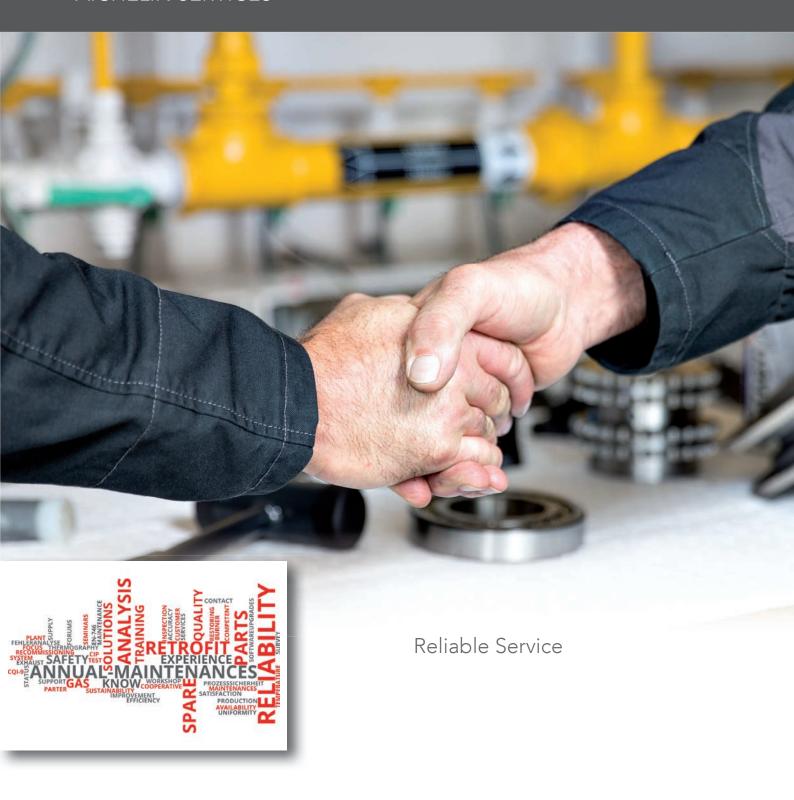


AICHELIN SERVICES







AICHELIN SERVICES

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ANNUAL MAINTENANCES

Maintenance of heat treatment plants

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

- 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.)



SAFETY CHECKS

Safety – a serious responsibility

The **national regulations** based on **EU Directive 2009 / 104 / EU** hold you as the operator of a thermal processing plant responsible. As the operating company, you are responsible for compliance with and proper implementation of all necessary tests and deadlines. We support you in the implementation of safety requirements for your thermal processing plants.

SAFETY FIRST We plants.

Status evaluation and measures

- Our offer includes a plant-specific inspection to determine the current status of the plant.
 The inspection is carried out in accordance with current regulations and essentially includes an assessment of the safety devices of the following assembly units:
 - Motion technology
 - Gas supply
 - Heating/temperature regulation
 - Locking mechanisms and shutdowns
- Your inspection package includes visual inspections to the extent allowed by your plant, without disassembling the plant. Defined plant conditions are created or simulated. This includes tests when your plant is operationally ready.

The following tasks are performed:

 Preparation work – Creation of a specific test plan based on the latest customer documentation

- On-site inspection of the plant
 - Recording the safety-relevant current condition of the plant
 - Checking the locking mechanisms and safety shutdowns
 - Simulation of specific safety conditions and verification of automatic safety shutdown during simulation
 - You will be provided with a report after the inspection is concluded.
 Particularly with information about:
 - The current condition of the plant
 - Type, scope, and deadlines for recommended tests
 - Required maintenance measures
 - Recommended training for your employees
 - Required and recommended conversions

Your advantages

- Testing of safety measures for effectiveness and optimal protection of your employees
- Ensuring the plant's productivity
- Compliance with legal obligations
- Documented, in other words verifiable inspection
- Observance of legal regulations, especially BetrSichV and EN 746

- Inspection by an experienced AICHELIN service technician
- Plant inspection in accordance with proven AICHELIN risk analysis and assessment
- Transparent costs and service overview
- Comprehensive test report and the resulting measures and recommendations
- Joint implementation of required measures

TRAINING

Operator Training (In-house)

Operating training takes places 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
- Explanation of locking mechanisms
- Instructions on the plant's safety functions
- 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. One 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 **goal** of this event is to impart on 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)

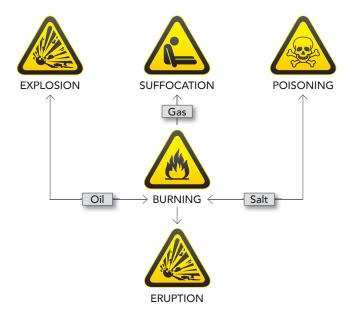
More than ever, international competition makes the acquisition and development of expertise and skills a fundamental requirement for all employees.

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 (www.aichelin.at/ trainingcenter).

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

EMA Indutec GmbH would like to offer your 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
 - Care and handling of precision tools

- 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 **long-term partnerships** that are solid. 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 face 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. Take advantage of the technical contributions from experts and discussions with maintenance professionals from other companies.
- 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_{mK}- 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!



RECOMMISSIONIONG 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

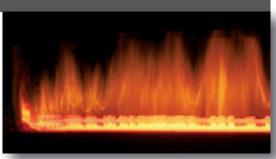
Cold test on the furnace

- 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



RECOMMISSIONIONG 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)
- Drawing up 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

- 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

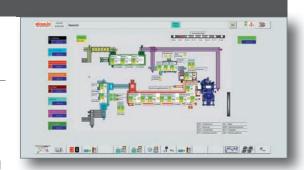
Your reliable partner

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

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
- \blacksquare Optional further ${\bf customization}$ of your software
- Uncomplicated order processing, plug & play is usually possible
- Highest quality and reliability during implementation
- Transparent costs and service overview

- 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 a conversion



SAT Test

SAT: System Accuracy Test

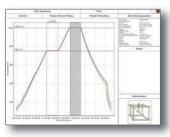
- Reference measurements on a control element to verify the accuracy of the entire control loop
- Testing during operation at typical operating temperatures
- According to CQI-9, quarterly test with the sensor method and monthly test with the comparative method

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 is to be carried out quarterly
- **Test setup** on foundation grate with cornerstones

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 gasses in the furnace through indirect measurement procedure
- 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

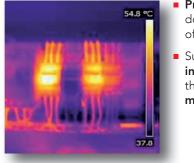
TESTS AND MEASUREMENTS

Thermography

- Detection of heat losses in the furnace plant 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

- 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. Our **specialists** for troubleshooting and repairs are at the ready 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

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

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