FLEXIBLE PRODUCTION OF SEAMLESS PIPES BY

Rupert WIESER,
GFM GmbH
Austria

RADIAL FORGING
BASIC COMPANY DATA (fiscal year 2012)

ESTABLISHED: 1945
HEADQUARTER: GFM, Steyr Austria
SISTER COMPANY: AMERICAN GFM Corp.

Chesapeake Va, USA
GFM (UK) Ltd.
Wellingborough, England

EMPLOYEE: 490 (combined)

TOTAL SALES: € 100 Mio.
GFM Locations

- Plant CHESAPEAKE, VA.
- AUSTRIA Plant Steyr
GFM – Location, STEYR - Austria

GFM - Steyr
Ennserstrasse 14
A – 4400 Steyr
AUSTRIA
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Fax: +43 7252 / 80 953
http:\www.gfm.at

Vienna
Linz
Salzburg

AUSTRIA

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Product Lines

% of Turn Over

MILLING ~ 10%

CUTTING ~ 10%

FORGING ~ 25% (small equipments)

FORGING ~ 50% (medium & large equipments)

ROUTING ~ 5%
CNC- Crankshaft Milling Machines - Type FKP 80
CUTTING honeycomb for the aviation industry
Ultrasonic Cutting Machines

Tapelaying and Handling – Turn Key installation
Radial Forging Type SKK
HOT FORGED – SOLID PARTS
HOT-COLD FORGING - STRAIN HARDENING

AUSTENITIC Cr-Mn STEEL + N

SPECIAL PROPERTIES:

- NON MAGNETIC
- CORROSION RESISTANCE
- HIGH STRENGTH
- LOW MAGNETIC PERMEABILITY

NON-MAGNETIC DRILL COLLAR
HOT FORGED – HOLLOW PARTS
RADIAL FORGING OF SEAMLESS TUBES

BLANK before RADIAL FORGING

RADIAL FORGED SEAMLESS TUBE
HOW to MAKE a HOLLOW BLANK
Depends on

- MATERIAL GRADE
- SIZE and SHAPE
- DEMAND on the HOLLOW
- EXISTING PRODUCTION FACILITY
HOW to MAKE a HOLLOW BLANK?

- DRILLING
- CROSS ROLL PIERCING
- PIERCING with PRESS
- EXTRUSION
- CENTRIFUGAL CASTING
- ESR PROCESS
HIGHLIGHTS of TUBE FORGING

- SURPASSING FLEXIBILITY
- CONTINUOUS RANGE OF DIAMETER
- EXCELLENT QUALITY of PIPE INSIDE SURFACE
- DEVELOPMENT of
  ➢ NEW TAILORMADE PRODUCTS
  ➢ PRODUCE NEW STEEL GRADES
Range of SEAMLESS TUBES

TUBE WALLTHICKNESS (MM)

TUBE OUTSIDE DIAMETER (MM)

DIN 2448
ASSEL MILL
PLUG MILL
PILGER MILL
GFM RADIALFORGING

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SOME APPLICATIONS

- Steam headers & Boiler Tubes - power generation
- Tubes for processing Industry
- Heavy duty cylinders
- Mechanical Tubes
- Oil Field Parts
SOME APPLICATIONS

Excellent versatility of the geometric shaping enables high productive production of:

- Truck Axles and Houses
- Cardan Shaft
- Gearbox Shaft …
Radial Forging enables pipes to be produced more close to **finish dimension** of parts:

- Almost stepless range of sizes
- In particular pipes with larger wall thickness
- Shorter machining times
- Reduced material losses
on DEVELOPMENT for RAIL ROAD AXLES

from solid to hollow
A successful development started in 2005 with the leading tube manufacturer Vallourec & Mannesmann.
Aulnoye-Ameries tube facility:

Forming steps before and today

Before:
- Furnace
- Piercer
- Elongator
- Plug
- Reeler
- Sizer

Five forming steps in the past!

Today:
- Furnace
- Piercer
- Forge

Only two hot forming steps

Quelle: Stahl und Eisen 132 (2012) Nr. 10
OLD TUBE MILL = COMPLEX

1. Rotary Furnace
2. CENTERING
3. ROLL PIERCER
4. ELONGATOR
5. PLUG MILL
6. REELER
7. SIZING MILL
8. COOLING BED

Quelle: Vallourec & Mannesmann Tubes
TUBE MILL after MODERNIZATION

NEW OPPORTUNITIES

HIGH FLEXIBILITY

100,000 t/a TUBES

1. Rotary Furnace
2. CENTERING
3. ROLL PIERCER
4. GFM Radial Forge
5. COOLING BED

Quelle: Vallourec & Mannesmann Tubes
Production sequence at the Aulnoye-Ameries tube facility

CC Material → RHF → Cross rolling

Forge → Cooling bed

Quelle: Stahl und Eisen 132 (2012) Nr. 10
Production sequence at the Changzhou tube facility

CC Material → RHF → PIERCING PRESS

Forge → Cooling bed

Quelle: Stahl und Eisen 132 (2012) Nr. 10
V&M Tubes uses various hot forming processes. Among these radial forging is gaining in importance, 5 locations are equipped with Radial Forging machines from GFM:

- **Changzhou mill (V&M China):** seamless pipes are forged from die-cast ingots, mainly for the energy sector.
- **Belo Horizonte works (V&M do Brazil):** forging is used to process seamless tubes into components for the automotive industry.
- **St. Saulve location (V&M France):** shapes the continuously cast-alloy material to the diameter required for the tube mills.
- **Aulnoye mill (V&M France):** seamless pipes are forged from continuous cast prematerial.
- **Riesa (V&M Saxony Germany):** pilot plant for development.
- **Changzhou mill (V&M China):** seamless pipes are forged from die-cast ingots, mainly for the energy sector.
Changzhou Mill

Quelle: Stahl und Eisen 132 (2012) Nr. 10
Changzhou Mill

Quelle: Vallourec & Mannesmann Tubes
Changzhou Mill

560 x 60

SEAMLESS PIPES BY RADIAL FORGING
Riesa (V&M Saxony Germany)

Quelle: Stahl und Eisen 132 (2012) Nr. 10
Production range of V&M tube forging plants

Quelle: Stahl und Eisen 132 (2012) Nr. 10
## Technical Data of RF-type of Forging Machines

<table>
<thead>
<tr>
<th>TYPE</th>
<th>RF 30</th>
<th>RF 35</th>
<th>RF 40</th>
<th>RF 45</th>
<th>RF 60</th>
<th>RF 70</th>
<th>RF100</th>
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<tbody>
<tr>
<td>MAX STARTING SIZE (mm)</td>
<td>400</td>
<td>430</td>
<td>500</td>
<td>550</td>
<td>680</td>
<td>750</td>
<td>1000</td>
</tr>
<tr>
<td>MIN FORGING SIZE (mm)</td>
<td>40</td>
<td>50</td>
<td>60</td>
<td>80</td>
<td>100</td>
<td>120</td>
<td>140</td>
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<tr>
<td>FORGING FORCE / DIE (t)</td>
<td>500</td>
<td>750</td>
<td>900</td>
<td>1200</td>
<td>1350</td>
<td>1800</td>
<td>2200</td>
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<tr>
<td>ADJUSTMENT RANGE (mm)</td>
<td>180</td>
<td>250</td>
<td>280</td>
<td>300</td>
<td>360</td>
<td>400</td>
<td>460</td>
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<tr>
<td>MAX STROKE RATE / DIE (min⁻¹)</td>
<td>340</td>
<td>340</td>
<td>290</td>
<td>260</td>
<td>240</td>
<td>240</td>
<td>200</td>
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<tr>
<td>MAX FORGING POWER (kW)</td>
<td>600</td>
<td>950</td>
<td>1000</td>
<td>1700</td>
<td>2000</td>
<td>2500</td>
<td>2700</td>
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</tbody>
</table>
RF 100 – GFM´s biggest worldwide
RADIAL FORGING MACHINES for TOOL STEEL and SUPERALLOYS in WORLD LEADING COMPANIES

SMC USA
TIMKEN LATROBE USA
HC STARK METALWERKS
TELEDYNE ALLVAC
CARPENTER
SHEFFIELD FORGEMASTER-IFA / ENPAR ENGLAND
ERASTEEL SWEDEN FRANCE
DEW GERMANY
BGH GERMANY
V&M
BÖHLER AUSTRIA
COGNE ITALFOND VALBRUNA ITALY
COGNE
PLANSEE AUSTRIA
RAVNE SLO
PSM PAK.
ISM POWMEX INDIA
ISCOR S.AFRICA
QILU
GMTC TAIWAN
DSS UKRAINE
RUSSIA
BEIMAN
KOBE
DAIDO
FUSHUN
BAOTOU
PANGANG
TISCO
ZYSO
TIANGONG
JINGONG
FEIDA

55 Installations (13 RF)
3 more on order

SEAMLESS PIPES BY RADIAL FORGING
THANK YOU FOR YOUR ATTENTION