



Living Quality

at HAWE Hydraulik

Solutions for a World under Pressure

HAWE
HYDRAULIK

www.hawe.de

Preface



HAWE Lives Quality...



QUALITYMANAGEMENT@HAWE.DE

... and everybody benefits – the people buying and using our products and, of course, the people at HAWE themselves. We offer top product quality at attractive prices, delivering reliably and on time. All of HAWE's people and units remember our strategic focus in their work. The challenge is for us to strike the right balance between staying agile and being professional, and to act according to that ambition.

To keep this possible, we – Quality and Organization – assist HAWE's management in creating the right environment in terms of personnel, organization, and technology. We believe that we have brought together the right set of competences in the Quality and Organization team. We know that the potential of the technology we have available can only ever be put to its full use with the right people, working in a coherent structural and procedural organization.

Comprehensive quality controlling means that HAWE is always monitoring and recording the effect of this concept, for us to be able to say one day: "HAWE lives quality"

This booklet tells you more about how we live this ambition with all of our people and our business partners at HAWE.

I hope you will enjoy reading more about quality at HAWE. My team and I are always there to answer your questions at qualitymanagement@hawe.de

Your Stefan Schmid
Director Quality and Organization

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Organization

General Information

Headquarters

HAWE Hydraulik SE
Streitfeldstr. 25
81673 Munich
Germany

info@hawe.de
www.hawe.de

Phone: +49 89 379100-0
Fax: +49 89 379100-1269

VAT ID: DE180016108
Commercial Register: HRB 174760,
Registry Court Munich

[Corporate Principles](#)
[History](#)

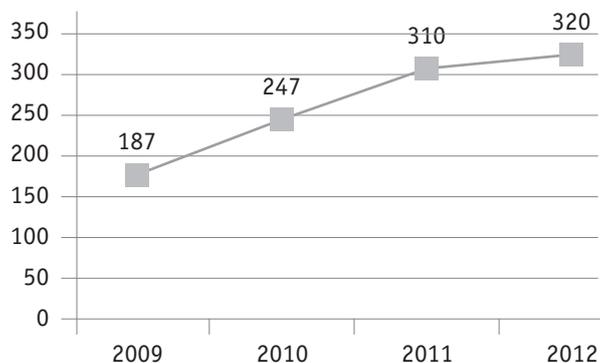


Headquarters Munich

HAWE offers sustainable hydraulic solutions and makes a contribution to tackling global technological challenges. Responsible and agile employees work professionally across a value chain spanning three continents to develop intelligent products for demanding customers. We are able to generate dynamic growth in value-driven market segments.

Key Figures

Annual turnover of the HAWE Group (in Mio. Euro)



Number of subsidiaries 14
Number of production sites 8

Employees (as of: May 2013)



HAWE Group	2.204
■ HAWE Hydraulik SE	1.651
■ HAWE Hydraulik SE – Production	53%
■ HAWE Hydraulik SE – Administration	40%
■ HAWE Hydraulik SE – Apprentices	7%
■ HAWE Subsidiaries	553

Product liability

(Insurance cover for physical injury and material damage) €20 million

Executive Board



Sales, Marketing, Quality & Organization (CEO)

Karl Haeusgen

Assistance: Ms. Sixt
Phone: +49 89 379100-1274
Fax: +49 89 379100-6274
Email: D.Sixt@hawe.de



Research & Development (CTO)

Martin Heusser

Assistance: Ms. Mihulet
Phone: +49 89 379100-1378
Fax: +49 89 379100-6378
Email: H.Mihulet@hawe.de



Production (COO)

Wolfgang Sochor

Assistance: Ms. Oswald
Phone: +49 89 379100-1201
Fax: +49 89 379100-6201
Email: M.Oswald@hawe.de



Finance, Controlling & IT (CFO)

Markus Unterstein

Assistance: Ms. Spindler
Phone: +49 89 379100-1441
Fax: +49 89 379100-6441
Email: R.Spindler@hawe.de

Organization

Premises

Munich (since 1949)

198 employees

- 20 administration personnel
- 178 production personnel
(as of: 05/2013)

Floor space: 6,400 m²
(total: 15,400 m²)

Core Competences:

- Mass production of PSL blocks and spool valves
- Automated component assembly and cellular final assembly



Freising (since 1965, expanded in 2007/2008)

400 employees

- 34 apprentices
- 58 administration personnel
- 308 production personnel
(as of: 05/2013)

Floor space: 13,000 m²
(total: 16,500 m²)

Core Competences:

- Production of valve units
- Production of pump casings
- Production of ground parts
- Logistics hub for all Bavarian sites



Sachsenkam (since 1977, new buildings 2008/2009)

198 employees

- 23 apprentices
- 22 administration personnel
- 153 production personnel
(as of: 05/2013)

Floor space: 6,000 m²
(total: 7,350 m²)

Core Competences:

- Mass production of turned parts (6-spindle lathes)
- Production of ground parts
- Mass production with product-specific rotary transfer machines (pump components)
- Automated assembly



Dorfen (since 1989, new buildings 2006)

157 employees

- 16 apprentices
- 20 administration personnel
- 121 production personnel
(as of: 05/2013)

Floor space: 4,800 m²
(total: 6,700 m²)

Core Competences:

- Production of valve units
- Assembly / Testing of valves in product-specific assembly units



Kirchheim (since 2007)

232 employees

- 47 apprentices
- 21 administration personnel
- 164 production personnel
(as of: 05/2013)

Leased premises, floor space:
10,500 m² (total: 11,000 m²)

Core Competences:

- Mass production of PSL blocks and spool valves
- Automated component assembly and cellular final assembly



Kaufbeuren (since 2011)

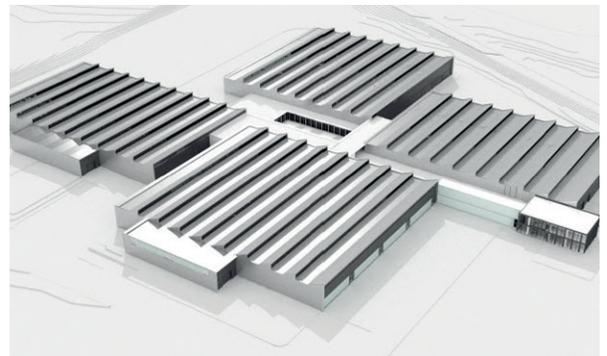
88 employees

- 9 administration personnel
- 79 production personnel
(as of: 05/2013)

Leased premises, floor space:
5,600 m²

Core Competences:

- Mass production of PSL blocks and spool valves
- Automated component assembly and cellular final assembly



New building – premises Kaufbeuren

HAWE InLine Hydraulik GmbH, Berlin (since 1998)

93 employees

- 3 apprentices
- 27 administration personnel
- 63 production personnel
(as of: 05/2013)

Floor space: 6,000 m²

Core Competences:

- Developing and manufacturing axial piston pumps for high-pressure applications



Schienle Magnettechnik + Elektronik GmbH, Salem/Lake Constance (since 1998)

86 employees

- 20 administration personnel
- 66 production personnel
(as of: 05/2013)

Floor space: 3,300 m²

www.schienle.de

Core Competences:

- Developing, manufacturing, and distributing solenoids, sensors, and actuation systems with and without explosion-proofing



HAWE North America, Inc. (since 1997)
Charlotte, North Carolina, USA (Head Office);
Houston, Texas, USA; Portland, Oregon, USA

75 employees
■ 3 apprentices
■ 62 administration personnel
■ 10 production personnel
(as of: 05/2013)

info@haweusa.com



HAWE North America, Charlotte

HAWE-Italiana S.r.l. (since 1973)
Milan, Italy (Head Office); Bologna, Italy

26 employees
■ 22 administration personnel
■ 4 production personnel
(as of: 05/2013)

info@haweit.com



HAWE-Italiana, Milano

HAWE-Otelec S.A.S.
(since 1977 as HAWE-France S.A.S./2007 Takeover of Otelec SARL)
Evry Cedex, France

23 employees
■ 1 apprentice
■ 19 administration personnel
■ 3 production personnel
(as of: 05/2013)

hawe.otelec@hawe-otelec.fr



HAWE Hidráulica S.L.U. (since 1995)
Barcelona, Spain

10 employees
■ 8 administration personnel
■ 2 production personnel
(as of: 05/2013)

hawe.hidraulica@hawe.es



HAWE-Hydratec AG (since 1996)
Cham, Switzerland

22 employees
■ 17 administration personnel
■ 5 production personnel
(as of: 05/2013)

info@hawe-hydratec.ch



HAWE Finland Oy (since 2000)
Espoo, Finland

7 employees
■ 6 administration personnel
■ 1 production person
(as of: 05/2013)

info.finland@hawe.fi



HAWE Österreich GmbH (since 2001)
St. Pölten, Austria

8 employees
■ 8 administration personnel
(as of: 05/2013)

office@hawe.at



HAWE Hidravlika d.o.o (since 2004)
Petrovče, Slovenia

8 employees
■ 1 apprentice
■ 5 administration personnel
■ 2 production personnel
(as of: 05/2013)

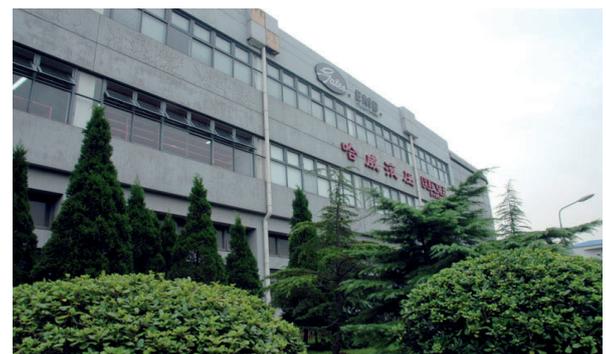
office@hawe.si



HAWE Oil-Hydraulic Technology (Shanghai) Co., Ltd. (since 1998)
Shanghai, China (Head Office); Beijing, China

104 employees
■ 59 administration personnel
■ 45 production personnel
(as of: 05/2013)

info@hawe.com.cn



HAWE Oil-Hydraulic Technology, Shanghai

HAWE Japan Ltd. (since 2007)
Nagoya, Japan (Head Office); Tokyo, Japan; Osaka, Japan

19 employees
■ 12 administration personnel
■ 7 production personnel
(as of: 05/2013)

info@hawe.co.jp



HAWE Japan, Nagoya

HAWE Korea Co., Ltd. (since 1995)
Chungnam, South Korea

29 employees
■ 26 administration personnel
■ 3 production personnel
(as of: 05/2013)

info@hawe.kr



HAWE Hydraulics Australia PTY Ltd. (since 2007)
North Wollongong, Australia

5 employees
■ 5 administration personnel
(as of: 05/2013)

hhirning@hawe.com.au



HAWE Hydraulics Pvt. Ltd. (since 2001)
Bangalore, India

35 employees
■ 7 apprentices
■ 15 administration personnel
■ 13 production personnel
(as of: 05/2013)

contactus@haweindia.com



HAWE Hydraulik Singapore Pte. Ltd (since 2012)
Singapore City, Singapore

3 employees
■ 3 administration personnel
(as of: 05/2013)

chan.ch@hawe.com.sg



Organization

Sales Organization

Sales Offices Germany

Freising Office

HAWE Hydraulik SE
Kulturstr. 44
D-85356 Freising
Vertrieb-Freising@hawe.de

Filderstadt Office

HAWE Hydraulik SE
Felix-Wankel-Str. 41
D-70794 Filderstadt
Vertrieb-Filderstadt@hawe.de

Hennef Office

HAWE Hydraulik SE
Bonner Str. 12 d
D-53773 Hennef
Vertrieb-Hennef@hawe.de

Kassel Office

HAWE Hydraulik SE
Frankfurter Str. 229 b
D-34134 Kassel
Vertrieb-Kassel@hawe.de

Norderstedt Office

HAWE Hydraulik SE
Werkstr. 6
D-22844 Norderstedt
Vertrieb-Norderstedt@hawe.de



Sales Partners

The Americas

Argentina, Brazil, Canada

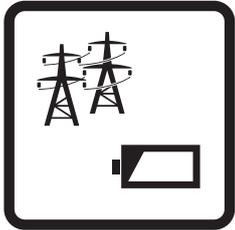
Asia-Pacific

Hong Kong, Malaysia, Taiwan, Thailand, Vietnam

EMEA

Belgium, Bulgaria, Czech Republic, Denmark, Egypt, Great Britain, Greece, Hungary, Israel, Luxembourg, Netherlands, Norway, Poland, Portugal, Romania, Russia, Sweden, Slovakia, Saudi Arabia, South Africa, Turkey, Ukraine

Key Markets



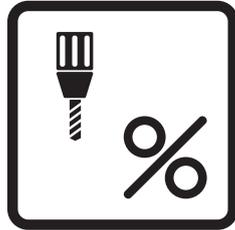
Energy

- Wind power
- Solar power
- High voltage distribution
- Geothermics
- Water power



Infrastructure

- Construction machines
- Civil engineering
- Crane and handling systems
- Railway equipment



Manufacturing Efficiency

- Machine tools
- Hydraulic tools



Nutrition & Health

- Agricultural and forestry equipment
- Food processing
- Medical equipment



Resources

- Oil & Gas field exploration
- Mining equipment

Product Portfolio

Products – Unique Features

Compact, energy-efficient, and durable products:

- Consistent use of steel (no parts exposed to pressure made of cast-iron or aluminum)
- Components designed for high pressures
- Compact builds (minimized installation space)
- Zero leakage and/or controlled leakage
- Permission for special usage conditions (e.g. ATEX, KBA, CE)
- Product portfolio in a modular system
- Customized system solutions

HAWE Hydraulik is contributing toward solving global problems. This approach is reflected in our target markets.

Organization

Product Portfolio

Product Line-Up

Pumps

Hydraulic Pumps & Power Units

- Radial piston pumps
- Two-stage pumps
- Gear pumps
- Hand pumps
- Air-driven hydraulic pumps
- Axial piston pumps and engines



Valves

Pressure Valves

- Pressure limiting valves
- Pressure control valves
- Proportional pressure limiting and control valves
- Two-stage valves
- Shut-off valves
- Over-center valves



Check Valves

- Check valves with/without hydraulic release
- Pre-fill valves
- Line rupture protection valves
- Shuttle valves
- Clamping cylinders



Directional Control Valves

- Zero-leak directional poppet valves
- Directional spool valves with/without proportional control



Flow Control Valves

- Throttles, regulating valves
- Control valves
- Proportional control valves
- Flow dividers



Accessories & Cylinders

- Pressure switches
- Pressure sensors
- Pressure accumulators
- Clamping cylinders



Electronics

- Electronic amplifiers
- Economy circuits
- Programmable control systems



Quality Organization

In 2011, HAWE combined its quality management, organization management, and HR management expertise in one dedicated business unit. This holistic approach serves the entire HAWE organization by means of:

- The constant monitoring and further evolution of HAWE's organization
- The systematic training and development of all employees
- The establishment and delivery of central services

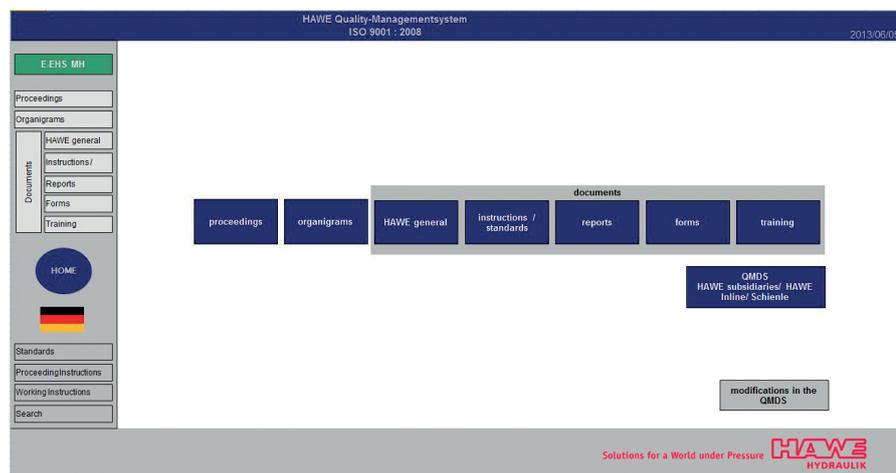
Quality Management System

HAWE's Director of Quality & Organization has been formally nominated by the CEO and supervises all quality management (QM) activities at the entire HAWE Group in line with the DIN EN ISO 9001:2008 standards.

The effective functioning and further development of the QM system is guaranteed by the cooperation of the autonomous Quality Representative (QR) of HAWE's international subsidiaries with the on-site Quality Representative of the local production sites and administration units. This system of cooperation is supervised and managed centrally according to standards processes, qualifying the entire HAWE Group for a QM matrix certification. Upon successful completion of the certification audit, the QM system will have been officially validated and the Group as a whole and all its subsidiaries will be awarded joint and individual QM certificates.

A **Quality Management Documentation System (QMDS)** has been put in place as an active online system maintained and constantly developed further by HAWE's Quality Representative.

Management assessments function as an umbrella QM review process that combines the regular reviews conducted at HAWE's subsidiaries. The QRs use it to define necessary interventions to be introduced in collaboration with the local units. Their completion is monitored and assessed centrally by means of an established set of indicators.



Home of QMDS

The constant validation and improvement of this QM system relies on the use of **QM instruments**, such as an established continuous improvement process (CIP) and dedicated tracking indicators, audits, and reports. Additional controlling indicators are integrated with the self-assessment and monitoring indicators used for QM purposes and feed into the monthly **Q&O Report** that reviews and visualizes the relevant financial, production, and quality indicators for use by selected management groups.

The report has proven itself as a viable tool for executive management and line managers wishing to track the status quo of operations at the company. Selected information is published for HAWE's wider workforce with monthly breakdowns of the data from the Q&O Reports for individual sites.

HAWE's German sites and its international subsidiaries take part in **internal audits**, conducted according to the DIN EN ISO 9001 norms by the central QM services. The results of these audits and the activities initiated in response are recorded in a central software system for use in the subsequent screening of the activities' impact and effectiveness in the following year's internal audits.

Corrective and preemptive interventions are selected after analyzing the data: CAQ (Computer-Aided Quality) data is processed into a report to support production management. All production incidents are recorded in the ERP system as additional data for the CIP process. This is further expanded with data from regular stock analyses and assessments and from the review of



Internal production-audit

HAWE's chosen production principles (e.g. Lean production, One-Piece-Flow principle).

Production operations are managed on the basis of **CIP indicators** for process controlling, including throughput times, capacities and their utilization, wastage data, quality costs, downtimes, and data from the results-oriented validation of the individual processes.

Customers' warranty claims lead to immediate fault assessments to define the suitable responses in terms of relevant corrective or preventative actions. Technical quality management conducts regular meetings in the operational units to review critical or repeated faults and introduce effective countermeasures to aid the systematic evolution of HAWE's production processes.

HAWE produces a full report on every guarantee or warranty incident, including details on the actions taken on behalf of the customer. Any actions are recorded via the ERP system to ensure the traceability of the incident and the availability of the required spare or replacement parts.

HAWE is certified according to:
DIN EN ISO 9001:2008 – HAWE SE
DIN EN ISO 9001:2008 – HAWE Group

ZERTIFIKAT ♦ CERTIFICATE ♦ CERTIFICADO ♦ CERTIFICAT ♦ CERTIFICADO ♦ CERTIFICAT



CERTIFICATE

The Certification Body
of TÜV SÜD Management Service GmbH
certifies that
HAWE - Group



HAWE Hydraulik SE
81673 Munich
Germany

has established and applies
a Quality Management System for

**Development, Production and Sale of
Hydraulic Components and Systems as well as
Corresponding Accessories,
Including Manufacturing Plants and Offices
as well as their scope of application as attached.**

An audit was performed, Report No. 70003345
Proof has been furnished that the requirements
according to

ISO 9001:2008

are fulfilled. The certificate is valid until **2013-08-30**
Certificate Registration No. **12 100 4503 TMS**




Munich, 2010-09-27
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TÜV SÜD Management Service GmbH • Zertifizierungsstelle • Ridlerstraße 65 • 80339 München • Germany



Quality Organization

Quality Policy

At HAWE, we see quality from two perspectives:

Customer's perspective:

At HAWE, we are dedicated to maintaining the lasting satisfaction of demanding **customers** as their reliable and responsive suppliers and engineering partners. We do so by delivering durable, top-quality products reliably with versatile **service** and quick responses.

Internal perspective:

Our **people** fulfill our customer's expectations by planning, executing, and continuously optimizing our **processes, products, and systems** professionally and transparently. We focus on deadlines, costs, and results.



QUALITYMANAGEMENT@HAWE.DE

At HAWE, we are committed to the following principles:

People

- Our executives and employees can rely on our effective organization and assume independent responsibility for the tasks and targets allocated to them. These targets are rated transparently with dedicated indicators and provide a basis for deciding any activities.

Products & Processes

- Our standardized product development process is complemented by using interdisciplinary teams, concurrent development phases, and the strategic inclusion of the client for bespoke developments.
- High-performance IT tools (including CAQ, ERP) are used to support our implementation of appropriate quality management methods (e.g. SPC, audits, FMEA, surveys). This ensures preventative error avoidance and the continuous improvement of products and processes.
- With our commitment to depth of production, we assume responsibility for the processes to produce quality products.
- The sustainable and forward-looking selection and development of our suppliers ensures optimum cooperation in line with HAWE's quality standards.

Services

- Our global service network supports our customers around the clock by offering on-site technical support and assistance by qualified service technicians.
- Our chosen service products help our customers use the entire potential of their HAWE products.

Systems

- The international scope of our quality management system defines global standards for the entire HAWE Group.
- Our management systems and products are certified regularly by impartial entities (e.g. ISO 9001:2008, ISO 14001:2009, ISO 50001:2011, CE0036).

Quality Organization

Environmental Protection, Energy, Health & Safety Management

HAWE is committed to protecting and promoting the occupational health and wellbeing and workplace safety of all of its people.

In addition to the protection of our environment and the efficient use of energy, occupational health and industrial safety are integral parts of HAWE's corporate principles. It is the duty of any company to reconcile the demands of ecology and economy. This principle is defined and applied in HAWE's **Industrial Safety and Environmental Policy**.

HAWE defines annual **programs for environmental protection, energy efficiency, and occupational health and safety** for all employees. Annual training on accident prevention for all personnel, regular seminars for the officers in charge, and expert qualification opportunities guarantee the stringent introduction and pursuit of targets with clearly defined responsibilities in the individual sites of the HAWE companies.

HAWE has defined fully measurable targets for **environmental protection**, including:

- The reduction of energy consumption and emissions to air and water.
- The reduced consumption of operating materials and hazardous materials.
- The maintenance of an operations- and hazardous substances registers.
- The continuous improvement of resource recycling.

HAWE has defined fully measurable targets for **energy efficiency**, including:

- The procurement of energy-efficient machines and equipment.
- The improvement of energy efficiency of site and building services.
- The screening of production processes for energy efficiency.
- The energy-efficient planning and construction of buildings and facilities.



SUSTAINABILITY @ HAWE

HAWE has defined fully measurable targets for **occupational health and safety**, including:

- The replacement of hazardous materials and substances with less harmful options.
- The improvement of workplace ergonomics.
- The prevention of workplace accidents and absences due to sickness or accident.
- The standardization of personal safety equipment.
- The reduction of harmful noise in production facilities.

These efforts have led to the following **certifications**:

DIN EN ISO 14001:2009 – HAWE SE

DIN EN ISO 50001:2011 – HAWE SE

OHSAS 18001:2007 – Site Munich

Industrial Safety and Environmental Policy

HAWE understands corporate health and safety, environmental protection and the sensible and efficient usage of energy to be a task for all employees.

HAWE therefore commits itself to the following industrial safety and environmental guidelines:

Health and safety at work, and doing business in energy and environmentally friendly ways is an entrepreneurial principle at HAWE.

The company regularly examines compliance with all applicable legal requirements on health and safety at work as well those pertaining to energy and the environment.

Alongside market and customer requirements for our products, HAWE monitors the optimal usage of energy and resources and the lowest possible environmental impact. This applies both to the generation as well as the entire life cycle of our products.

The health and safety and environmental aspects as well as the energy requirements of our production processes and facilities are continuously monitored and evaluated. Activities and processes meriting improvements are replaced by technically and ergonomically as well as energy and environmentally friendly alternatives. We put great emphasis on creating and maintaining a safe work environment that fosters and promotes health and performance. Prior to their implementation, all new activities and processes are analyzed to prevent damage to people and the environment and inappropriate energy consumption.

We define strategic and operative targets and monitor these with performance indicators. We also define and document responsibilities for attaining these targets. The employees in charge have free access to all results and measurements. This constant review must result in a permanent improvement in health and safety protection, the energy-related performances in the company and a continual reduction of the burden on people and the environment.

We define and further develop procedures and methods that contribute through the acquisition of products and

tertiary services toward improving health and safety at work, including energy and environmentally related services. We require our suppliers to comply with our industrial safety and environmental policies as well as all applicable legal requirements.

HAWE consistently reinforces its employees' sense of responsibility for corporate health and safety and environmental protection as well as energy efficiency and further develops this through regular information, training and briefings.

We keep our customers, the public and authorities informed about our objectives and activities for health and safety at work, energy and the environment. We want to contribute to an improved mutual understanding of these issues through an objective dialogue. To this end, we continually work with all parties concerned.

Suitable measures are planned and implemented to prevent or minimize the effects caused by malfunctions and accidents that could result in damage to people and the environment.

HAWE commits itself to use resources sparingly and strives to avoid noise and emissions harmful to health and the environment, refuse, waste water and the unnecessary uptake of energy. To achieve this, the company seeks to use the best available state-of-the-art technology. Workplace ergonomics are of great importance for HAWE to maintain and promote the health of our employees.

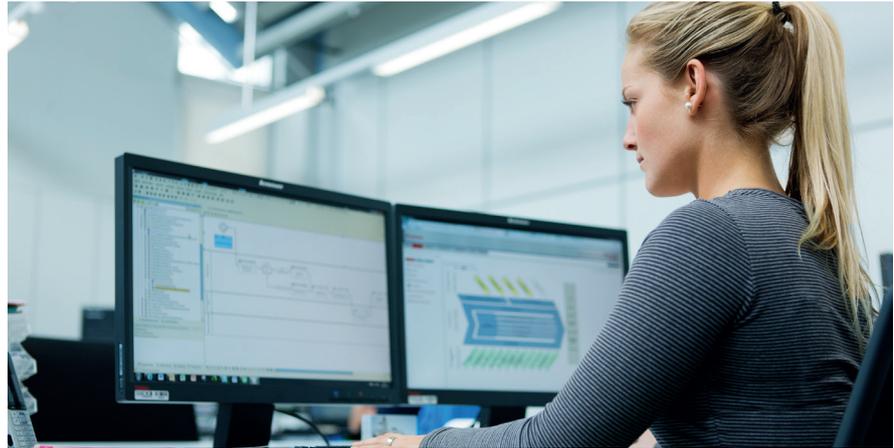
Our management system provides for the technical and organizational implementation to ensure success of our health and safety and environmental protection policy. This system also serves to identify deviations from the objectives or system. Discrepancies are corrected as swiftly as possible by means of the measures introduced.

Quality Organization

Control of Documents and Records

Standardized, fully documented processes and instructions are used to manage the flow of business-relevant documents and records.

The QMDS, Quality Representative and specialist personnel ensure these documents are kept up to date and available where they are needed to achieve a reliable and consistently traceable flow of information to HAWE's employees.



Process documentation at QMDS

Responsibilities and Authorizations

The responsibilities and authorizations of every HAWE employee is recorded in a job description, revised annually or more frequently as part of the employee review.

The **potential rating** is a mandatory process for both internal and external applicants for executive positions. The critical requirements of the target function are simulated in a dedicated **aptitude diagnostics procedure** in line with the DIN 33430 standards, in which the candidates' aptitude is assessed as a set of

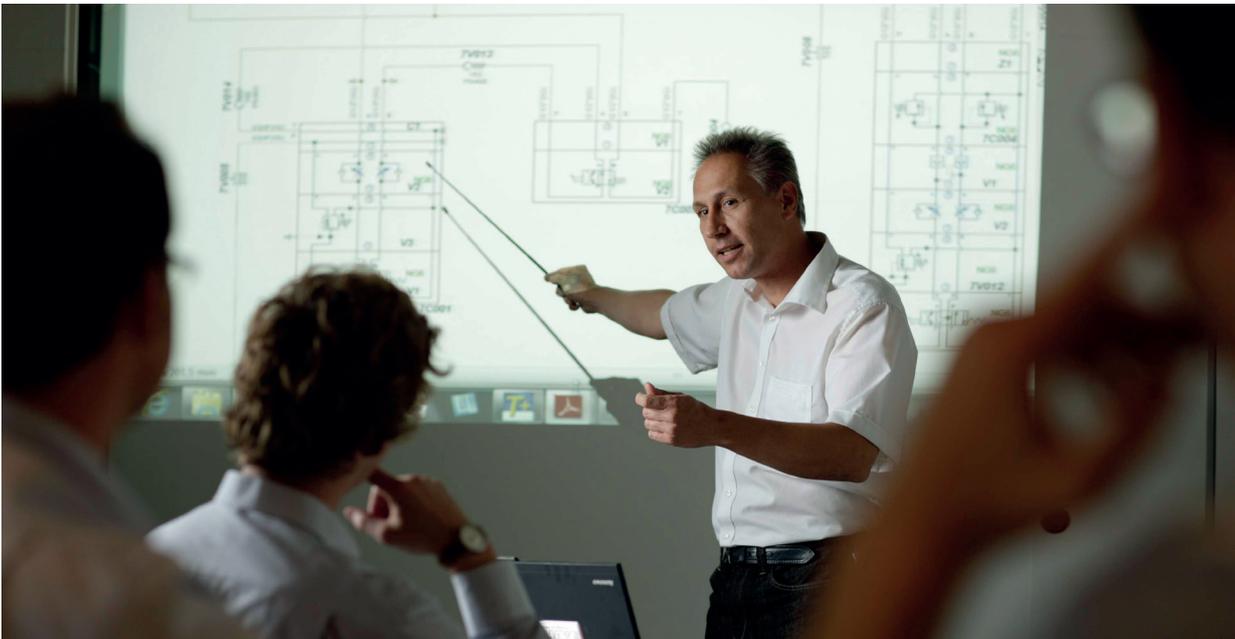
behavioral criteria. Irrespective of any placement decision, individual development plans are defined and introduced for the candidates. After appointment to an executive position, the success of the candidate is monitored with regular performance indicators and a **360° feedback** procedure.

Competence, Training and Awareness

All executives abide by their shared leadership principles as expressed in practical behavioral terms in the HAWE model of competence.

They are trained to conduct the annual employee reviews by means of dedicated guidelines, turning this joint employee-supervisor meeting into a well-established instrument and forum for mutual feedback. In the procedure, the **annual targets** are defined in line with the general strategic direction of the company. The effect of past **HR development measures** is assessed and new activities are chosen for the next period to match the job requirements defined in the job description.

The **HAWE Academy** provides a selection of HR development opportunities for all people of HAWE. This not only allows easier access to training, seminars, and autodidactic study formats. It is a channel for sharing and transferring competences between the people and units of the organization.



Internal training – hydraulic basics

Sales

HAWE operates a network of sales offices for immediate on-site support for its clients.

Most queries and emails can be handled directly by internal technical services. Defined rules for forwarding calls and replacements during periods of absence are in place to guarantee **constant availability**. Optimum customer support is achieved by recording all relevant customer data in a central CRM system.

Field service teams are available to process specific questions or functional queries on site at our customers, with specialist advisors for specific applications and sectors of industry to help with project development and design.

When the customer's specifications can be fulfilled with a choice of functionalities from our modular portfolio, HAWE will produce a full **offer** within approx. two working days. Every offer includes details on pricing as well as the product ID and material class. Where required full hydraulic diagrams or 3D models are included, using our ERP-integrated configurator system, computer-recorded parts list, diagram design and 3D modeling applications.

Order processing is handled internally. The order data is recorded as a single incident in ERP or automatically entered in the pre-defined templates for larger accounts. This helps reduce the margin of error and speeds up the process to enable us to confirm the order within two working days.

The system allows an automatic forecast of **delivery** dates, including details on transport times. HAWE has developed a set of strategically optimized standard delivery times to enable efficient delivery handling as expected by our markets. Our order management cockpit allows us to provide customers proactively with the right information they need whenever there are any unexpected events affecting the confirmed delivery times. After receiving the goods, the customer can pay the outstanding amounts within eight days to benefit from two percent discount or, alternatively, pay the net invoiced amount within 30 days.

HAWE has introduced effective means to ensure that customers receive the goods they ordered in full and to their specifications (see "Production"). In the unlikely case that this does not happen, the customer can contact our sales or customer service team directly, who will take over the handling of the claims from there.



Development

Whenever customers need products for functions that are not yet covered by HAWE's modular portfolio, the right solutions can be developed at the Technical Office (TO) or SYSTEC.

TO projects are usually introduced for larger product runs that will benefit more than one client, whereas SYSTEC is in charge for special, bespoke solutions.

A standardized process is used for developing new or optimizing current components and systems, with defined rules for organizing, processing, and documenting such projects. This is a mandatory process for all projects of the Technical Office, the electronics section, SYSTEC and works preparation, outlined in HAWE's **project management manual**. Additional, unit-specific **project and workstream templates** are available that can be combined as the individual milestones in a standards PSP plan.

Depending on the requirements of the customer, market, or specific product, **detailed project management** is handled:

- either as a project of the Technical Office (TO project),
- an electronics project, or
- a SYSTEC project.

Highly innovative, complex projects can become part of the **HAWE innovation process (HIP)** if certain criteria are in place:

- complex coordination required between multiple departments, units, and/or suppliers
- the strategic significance of the product
- need for substantial investments



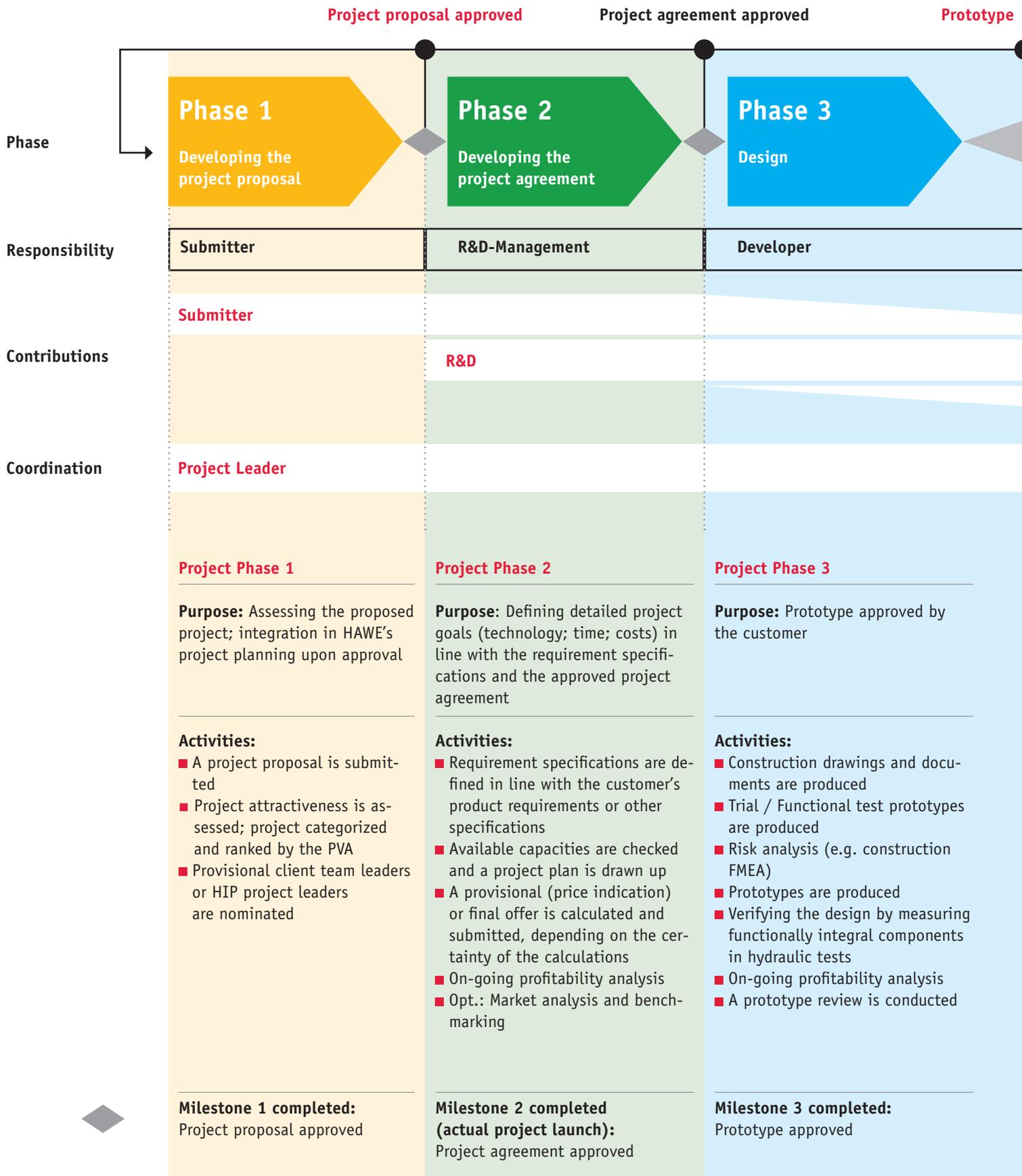
The decision whether and when a project is considered an HIP project is taken at the regular sessions of the executive team and communicated to the departments involved, including the nomination of a HIP project leader.

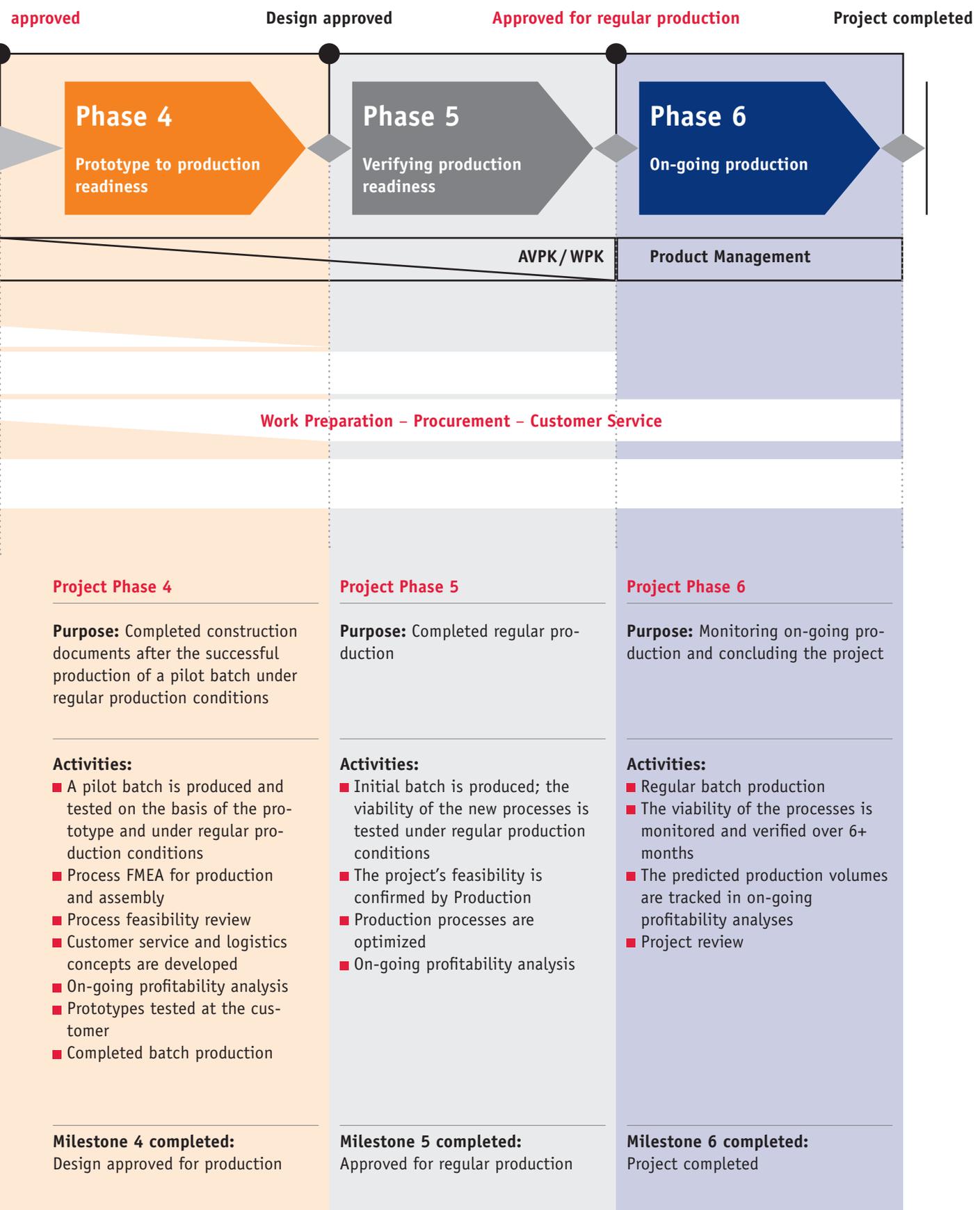
All HIP projects make the keeping of a list of **specifications** according to the customer's or market requirements mandatory. Product and component development at SYSTEC follows the processes and workflows defined in the **construction manuals**.

A standard **HIP project plan and schedule** consists of six phases, optionally extended with a seventh phase for SYSTEC projects. All relevant CAD data, including designs, models etc., are archived in the central product data records system, which also allows the tracking of different versions and archiving of related documents during the design phase.

Development

Project Plans and Schedules in Component Development





Development

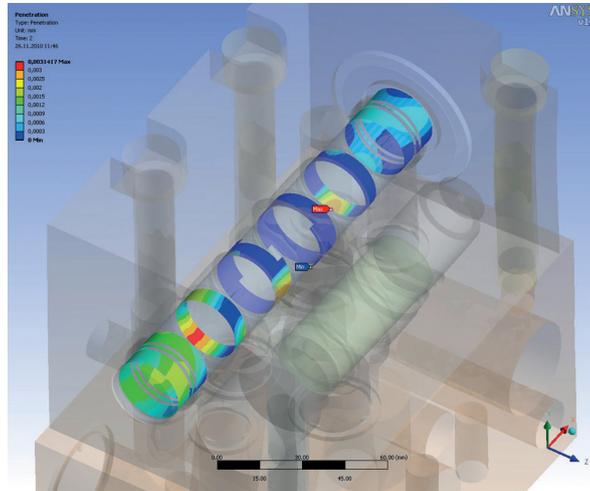
Additional Development Methods

Simulation Tools

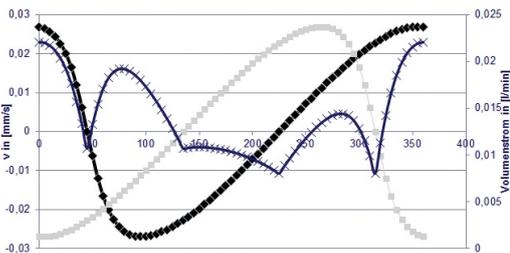
Simulation tools are used where required during development to add insights for risk assessment and FMEA processes. Depending on the product or assignment in question, the established internal simulation tools are used for the purpose or external expertise is brought on board.

The **Finite-Element Method (FEM)** is used in the following areas:

- Bolt calculations in accordance with VDI 2230
- Strength analyses
- Deformations to flange faces, cylinder bores etc.
- Analysis or design of form or force-locking connections
- Eigenfrequency analysis
- Analysis and design of a positive and/or positive-mode connections



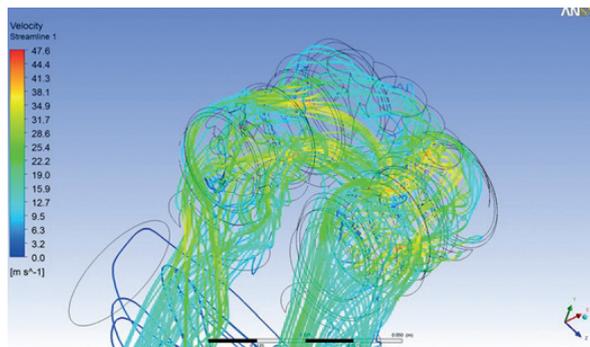
FEM-View



Rigid- or multibody-simulations diagram

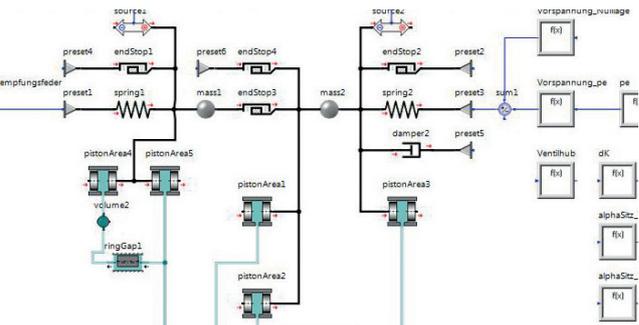
Rigid- or multibody- simulations can be conducted to simulate the movements of solid bodies. This helps understand the momentum or force exerted or created by the movement.

Flow simulation for valves and ducts in hydraulic systems is used for analyzing invisible flow phenomena (e.g. turbulences, cavitation), pressure traps, or other currents in hydraulic components.



Flow-Simulation

Full **system simulation** visualizes the static and dynamic behavior of the complete system by modeling individual components in it, such as valves, as mathematical models with common differential equations. The physical properties of the entire system can be calculated by exploring how these components interact with each other. In practice, this is used to analyze vibrations or predict the energy efficiency of the hydraulic setup.



System-Simulation

Failure Mode and Effects Analysis (FMEA)

FMEA is used for a systematic exploration of possible weak spots. It covers known and potential faults and identifies potential improvements. HAWE has been using development and process FMEA with success for a number of years and integrated it as a fully established process at the company. FMEA activities help define specific fault-prevention opportunities.

The participating departments execute the action plan produced by FMEA in full. For HIP projects, FMEA is a mandatory part of the process.



Clearance of the action plan from the process-FMEA

Pilot Production

The Pilot Production department is in charge of **prototyping** hydraulic solutions to enable HAWE to respond quickly and flexibly to customer's queries. The entire production process is contained in this department as a testbed for improved component designs or the effective testing and further development of new production technologies.

HAWE's customers benefit from the excellent qualifications of the people in charge, the sophisticated facilities, and HAWE's integrated toolmaking section and the custom tools it produces. The experience, new programs, production processes, metrological insights and inspection data produced here is recorded in detail and made available to production for the later full-scale production runs.

Pre-Assembly

Pre-assembly forms the bridge between prototyping, testing and batch production. Its responsibilities include:

- The development of prototypes to full production readiness
- The elimination of any malfunctions in cooperation with the development team
- The standardization of production and assembly processes, and
- The definition of processes, inspection instructions, and work plans in line with HAWE's regulations.

For this purpose, HAWE uses the following **methods**:

- Leak tests
- Material valuation and testing
- Switching tests
- Power usage
- Assessment of temperature increases etc.

Pre-assembly verifies whether the customer's or market requirements have been fulfilled in terms of the specifications list or construction manual.



Preparation of a PSL-battery for testing

Development Testing

In order to ensure functioning, safe, and durable products, HAWE's testing specialists use a broad spectrum of computer-aided digital metrology techniques as well as cutting-edge, versatile testbenches.

Modern simulation tools and rapid control prototyping are also used for this purpose, including SimulationX and Matlab/Simulink for the design, layout, and coordination of hydraulic systems.

HAWE's **testing services** include::

- The definition of static or dynamic time profiles and characteristic curves to verify the proper functioning of electrohydraulic components, assembly units, and entire systems (e.g. ram pressure, flow rates, pressure or control characteristics, highly precise tightness or leak measurement according to the exacting HAWE standard; switching time and switching reliability)
- Power and performance tests for assembly units and pressure supply components to establish their volumetric capacity, overall efficiency (electric – hydraulic), starting currents, power intake, maximum pressure and temperature increase or steady-state temperature in the defined load profile
- Burst pressure trials at up to 2,500 bar and 0.7 lpm
- Designing and conducting complex long-term tests to verify product durability (pressure pulses, permanent operations etc.)
- Temperature and climate trials in the in-house climate chamber
- Noise measurement for electrohydraulic equipment and facilities
- Conducting acceptance tests when commissioning complex hydraulic assemblies or installations to customers' specifications
- Design and establishment of special hydraulics testbenches, including electrical, electronic, and operating systems (hard- and software)



Long-term tests bench with PSL III

Purchasing

Supplier Selection and Development

HAWE's purchasing activities are organized by product groups in central purchasing. The selection and development of good suppliers is considered as important as questions of sustainability or profitability.

HAWE reviews all of its suppliers in its ERP system on an annual basis. This **supplier rating** covers the quality, delivery reliability, and service level of the suppliers, allocating them to A, B, or C categories depending on their performance. HAWE demands official statements on any incidents or problems and a list of planned or active countermeasures from all B and C-category suppliers, monitoring the responses in full. B and C-category suppliers are also shortlisted for supplier audits.

For **supplier audits**, HAWE uses defined plans and standardized methods, while also considering the actual experience of its buyers to allow ad-hoc audits in the case of any relevant incidents. Should these audits give cause for concern in the focus areas of systems, processes, and products, the results are compiled in the audit report with details on the nature of the problem and the deviation from the expectations. HAWE uses these reports when arranging countermeasures with the supplier, the effectiveness of which is tracked in detail and included in the next year's supplier audit.

Whenever **faults** or quality problems are identified, procurement notifies the supplier and files a complaint. A Q-report is also recorded in the ERP system and a formal 8D report is requested from the supplier. The plausibility of the proposed measures is checked as part of HAWE's defined, multi-level complaints procedure. All complaints are included in the supplier ratings.

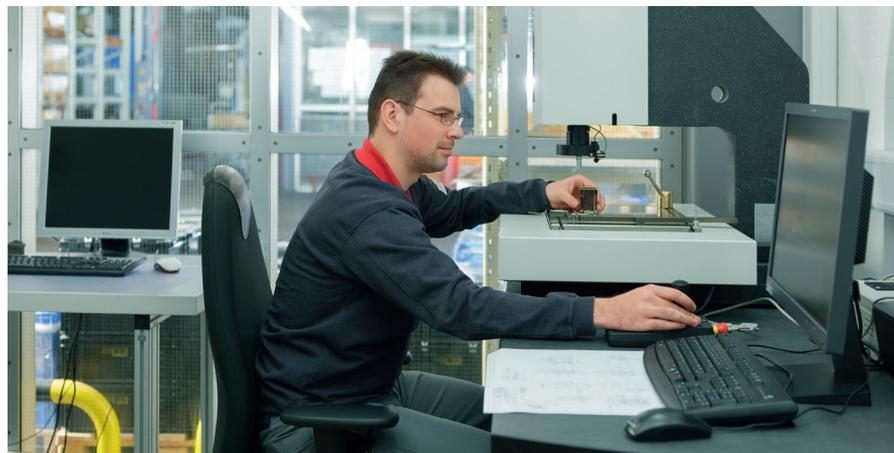


Purchasing

Verification of Purchased Product

HAWE's purchasing produces an initial sample test report (ISIR) for every new delivery (of defined product groups), including a set of details defined by HAWE's technical documents, e.g. product drawings or print documents.

When the goods arrive on the HAWE premises, incoming goods inspection verifies these criteria on the supplier's documents and records the inspection results. The Quality / Metrology Representative clears the ISIR for all HAWE sites.



Product testing in the goods receipt



The fully documented **inspection of incoming goods** is used at all HAWE production sites. After new goods are recorded in the ERP system, the CAQ system automatically files an inspection order with details on the order, supplier, and material ID and defined instructions about the size of the sample and the criteria to be tested. The batches flagged in this manner remain on QM hold and are not released for production until this inspection has been completed.

The inspecting officer records the required data, which is automatically uploaded in the CAQ. Whenever faulty parts are identified, an automatic Q-report is produced to initiate fault proceedings. The results of the inspection also form part of the "quality" category of HAWE's supplier management system.

Production

HAWE's products are built with a coherent modular system. The company's sites are specialized for specific product groups, allowing the optimum bundling of technologies and know-how on site.

Production is arranged by processes to allow every piece to be produced from start to finish. The **lean production philosophy** is followed in every respect to avoid waste and inefficiency. Order and cleanliness are maintained by applying the **5S method** and the **one-piece flow** system.



Premises Sachsenkam

The hallmarks of production at HAWE:

- Standardized material supplies (small containers / blister packaging / bulk containers)
- 100% inspection integrated in assembly processes
- High degree of automation
- In-house mechanical engineering and machine design
- Cutting edge technology used in the facilities
- Highly qualified personnel



Automatic assembly machine in Sachsenkam



Premises Dorfen

Production

Control of Production

HAWE has introduced standard processes for defining and tracking delivery times.

Short, clearly defined lines of communication in the production and assembly units help spot any incidents that make the updating of delivery plans necessary. Dispatch acts the central communications interface with HAWE's sales partners and subsidiaries and keeps our customers informed about the expected delivery of their orders. ERP is used to track and manage these

schedules. Additional tools, including dedicated **forecasts, delivery plans, and KANBAN**, are available to manage production, dispatching, and demand planning.

All of HAWE's production sites are integrated in the standardized, **CAQ-based quality assurance** system.

Control of Nonconforming Product

In the case of internal fault notifications, the Quality Representative in charge of the area in question enters a Q-Report.

The fault is then processed by means of the 8D method. The team develops countermeasures to mitigate or prevent the effects of the fault or preventative measures to avoid a future repetition of the problem. Faulty parts are marked and removed from the production process in separate hold storage.

In the case of **external customer complaints**, central customer services acts as the interface with the client. The customer service team analyzes the fault in question in cooperation with technical quality management before handing the incident over for processing accor-

ding to the 8D method as in the case of internal faults. Again, the team develops either operational mitigating measures or preventative measures to avoid repeat faults. Customer service is notified about the chosen measures, which it forwards to the customer in a standardized format (8D report). In addition to the 8D process, the standard QM methods used for this purpose include process FMEA and product audits.

Monitoring and Measurement of Product

In-Production Inspections

In-production inspections are conducted by HAWE's production staff in the form of **CAQ-supported operator self-inspection** on dedicated testbench spaces in the production units that are equipped with the **inspection equipment and CAQ terminals** needed for the purpose. This process is closely **integrated with ERP** to ensure the full traceability of the inspections.

In addition to these self-inspections, dedicated inspection facilities are available for high-precision metrology purposes (e.g. form and position, edge smoothness, dimensions). Like the in-production inspections, these are recorded in the CAQ system.

All data in the CAQ system is available for statistical analysis and integration in the production process by means of SPC (static process controls).



Product identification



Production

Monitoring and Measurement of Product

Final Hydraulic Inspections and Performance Tests

HAWE is committed to optimizing all inspection instructions and processes. For this purpose, most **inspection** results are archived, and every member of staff is required to comply with the established corporate standards. .

The custom, in-house design and construction of hydraulic test benches and their continuous improvement contribute substantially to these efforts. Full 100 percent inspections are conducted for most products, with a specific inspection plan for the random testing of all other products. Regular maintenance of the test benches and verification of the metrological equipment ensure the continued reliability of these processes.



Final hydraulic inspections and performance tests of a battery

Control of Monitoring and Measuring Equipment

HAWE uses **central metrology and testing administration** for all measurement and testing equipment that requires formal calibration. The system monitors the running times of metrological equipment and records all calibrations.

HAWE's in-house calibration laboratories offer calibration services according to current norms, primarily for the calibration of physical lengths. Additional calibration activities are conducted on behalf of HAWE by renowned calibration institutes. The corporate metrology equipment office procures all metrology and testing

equipment subject to calibration and is in charge of the repair and maintenance orders for all metrology facilities.

Monitoring and metrical equipment is formally inspected on an annual basis at all production sites to ensure its effective management and controlling.

Warehousing & Logistics

HAWE stores its goods in three distinct types of storage facilities. **High-bay warehousing** with automated storage retrieval systems bring HAWE's products from their place in the 1,000 europallet warehouse to dispatch.

Forklift operators store and retrieve goods from conventional **manual storage**.

At HAWE's main warehousing facilities in Freising, the fully **automated small-parts storage** has around 16,000 storage units in three double-sided high-bay aisles, accessed with three automated retrieval systems and four feed-in and retrieval points.

All automated storage facilities are fully enclosed to prevent soiling or unauthorized access. A standard cleaning procedure is used to ensure clean and unsoiled containers.

HAWE's seven basic warehousing processes:

- Storing operating and fully assembled goods
- Dispatching client orders
- Storing and retrieving assembly orders
- Supplying assembly operations (supplying the dual-container logistics)
- Dispatching assembly orders
- Redefining (freeing up storage capacities via combined storage)
- Ad-hoc retrieval

HAWE uses special warehousing software to ensure full **stock availability**. All items stored or retrieved are recorded by an identified user and are fully traceable at every point in the system. All dispatch orders are initiated by ERP and transmitted into the warehousing system via a dedicated interface, where dispatch lists are printed and verified by scanning the goods barcodes at the point of retrieval. For this purpose, all storage containers and europallets are marked with their own barcodes to track their every movement and their location in the system.

To achieve full and comprehensive traceability in the system, all products, materials, or order parts are stored according to the **FIFO principle** (First in, First out).



Automatic small-parts storage

Dispatch

As a global company, HAWE moves goods around the world – with exports accounting for approx. 75% of the business.

With its commitment to protecting our environment, HAWE aims to reduce the environmental footprint of its business operations in terms of CO₂ emissions. Packages are sent with the climate-friendly **DHL GoGreen** service. HAWE also bundles its dispatch activities efficiently by cooperating with a general **haulage partner**. It also uses the **lean logistics** concept to uncover waste immediately and find and introduce the right responses to avoid or reduce it.

In September 2012, HAWE was officially listed as a **known consignor** in accordance with the EU security regulations 300/2008. With an internal security section integrated in its dispatch unit, HAWE's compliance with all security-relevant aspects has been certified by the Civil Aviation Authority.

As part of its **compliance management** efforts, HAWE has assessed and introduced all activities and processes for the suppression of terrorist activities required by domestic and international regulations. For this purpose, HAWE has installed an IT system for the automatic checking of governmental sanctions to reduce the risks of unwittingly supplying listed organizations or persons.

Absolutely **reliable deliveries** are a constant ambition of HAWE which the company achieves e.g. by means of a solid **supply chain**. Throughput, handling, and transport times are known and allow HAWE to state specific **delivery dates**, achieved by stable, lean, and flexible processes. HAWE's dispatch team is committed to processing and dispatching finished orders on the



stated date. By **controlling** processing times, the flow of ready-for-dispatch orders is tracked consistently.

The **container and packaging** section uses small containers and reusable packaging, choosing the right packaging to match the mode of transport, transport security requirements, and the customer's specifications.

AfterSales & Customer Service

Domestic and international customers can send HAWE products to the Service Center in Munich for repairs or modifications.

Dedicated testing facilities are available to check the sent-in products and identify any flaws or faults. Depending on the lifecycle of the product, a range of services can be offered..

Customer Service provides a comprehensive **service portfolio** for HAWE's product and systems, including:

- Installation, commissioning, maintenance, and repairs as mobile **on-site service**
- Custom **service and maintenance contracts**
- **Hydraulics seminars** for end customers and subsidiary companies covering the functions, maintenance, and repair of HAWE products
- **In-house services** including: Maintenance service, modifications, claims processing, and reviews at HAWE's in-house service center in Munich

HAWE equips its installers and service technicians with cutting-edge technology and instruments, both at the Munich service center and in its mobile service teams around the world. HAWE's service experts possess in-depth expertise for hydraulics technology, including specialist applications like offshore technology.



Service mobile



Service technician in field work

Conclusions

Living Quality at HAWE Hydraulik

Quality Management

Organization Development



Sales

- Constant availability
- Offer
- Order processing
- Delivery date

sales@hawe.de



Development

- Component development
- HIP: HAWE Innovation Process
- FMEA
- Simulation tools
- Prototype (Pilot Production)
- Pre-assembly
- Testing



Purchasing

- Supplier rating
- Supplier audits
- Initial Sample Test Report (ISIR)
- Inspection of incoming goods

Customer

HR Development

Environment, Health & Safety



Production

- Lean production
- 5S method
- One-piece flow system
- Forecasts, delivery plans, KANBAN
- CAQ-based quality assurance
- Internal and external customer complaints
- In-production inspections
- Final hydraulic inspections and performance tests
- Metrology and testing administration



Warehousing, Logistics & Dispatch

- High-bay warehousing
- Manual storage
- Automated small-parts storage
- Stock availability
- Haulage Partner
- Lean Logistics
- Known consignor
- Compliance management



Customer Service

- On-site service
- Service and maintenance contracts
- Hydraulics trainings
- In-house services
- 24h helpline

service@hawe.de

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