocks** and **safety functions** in the control system
- Checking the **drives** when **loaded**
- Drawing up a **test protocol**

HOT TEST ON THE FURNACE

The following steps are carried out on the hot furnace plant:

- Checking proper **functioning** of each **individual drive**
- Checking the **limit switch settings** of all drives
- Checking the **drives** when **loaded**
- Drawing up a **test protocol**

RECOMMISSIONING SERVICES

RESTORING THE GAS SUPPLY

Restoring the atmosphere necessary for the production process by

- Checking the **pressure holding**
- Checking the **dew point**
- **Leak-testing** the plant
- Initiating the carrier gas supply
- **Setting** the **flow conditions** of carrier gas in the furnace plant
- Setting the **safety volumes**
- Setting the **carbon potential**
- **Optionally**, it is also possible to run a **reference part** or receive production support
- Drawing up a **test protocol**

ADJUSTMENT OF THE BURNERS

The foundation for **reproducible results** during production are functioning and properly configured **burner systems**

- Visual **inspection** of all relevant components
- **Cleaning** of the relevant components
- **Burner adjustment** using exhaust gas analyzer (possible only during plant or production operation)
- Creation of **burner protocols**

CHECKING OF ELECTRICAL HEATING ELEMENTS

For **consistent quality of parts** with your electric heater:

- Visual **inspection** of all relevant components
- **Cleaning** of the relevant components
- Checking the **power consumption** of the individual heater groups

YOUR ADVANTAGES

- **Recommissioning**, an important and sensitive step, is carried out for you with **utmost care** and **reliability**
- A prerequisite for consistent **quality** and
- to ensure the **production process** of your plant

YOUR RELIABLE PARTNER

- A competent partner by your side - from plant burn-outs through to checking the heating elements
- Know-how from hundreds of successfully implemented plants

PLANT INSPECTION

PLANT INSPECTION ACCORDING TO THE AICHELIN STANDARD

- Inspections provide a long-term guarantee that your plant is functional and reliable
- Recording the **actual state** of a plant
- Documentation
- **Maintenance** or **repair recommendations** that you can schedule
- **You decide** on the nature, date, and implementation of the **measures**



PLANT INSPECTION ON THE COOLED FURNACE PLANT

- Checking the plant for **completeness**
- Visual inspection of the **drive technology, furnace lining, and gas supply technology**
- **Wear test** of all parts subject to wear in assembled condition
- Determining possible **reasons for wear**
- Derivation of the necessary **measures** for further operation of the furnace plant
- **Optional: Cold test**
- **Report** with a list of recommended measures

PLANT INSPECTION ON THE HOT FURNACE PLANT

Preconditions:

- All components are installed
- Furnace is at working temperature and filled with nitrogen
- Cold test has been successfully completed and documented
- All drives are ready
- The instrumentation and control (I&C) system is ready for operation

Work carried out:

- Checking the **plant** for **completeness**
- Checking the **drive technology**
- Checking the **process technology**
- Determining possible **reasons** for **wear**
- Derivation of the necessary **measures** for further use of the furnace plant
- **Report** with a list of recommended actions

YOUR ADVANTAGES

- **Transparent actual** state of the plant
- Support for **prioritization** of **measures**
- Measures to ensure **plant availability**

YOUR RELIABLE PARTNER

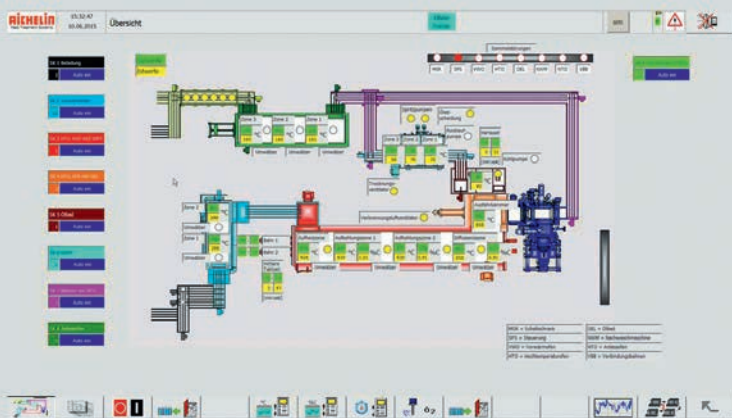
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SOFTWARE CHANGES/UPGRADES

THE SOFTWARE FOR YOUR FURNACE PLANT

Operators frequently desire **small adjustments** to the plant program. For example, additional information may need to be displayed, or the position of existing information is modified through minor program changes.

Of course we also offer **more extensive modifications** and would be glad to advise you.



SOFTWARE UPGRADES AND SOFTWARE CHANGES

New software versions include:

- Program changes according to **customer requirements**,
- new program versions, or **recalibrations** of software

The software **upgrades** concern PLC programs or Focos programs.

Software upgrades basically include the following services:

- **Preparatory work**
- **Development** of special programs or modification of standard software to adapt to the special requirements at the customer's premises
- On-site **installation** and testing

YOUR ADVANTAGES

- **Software** and **hardware matching** from a single source
- Optional further **customization** of your software
- **Uncomplicated order processing**, plug & play is usually possible
- Highest **quality** and **reliability** during implementation
- **Transparent** costs and service overview

YOUR RELIABLE PARTNER

- Extensive know-how about software
- Manufacture and service from a single source
- Very good reputation in the market, especially with respect to the furnace program
- Competent partner with hundreds of plants already delivered

TESTS AND MEASUREMENTS

MEASUREMENTS TO ENSURE A CONSISTENT LEVEL OF QUALITY

As the premium manufacturer of thermochemical heat treatment plants, AICHELIN offers a **broad range of tests and measurements**, which can be applied individually or in combination, e.g., after maintenance or rebuilding

SAT TEST

SAT: System Accuracy Test

- Reference measurements on a control element to verify the accuracy of the entire **control loop**
- Testing **during operation** at typical operating temperatures
- According to CQI-9, quarterly test with the **sensor method** and **monthly test** with the **comparative method**

The following tasks are carried out to measure directly on the plant:

- **Calibration** of the **thermocouples**
- **Calibration** of the **data acquisition system**
- **Protocol/documentation** of measurement
- Support for **interpreting** the **measurement results**



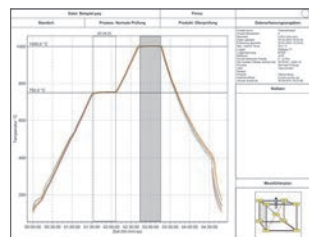
TUS TEST

TUS: Temperature Uniformity Survey

- Shows the current **capacity** of the plant
- Pointing out weak points caused by deterioration of the temperature uniformity
- According to CQI-9, this examination must be carried out **quarterly**
- **Test setup** on base tray

The following tasks are carried out to measure directly on the plant:

- **Calibration** of the **thermocouples**
- **Calibration** of the **data acquisition system**
- **Temperature Uniformity Survey (TUS)**
- **Protocol/documentation** of measurement
- Support for **interpreting** the **measurement results**



GAS ANALYSIS

- The **quality** and **composition** of the **process gas** has a direct impact on the carburization result
- **Control** of the process gases in the furnace through indirect measurement procedures
- **Analysis of the process gas** in the furnace and matching with the furnace control required at regular intervals

The procedure works as follows:

- A **suitable measuring** method is selected **based on the situation** (directly on the plant):
 - Gas analyzer
 - Dew point or
 - Foil samples
- **Protocol/documentation** of measurement
- Support for **interpreting** the **measurement results**

TESTS AND MEASUREMENTS



THERMOGRAPHY

- Detection of heat losses in the furnace through thermography
- Non-contact capture of the **surface temperature** of the plant by using measuring devices that make heat radiation visible
- **Quick** and **precise testing** of weak points in the insulation that are caused by wear
- Representation of the surface temperature distribution with different colors, **interpretation** through a temperature scale in degrees Celsius

The following tasks are carried out when testing directly on the plant:

- **Preparatory work** - measuring device (hardware and software)
- **Measurements** and documentation of degree of wear
- **Protocol**/documentation of the test
- Support for **interpreting the measurement results**

EARTHING TEST ACCORDING TO DGUV (FORMERLY BGVA3)

- Testing according to DGUV: **Mandatory** for companies **after modifications or maintenance**, or at **certain intervals** (every 4 years)
- The test may be carried out by a certified **electrician** in accordance with DGUV **only**

The following tasks are carried out when testing directly on the plant:

- **Preparatory work** - measuring device (hardware and software)
- **Earthing test** according to DGUV
- Follow-up work
- **Protocol**/documentation of the test
- Support for **interpreting the measurement results**



YOUR ADVANTAGES

- **Objective measurement** results and Interpretation support
- Deriving efficient measures
- **Transparent costs** and service overview
- **Measurements** are carried out according to the applicable standards and regulations

YOUR RELIABLE PARTNER

- Extensive know-how of thermochemical heat treatment plants and the statutory regulations and standards
- Manufacture and service from a single source
- Competent partner with hundreds of plants already delivered

EMERGENCY SERVICE OPERATIONS

YOUR COMPETENT PARTNER IN CASE OF PROBLEMS

- **Emergencies** may occur at any time in a production plant, e.g., due to a crash in the plant or failing components. You have to **act quickly** to **resume production**.
- **Take advantage of our experts** if you have a problem at your plant that needs to be dealt with fast.
- You can reach us by **phone** or we can be there in **person** on short notice. For this purpose we have our **specialists** for troubleshooting and damage repair directly in-house.



AICHELIN = SOLUTION-ORIENTED

- **Quick assessment of the situation on-site** by AICHELIN staff
- Determination of the **measures** and **advice** required
- Non-binding **cost estimate** after inspection, on customer request
- **Cost accounting** based on **expenditures** and pursuant to applicable billing rates
- **Quickest possible troubleshooting**, so you can resume production as soon as possible
- **Professional and proper** implementation of **potential tasks** with your support

YOUR ADVANTAGES

- **Quick help** from competent partners
- **Expert analysis** and consultancy services
- Numerous **specialists** from a single source
- Reliable **elimination of damage**
- **Collaboration** with the **customer** where possible
- **Uncomplicated processing**

YOUR RELIABLE PARTNER

- Know-how from hundreds of successfully implemented plants
- Hands-on training program by AICHELIN specialists

CONTACT

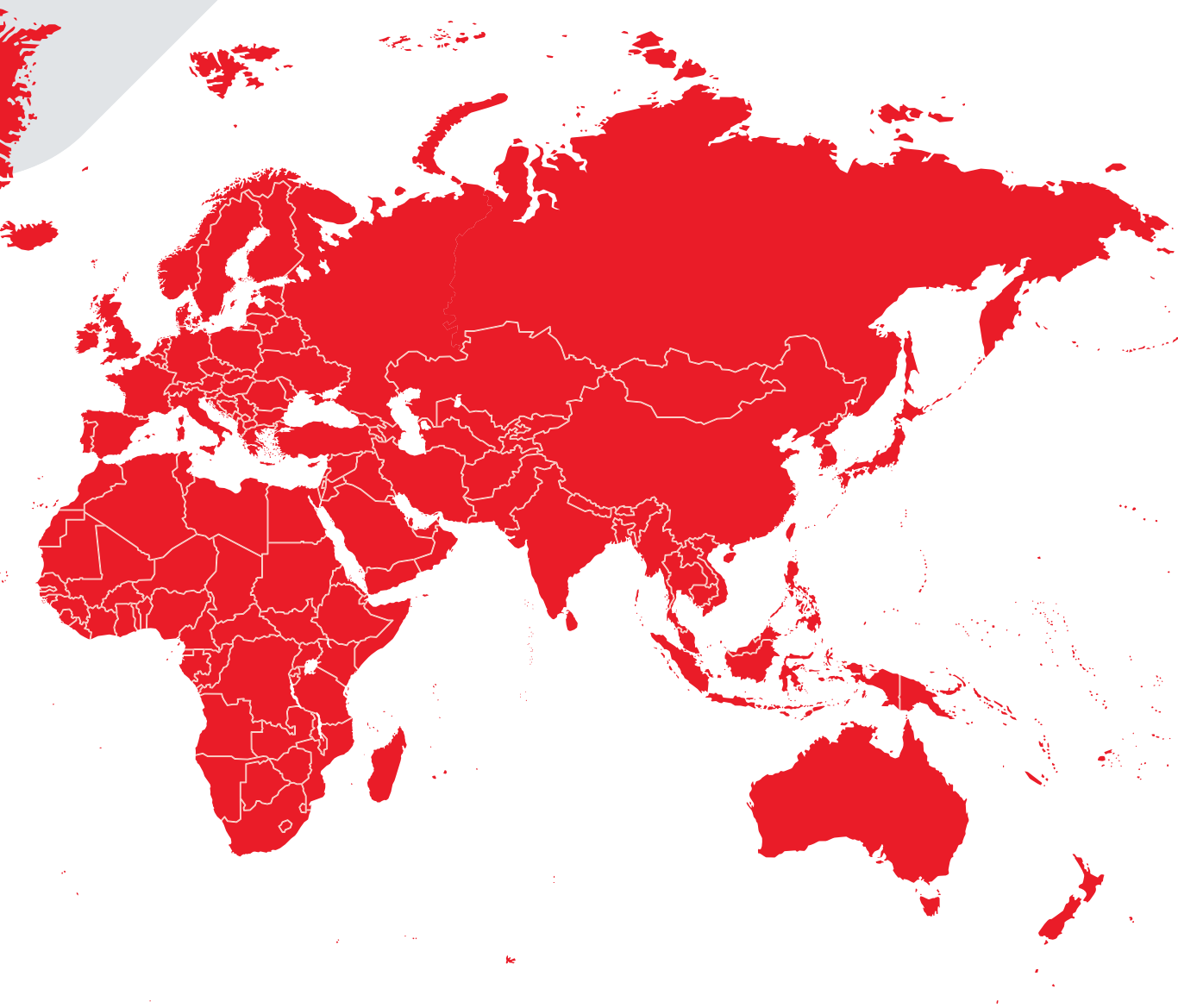
AICHELIN SERVICES

AICHELIN Service GmbH
Schultheiß-Köhle-Straße 7
D-71636 Ludwigsburg
Tel.: +49 7141 64 370
service.de@aichelin.com

AICHELIN Ges.m.b.H.
Fabriksgasse 3
A-2340 Mödling
Tel.: +43 2236 23 64 60
service.at@aichelin.com

SAFED France SAS
17E, Rue Alain Savary
F-25000 Besançon
Tel.: +33 353 57 00 03
contact.france@aichelin.com





Aichelin

global services

AICHELIN Service GmbH
Schultheiß-Köhle-Straße 7
D-71636 Ludwigsburg
Tel.: +49 7141 64 370
service.de@aichelin.com

AICHELIN Ges.m.b.H.
Fabriksgasse 3
A-2340 Mödling
Tel.: +43 2236 23 64 60
service.at@aichelin.com

SAFED France SAS
17E, Rue Alain Savary
F-25000 Besançon
Tel.: +33 353 57 00 03
contact.france@aichelin.com

www.aichelin-service.com