



# Hydraulic Forging Presses

Products Industries Applications Modernization



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#### www.wepuko.com

Follow this link to get more detailed information on the solutions and products of Wepuko PAHNKE.

#### Dear Reader,

For over 40 years, the name PAHNKE has been known worldwide for the most modern, productive, and highquality hydraulic forging presses. Early on, Hans-Joachim Pahnke, the father of Michael Pahnke, developed revolutionary new concepts for the construction of open die forging presses. In 1956, he built the first two-column pull-down press for open die forging. His idea was soon imitated by other large press manufacturers all over the world.



1956: The first open die forging press with 10 MN press force built under the direction of Hans-Joachim Pahnke. A pulldown design with Z-shaped cross-heads.

In 1996, the Pahnke family took over Wepuko Hydraulik, the supplier of the excellent radial piston pumps for the PMSD drive. In 2002, PAHNKE's press construction merged with the pump business of Wepuko.

It fills us with pride that we have been able to successfully continue the tradition and worldwide recognition for PAHNKE products created by Hans-Joachim Pahnke and his son Michael Pahnke. During the 1960s, Hans-Joachim Pahnke improved his presses with a completely novel frame concept. The principles of this ingenious construction are still being used by all wellknown press manufacturers today – and (of course) by us as well! We pursue this with absolute determination, as only in this way can we achieve highest product precision, maximum machine working life, and thus the best cost-benefit ratio for the user. In 1973, Hans-Joachim founded his press company, PAHNKE Engineering. In 1975, he developed a just as revolutionary hydraulic drive principle for presses, the **P**AHNKE **M**odified **S**inusoidal **D**irect drive (PMSD drive). Even today, this system remains unsurpassed in regard to precision and performance with, at the same time, low maintenance costs and extremely affordable power consumption.



1976: The first PAHNKE press with the first **P**AHNKE **M**odified **S**inusoidal **D**irect drive (PMSD drive). The press force of the pull-down open die press is 5 MN.



2017: A 31,5-38 MN pull-down open die forging press from PAHNKE at CHW Forge in India. The press features a PMSD drive with 6 RX pumps.

# •••• Quality is strength: Hydraulic Forging Presses

At our company developers and engineers work together in interdisciplinary teams including mechanical, hydraulic and electronic experts. This ensures well thought-out, harmonious overall concepts for the main and ancillary units of our forging plants.



### Open die forging presses

Our scope of supply includes all presses and manipulators for the open die forging industry, with modern hydraulic drives and electronic control systems for automatic and programmed working between 5 MN and 185 MN.

For the open die forging industry we plan complete systems. We check and organize forging programs, select the required machines, calculate production time and costs, and provide economic viability calculations.



The new, quick-action open die forging press at OTTO FUCHS KG, Meinerzhagen, Germany, mainly forges products for aerospace applications and plant construction. The press force amounts to 30/36 MN. The press uses the **P**AHNKE **M**odified **S**inusoidal **D**irect drive (PMSD drive) and was constructed in a two-column design.



Forging of titanium and super alloys is very demanding. Baoti in China uses the world's most powerful and fastest open die forging press in the titanium industry made by PAHNKE (80/100 MN press force, two columns, pull-down design). It's PMSD drive, highly intelligent control systems and sophisticated design secure Baoti's leading position.

# Closed die forging presses

We plan, develop, and design every closed die press according to the individual specifications and requirements of our customers. Our experience ranges from 20 MN to 350 MN press force, from a precisely regulated creep speed (0.1 mm/s) to press speeds of 100 mm/s, from hot-isothermically pressed nickel alloys to meter-long aluminum parts for wide-bodied aircraft.



This high-performance closed die press with a press force of 300/350 MN is in use at Weber Metals, Inc., in the United States.



A typical product of a closed die press is this frame structure.



This closed die 110 MN press is located at Weber Metals, Inc., in the United States.

#### Special presses

PAHNKE special presses can be used for a wide variety of applications. They are used not only for serial production, but also for the creation of prototypes and research.

Some examples of special presses are:

- Piercing presses
- Steel extrusion presses
- Bending presses
- Straightening presses
- Multi-purpose presses
- Multi-cylinder presses
- Wheel presses
- Try-out presses

All presses can be equipped with manipulators for automation.

An important area of application is the manufacturing of high-pressure valve bodies for the gas-chemical and petrochemical industries, as well as parts for aerospace applications. Special presses are absolutely vital for the economic manufacturing of these components. Recesses and cavities can be pressed directly. This reduces the time in which the workpiece must be kept at the right temperature and uses less materials. One of our special presses is in use at the Technische Universität Freiberg (Technical University of Freiberg). Its versatile application in various materials-forming methods makes it unique in the world.

In the area of massive forming:

- Open die forging
- Closed die forging
- Thixo forming
- Hot extrusion
- Cold extrusion
- Powder forming
- Hammer forging (drop hammer)

In the area of plate forming:

- Deep-drawing
- Press hardening
- Interior pressure forming

![](_page_6_Picture_26.jpeg)

An example from the portfolio of Wepuko PAHNKE is this 20 MN multi-function press with force levels of 15 and 6 MN with installed isothermal forging tools.

![](_page_6_Picture_28.jpeg)

This 200 MN multi-cylinder press manufactures forged valve bodies for use in the oil & gas industry.

![](_page_6_Picture_30.jpeg)

This particularly versatile 10 MN multifunction press is used at the Technische Universität Freiberg.

## Oil hydraulic drives for forging presses

Based on designs by Hans-Joachim Pahnke, PAHNKE Engineering developed the **P**AHNKE **M**odified **S**inusoidal **D**irect drive (PMSD drive) especially for oil hydraulic press drives.

This drive does not need any valves for the control of the press movement, but uses Wepuko's quickly-controllable RX series high-pressure pumps to determine the press force, forming speed, and direction of movement of the press.

### What's special about the PMSD drive:

- Particularly quiet running (shockfree)
- Extremely high reliability (at least 30,000, but in some cases even well over 50,000 operating hours without repair)
- Energy savings of more than 60 % in comparison to water hydraulic drives and between 20 and 30 % in comparison to other oil hydraulic drives.

Based on this drive, we have also designed the 42-pump PMSD drive (RX 500), the most powerful hydraulic plant in the world. With 30 MW installed power, it operates a 360 MN steel extrusion press and a 150 MN preforming press for Norheinco, China.

![](_page_7_Picture_9.jpeg)

Wepuko PAHNKE radial piston pumps are the core element of a PMSD drive.

![](_page_7_Picture_11.jpeg)

PAHNKE Modified Sinusoidal Direct drive

![](_page_7_Picture_13.jpeg)

Part of the 20-pump PMSD drive (RX 500) of a 185 MN press.

![](_page_7_Picture_15.jpeg)

16-pump PMSD drive (RX 500) of an 80/100 MN press.

#### Water hydraulic drives for forging presses

For over 50 years, we have had both oil and water hydraulics in our product range. This differentiates us from most of our competitors. Our dual-track strategy has long proven to be a great advantage - both for us and our customers.

#### What's special about water hydraulic drives for forging presses:

- Extremely environmentally friendly
- Water is not flammable
- Water is practically unlimited in its availability and thus an affordable medium
- Water drives continue to be widespread in the modernization of press plants

You can rely on it: our consulting is always system-neutral - we focus only on your success. Only practice can determine which hydraulic variant is the best for you.

![](_page_8_Picture_8.jpeg)

![](_page_8_Picture_9.jpeg)

![](_page_8_Picture_10.jpeg)

This Wepuko PAHNKE water hydraulic press drive is used at OFAR in Italy.

#### Press control systems

Our electronic press control systems are available for press plants, including those with integrated forging manipulators. The control systems, which we developed ourselves, are state-of-theart (on a PLC basis). Features include: programmed forging, storage of QA data, PC-supported maintenance and system optimization.

#### We plan, develop, and supply:

- Simple, manual, or semi-automatic control systems
- Complex, fully automatic open and closed loop control systems
- Systems for the intelligent monitoring of machines and hydraulic plants
- Diagnostic systems with icons or plain-text messages
- Recording and processing of process data, operating data, and machine data

![](_page_9_Picture_9.jpeg)

This is the control console of a 30 MN open die press in Brazil.

![](_page_9_Picture_11.jpeg)

Control room for a 360 MN steel extrusion press and a 150 MN preforming press.

#### Forging manipulators

Rail-mounted forging manipulators are integrated with the press which creates an efficient plant unit. They enable the fast and precise positioning of the forgings and create the prerequisite for an automatic procedure with repeatable processes.

Our manipulators are also suited as guiding machines for the forging of heavy workpieces with crane support.

![](_page_10_Picture_3.jpeg)

Wepuko PAHNKE forging manipulators enable the fast and precise positioning of heavy workpieces.

# Ancillary units and accessories

Wepuko PAHNKE also provides many ancillary units and accessories for forging presses from a single source. Examples include forging manipulators, bogie cars, lifting rotary tables, quick-changing tool systems, integrated tool magazines, workpiece, tool lubrication, tool cooling, tool heating, tool manipulators, centering devices, and special forging tools.

![](_page_10_Picture_7.jpeg)

Quick-changing tool system of an open die forging press.

# Accepting challenges: new and further development in all industry sectors

Satisfied customers of PAHNKE forging plants can be found in all sectors of the metal-forming industry. This includes both the production of forging products in ferrous metals and alloys and the processing of non-ferrous metals.

![](_page_11_Picture_3.jpeg)

![](_page_12_Picture_0.jpeg)

#### Steel industry

In the steel industry, PAHNKE forging presses process products from simple construction steels to the highest alloyed metals. These products include roller bearing steels, low-temperature steels, heat-resistant steels, and, in particular, corrosion-resistant steels. Many forgings from the steel industry are also used in power plants, ship construction, or on- and offshore applications.

![](_page_12_Picture_3.jpeg)

![](_page_12_Picture_4.jpeg)

#### Titanium alloys and superalloys

An important area for forgings processed on hydraulic presses are products made from titanium alloys and super alloys. In the future, this sector will become even more important.

All over the world, numerous manufacturers create products from these materials using PAHNKE forging presses.

PAHNKE hydraulic presses used for production of titanium and super alloy forgings range from 6,3 MN to 100 MN for open die forging and from 20 MN to 500 MN for closed die forging.

### Light metal industry

Even in the case of light metals, the properties of forged products, such as those made of aluminum or magnesium and their alloys, are becoming increasingly popular since considerably higher demands can be met with less material expense.

Here, our forging machines function to some extent as preforming units (open die presses). Most frequently, however, they are used as closed die forging presses for vehicle parts or large forgings for aircraft construction.

# Arrowheads and plows: the entire spectrum of metalworking

For thousands of years, forged metal has been used wherever extremely high tensile strength and ductility are required. The speed at which materials and techniques change increases continuously – with hydraulic presses from Wepuko PAHNKE, you are always at the forefront of developments.

![](_page_13_Picture_3.jpeg)

![](_page_14_Picture_0.jpeg)

# Bar steel and plate slabs

The most frequent forged products, both for steel and for non-ferrous metals, are round, square, or rectangular bars. For this purpose, PAHNKE supplies highly efficient, fast, and fully automated forging lines.

## Rollers and shafts

For the production of rollers and shafts, the high precision and the fast, shock-free operation of the PAHNKE forging presses are valued features.

# Rings, discs, and special shapes

With the PMSD drive, which can be very precisely controlled, rings, discs, and special shapes can be manufactured with ease using both manual and semiautomatic operation.

![](_page_14_Picture_7.jpeg)

## Large die-forged parts

Large hydraulic closed die forging presses create parts made of aluminum or titanium that are practically ready to install. Products manufactured on our presses are used worldwide in the construction of large aircraft and jet engines.

![](_page_14_Picture_10.jpeg)

## Valve bodies

Our multi-cylinder presses are specialized for the production of valve bodies, valve blocks, and similar formed steel parts made of high-alloy metals. Customers include the oil & gas industry, particularly for offshore or deep-sea applications.

# ···· Creating and preserving value: modernization of plants

Whenever the acquisition of a new plant would not be cost-effective, modernization is a sensible alternative. With modern drives, control systems, and improvements in handling, we convert unprofitable press plants into efficient ones.

#### Objective

Presses currently in operation often have a service life of more than 30 years. Even if new presses are being built, an old press is rarely scrapped. However, the high standards required on the market can no longer be achieved with these old presses. This applies to both the products themselves and the production processes, documentation, and certifications.

# A number of advantages could make modernization a sensible alternative:

- Increase in the availability of the plant
- Reduction of the non-productive times
- Improvement of the machine parameters
- Reduction of the operating costs
- Reduction of the required workforce
- Possibility of expanding the product range
- Lower maintenance costs, better spare part availability

Wepuko PAHNKE has already performed numerous modernizations with great success for the users. For example: the modernization and expansion of the oil hydraulic drive at a German forge. After modernization the result was a permanently higher availability of about 99 % in regard to the hydraulic plant with a simultaneously lower energy consumption of 30%. In addition, a higher productivity has been achieved by increasing the output of the plant.

#### Implementation

With selective modernization measures adapted to each individual case, we increase the efficiency, operating safety and service life of the plants. For hydraulic forging presses, increasing the pressure to achieve a higher press force can be implemented without a problem in many cases.

By replacing or modifying mechanical parts, more precise, low-maintenance guides can be installed or the service life of cylinder seals can be extended from less than 1 to up to 10 years.

A new, state-of-the-art electronic control system offers not only many varied possibilities for the precise setting of these control systems or for the recording of

![](_page_15_Picture_20.jpeg)

This modernized open die press with three cylinders has the following technical data: Press force levels 18 MN (two-cylinder operation) and 27 MN (three-cylinder operation), compressive force: 30 MN, drive 8 x RF 650 radial piston pumps with valve control system.

#### Our offer

important operating or quality data, but also eliminates the problem of spare parts that are no longer available in this fast moving sector.

By installing remote-controlled tool clamping and changing devices or faster-moving tool tables, we achieve an acceleration of the forging processes.

The modernization or expansion of the handling units like forging manipulators or the addition of lifting and rotary tables for the faster handling of forgings can result in a considerable increase in output. We optimize the machines and plants in the periphery of forging presses, such as ovens, cranes, or tool conveyors.

Does it make more sense to modernize or to invest into new equipment? In an intensive discussion, we analyze the actual condition of your plants and talk about your production objectives. Our experienced experts will tell you which measures are appropriate.

![](_page_16_Picture_6.jpeg)

A modern press control system from Wepuko PAHNKE.

![](_page_16_Figure_8.jpeg)

Output and energy consumption of a 55 MN open die forging press before and after modernization in 2002.

# Close to the market: research and development

What does the market need? This question excites the developers at Wepuko PAHNKE. Their work involves creating solutions for special customer requirements and opening up new fields of application. Research and development, design and the entire production are located in Metzingen. This means all our competency is consolidated on one site.

![](_page_17_Picture_3.jpeg)

Modern simulation tools such as FEM and CFD support the design process at Wepuko PAHNKE.

#### Innovation on-site

Research and development is of high priority to us. This is the only way to achieve our goal: reliable, sturdy and precise machinery.

Wepuko PAHNKE GmbH combines the knowledge and experience of two great companies: the history of Wepuko with over 80 years of experience with high-pressure plunger pumps and the history of PAHNKE Engineering with over 40 years of experience with hydraulic forging presses. The development team also benefits from the short and quick communication channels at the headquarters, when dealing with the challenges of tomorrow.

Presses and pumps are developed separately due to their product-specific properties. Nevertheless we focus on an intensive exchange of ideas and concepts between the departments. The result: coherent, optimized solutions for our customers.

All of our tests and development take place on our site in Metzingen. This is how we protect our unique knowledge and save time.

#### Quality standards

Our presses and pumps fulfill extreme requirements when it comes to load capacity and reliability. Many of our products are custom-made, designed precisely to fit the requirements of the customer.

For our prototypes and small series the planning and simulation phase is key. At Wepuko PAHNKE, we constantly reinvent our products for the needs of our customers.

Even small changes, for example in the dimensions, often have major effects on the occurring forces and material stresses. With fluid flow in complex geometries, avoiding cavitation is essential.

Virtual development processes are increasingly gaining importance; they secure high quality with short development times. They offer our customers transparency and security: in many cases, our customers actually receive an initial feasibility study and test calculations with their offer.

It goes without saying; our quality management system is certified in accordance with ISO 9001:2008.

#### Development with FEM

In order for the development to lead quickly and efficiently to a result, we use the latest simulation tools, the FEM (finite element method) to analyze mechanical stability and CFD (computational fluid dynamics) to inspect the fluid mechanics of components.

This allows us to calculate the mechanical and fluidic properties of individual components from the very first design step, to an optimized final design, leading to a highly efficient product.

Our test bench subjects the end product to an extensive test procedure allowing us to guarantee the requested product properties and total customer satisfaction.

# We perform under high pressure... and we perform peerlessly!

Wepuko PAHNKE is the merger of two market leading, traditional companies: Wepuko, the specialist for high-pressure pumps and PAHNKE, the pioneer in the field of hydraulic forging presses. This mixture makes us unique and gives us significant advantages towards the competition.

![](_page_18_Picture_3.jpeg)

Wepuko PAHNKE GmbH in Metzingen, Germany.

Wepuko PAHNKE is a German mechanical and systems engineering company, specialized in the design and manufacturing of high-pressure pumps and hydraulic forging presses, including their drives and controls. The company is a global leader in these fields. The range of pumps includes triplex plunger pumps and radial piston pumps with variable and constant displacement. Wepuko PAHNKE also develops and builds units and systems according to customer specifications. Furthermore, the company offers complete descaling systems.

Our solutions can be found in the oil and gas industry, chemical plants, power plants, heavy industry, steel mills and many other applications. Customers include: Otto Fuchs and Citic Heavy Industries in the Hydraulic Forging Presses and Oil Hydraulics sectors, SMS Meer, Vallourec & Mannesmann, Robert Bosch and ArcelorMittal in the Water Hydraulics sector and Shell, Petrobras, Petronas, Statoil, Gaz de France and Hyundai Heavy Industries in the Process Pumps sector. The company was founded in 1932 by Fritz Thumm in Metzingen, South-West Germany. One of the company's many innovations was the introduction of large radial piston pumps with a very flexible control system and rapid flow direction reversal (1966).

After the takeover of Wepuko by the Pahnke family in 1996, the company was able to integrate the expertise of Hans-Joachim Pahnke and his son Michael Pahnke, both pioneers in the field of open die forging presses. The outstanding innovations that Hans-Joachim Pahnke developed, include the first underfloor open die forging press featuring a two-pillar design (1956) and the **P**AHNKE **M**odified **S**inusoidal **D**irect drive (PMSD drive) in 1975.

The largest hydraulic system in the world went into operation at Norheinco in China in 2009, and the world's strongest open die forging press by PAHNKE went into operation in 2011 at Citic Heavy Industries in China. Both using a PMSD drive. Today, the company is managed by Tanja Pahnke and remains a strong innovator in its fields. The Wepuko PAHNKE group includes companies in the USA, China and Russia. Wepuko PAHNKE also has a global presence with representatives in more than 70 countries.

#### Milestones

Wepuko is founded in Metzingen by Fritz Thumm
PAHNKE Engineering is founded in Düsseldorf by Hans-Joachim Pahnke, Fritz Thumm Jr. and Eric Koik
Wepuko is taken over by the Pahnke family
The products of the two com- panies are consolidated into one company

2011 Renamed to Wepuko PAHNKE

![](_page_19_Picture_0.jpeg)

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#### At home the world over: with our representatives in more than 70 countries