



OIL FIELD TECHNOLOGY AND VEHICULAR HYDRAULICS

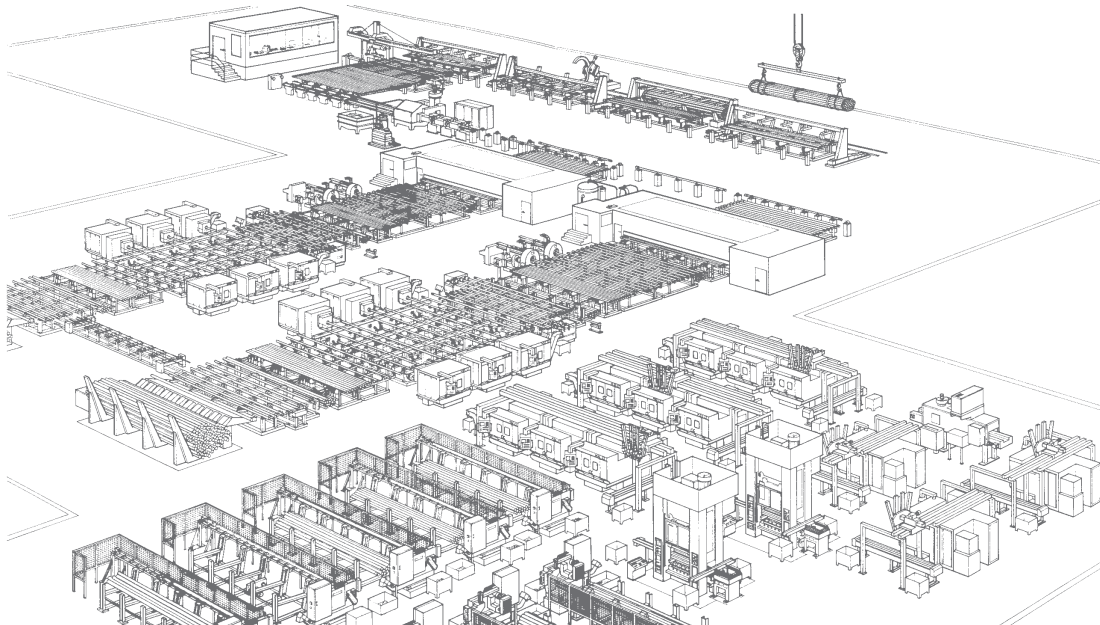


COMPLETE MANUFACTURING SYSTEMS

... for the machining of tubes, coupling sleeves and caps

EMAG can look back on many years of experience in the machining of oil field components (Oil Country Tubular Goods [OCTG]). In fact, the company began to build NC manufacturing systems for the oil field industry as early as 1976. Even then, customers were looking for a solution in complete manufacturing systems for coupling sleeves, with operations including sawing, heat treatment, turning, threading, gauging and washing – everything fully interlinked and fully automated. This paved the way to a new technology.

Besides machines for the manufacture of coupling sleeves, EMAG also developed machines and manufacturing systems for tube ends. Today, EMAG supplies whole production lines for the complete-machining of tubes and coupling sleeves including caps.



TURNKEY SYSTEMS

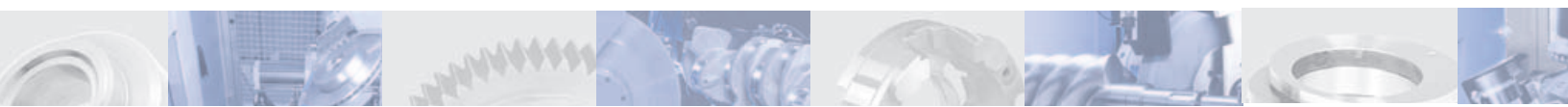
Many manufacturing sectors combined

Today, production lines for the machining of tubes, coupling sleeves and caps cover a variety of manufacturing processes. Apart from CNC machines for threading work, there are automatic circular saws, hydraulic presses producing raw parts for thread protectors and nipples, washing machines for coupling sleeves, loading pits for tube bundles, mandrel test facilities, collection pits for tube rejects, tube storage lines, stations for visual thread inspection, non-destructive tests, coupling sleeve assembly lines, stations for the

fitment of thread protectors and nipples, automatic test presses, coating machines, dry beds, length measuring systems, weighing stations, embossing stations, ring marking devices, stacking and bundling facilities and last, but by no means least, the central control system for the whole process.

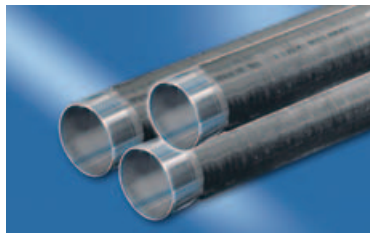


Complete-machining of tubes



WE HAVE THE RIGHT SOLUTION FOR THE MACHINING OF ...

... tube ends



... coupling sleeves
and tool joints



... rock bit cones



... pump components



... vehicular hydraulics
components



EMAG machines offer these advantages:

- ◆ Modular design
- ◆ Very sturdy, vibration-resistant machine base in high quality MINERALIT® polymer granite
- ◆ Powerful, direct-driven spindle motors
- ◆ Direct-indexing tooling systems
- ◆ High-precision, preloaded linear roller guides for maximum precision and great dynamic
- ◆ Absolute measuring systems for constantly maintained accuracy
- ◆ Fluid-cooled, temperature-controlled main assemblies – including spindle motor, tooling system and electrical cabinet – as the basis for highest workpiece quality
- ◆ Safe, no-wear, maintenance free machining area envelope
- ◆ Ideal chip flow conditions, with the chips falling to the bottom

This is the ideal platform for multi-functional manufacturing solutions – whether single- or multi-spindle – up to and including fully automated production systems.



MACHINING TUBE ENDS WITH ...

Many years of experience in the machining of oil field components

The new USC series offers all the advantages of a modern machine tool for the machining of all threaded connectors in the OCTG sector.

▶
API thread on an ascending tube, machined on a USC 11



The machines – offered in three sizes: USC 11, USC 21 and USC 31 – represent a tailor-made solution for the machining of tube ends (tubes, casings).

Range of application:

- ◆ Tube diameters from 40 to 508 mm (1.66" to 20")
- ◆ Tube lengths of up to 18 m
- ◆ All common threads to international standards, also to proprietary standards such as API, GOST, VAM, BDS and others
- ◆ Complete-machining of the tube ends, with automatic tube transport systems that do not require resetting

Direct-driven motor spindles with

- ◆ a power rating of up to 180 kW
- ◆ a torque of up to 12,000 Nm

▶
Casings with external thread machined on USC 21



... MACHINES OF THE USC SERIES

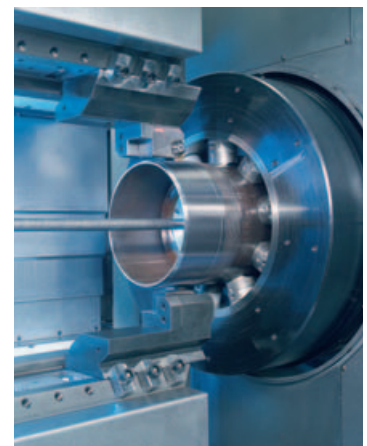
Machining both ends of a tube

The particular advantages of this series of machines are:

- ◆ Main spindle with a max capacity of 550 mm
- ◆ 2 compound slides with 4-station flat-bed turret; all tooling systems can be accommodated
- ◆ Alternatively: 12-station disc-type turret to VDI 40 or VDI 50
- ◆ Truing attachment for tube ends
- ◆ Use of front and rear end chucks for optimal clamping – hydraulically, pneumatically or mechanically operated
- ◆ High motor power and high torque rating on the main spindle
- ◆ During machining, the inside of the tube is sealed against the ingress of chips and coolant
- ◆ High degree of operator-friendly, low-maintenance automation
- ◆ Maximum stability



▶
Truing of
the tube end



▶
The tube end is sealed
against the ingress of
chips and coolant
during machining



◀
USC21
with machine-
specific tube
handling system

MACHINING COUPLING SLEEVES AND ...

Always the most economical solution

Bespoke solutions for every requirement, with machine designs – such as center drive machines of the USC series, or VSC and VLC vertical turning machines – and frame sizes for all commonly found coupling sleeves in today's oil fields.

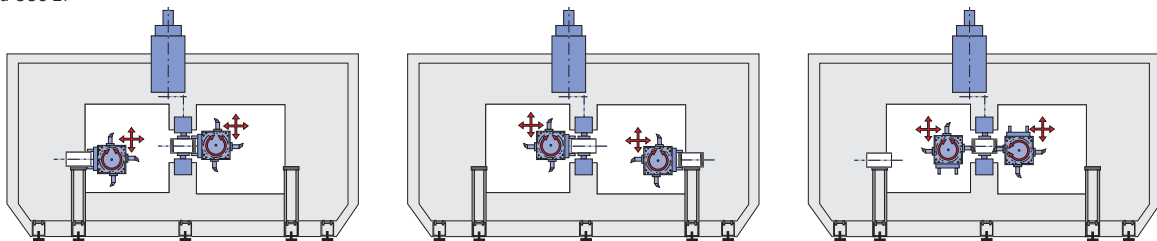
The USC 17, USC 27 and USC 37 center drive machines stand for efficiency in the simultaneous machining of both sides of coupling sleeves and tool joints with threads to API, GOST, VAM, BDS and other company-specific standards.

The advantages of working with center drive machines are:



- ◆ Reduced machining times through simultaneous complete machining of both ends of the workpiece
- ◆ Highest precision and concentricity of the simultaneously machined threads
- ◆ Fully automated workhandling minimises idle times
- ◆ Wide range of applications:
Coupling sleeve diameters 40 - 508 mm
Workpiece lengths 80 - 1270 mm
- ◆ Direct-driven motor spindles with speeds of max 1,000 rpm
Power rating up to 120 kW

▲ Machining of coupling sleeves – both ends simultaneously – on a USC 27



The principle of machining coupling sleeves on USC 17/27/37



... TOOL JOINTS ON USC, VSC AND VLC

The machining of coupling sleeves and tool joints on the VSC – single- or twin-spindle version – and the VLC also offers these well-established advantages:

- ◆ The machine loads itself through the pick-up spindle
- ◆ Shortest travels, resulting in shortest loading/unloading times
- ◆ Ideal chip flow conditions
- ◆ Workpieces measured outside the machining area as part of the same set-up
- ◆ Reduced footprint



▲ VLC 800, used to machine the larger coupling sleeves



▼ USC 27, for the machining of coupling sleeves



▼ The VSC series for the machining of smaller and medium size coupling sleeves



COMPLETE-MACHINING OF ROCK BIT CONES ...

From raw part to finish-machined component – all operations included

Tailor-made designs and frame sizes from the VSC, VLC and BA series of machines are also available for the machining of rock bit cones.

The rock bit cones are pre-machined internally and externally in two set-ups on machines of the VSC series.

The application of cleverly thought-out loading concepts ensures that the machines can be quickly reset to accommodate a variety of workpiece sizes.

Machining centers from EMAG SW machine the precision stud holes and mill the pre-forged cutting teeth.



◀ Carbide tipped rock bit cone

▼ Internal machining of the bearing journals on a VSC 400 (machine shown in pick-up position)



▼ BA 400-2 for the drilling of stud holes in rock bit cones



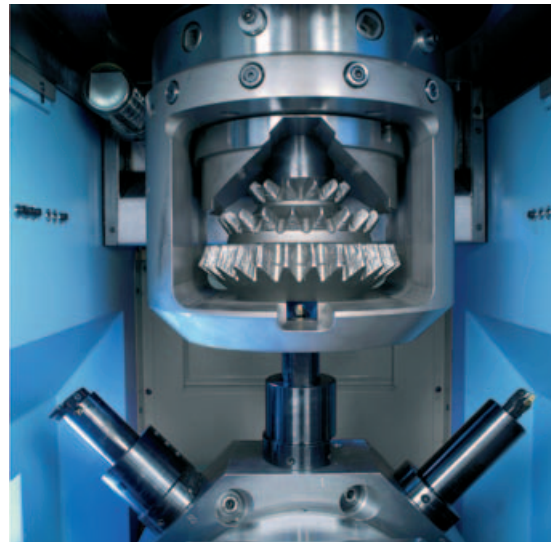
... ON VSC, VSC DS, VLC AND BA



The bearing journals of the rock bit cones are hard-turned on VSC machines and/or ground on machines of the VSC DS series. Rapid loading and unloading is accomplished by the pick-up spindle equipped with a special axial (pot) chuck. Even variations in the external contour can thus be securely clamped, guaranteeing highest precision of the internal contour.



▲ An external view of rock bit cones and a view of the finish-machined internal bearing journal



Internal machining of bearing journals on a VSC 250 or VSC 400 ▲



The VLC series is used to machine rock bit cones and rock bit head segments quickly and economically. The use of a Y-axis in conjunction with drilling/milling attachments and grinding spindles provides for cost-effective combination- and complete-machining.



MACHINING OF PUMP COMPONENTS ON VL, VSC AND VSC DUO ...

Outstandingly operator and maintenance friendly

Pump components such as impellers, housings and tail pieces in different sizes are complete-machined on flexible single or interlinked multiples of machines.

The distinguishing features of the VL 3 and VL 5, the pick-up turning machines for chucked components of 30 to 220 mm diameter, are:

- ◆ High output rates
- ◆ Constantly maintained accuracy and operational reliability
- ◆ Automatic workpiece changeover in the shortest possible time
- ◆ Integrated automation
- ◆ High degree of availability
- ◆ Very short chip-to-chip times
- ◆ Small footprint



▲ VSC 400 DUO for the simultaneous execution of OP 10 and OP 20

VSC DUO – the highly flexible twin-spindle automatic for a variety of operations.

The DUO features two separate machining areas and independently programmable overhead slides. Both spindles can carry out the same machining cycles simultaneously or different ones independently.



◀ 2 machines of the VL 3 series, connected by a transfer station

▶ Pump impeller and pump housing



... AND VEHICULAR HYDRAULICS COMPONENTS ON THE USC

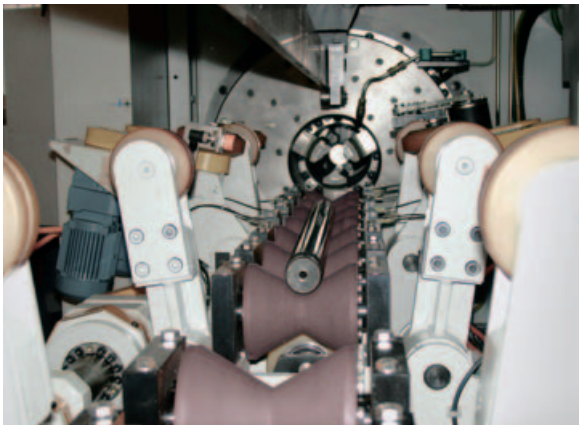
Flexible manufacturing system for a variety of diameters

The well-established machine designs USC 11, USC 21 and USC 31 produce hydraulic cylinders and pistons of the highest quality, with hardly any need for resetting and at excellent productivity rates from as few as a batch size of 1.

Dependent on requirements, flexible work-piece loading can be fully automated. The transport system adapts to the task in hand without having to be reset. Self-centring steadies position the work-piece at speeds of up to 1,800 rpm.



Hydraulic cylinder



▲ USC 21 for the machining of vehicular hydraulics components

◀ Piston rod

◀ Host computers ensure the automation system resets itself





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