LEIFELD

eckotech®

FLOW-FORMING OF WHEELS

LEIFELD METAL SPINNING AG

Long – Term and Trustful Cooperation

- The confidentiality of our clients plans and data is most critical. Leifeld rigorously applies organizational separation of teams working for competitors as well as several other rules **to protect the confidentiality of all client information**.

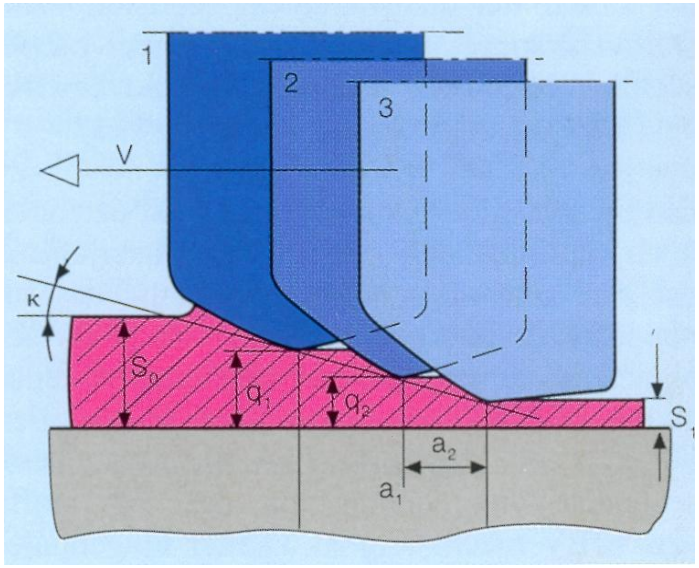
- Similarly, our industry is very competitive and we regard our approaches and insights as proprietary. Therefore, we look to our clients **to protect Leifelds interests in our presentations, methodologies and techniques. Under no circumstances** should this material be shared with any third party, including competitors, **without the written consent of Leifeld Metal Spinning**.

CHIPLESS SPINNING AND FLOW-FORMING TECHNOLOGY

Roller Offset in the Flow-Forming Process

TECHNOLOGY

- Preform: Tube, preform
- The principle of flow forming:
  - By building up a pressure cone under the rollers, the material starts to flow in longitudinal direction.
  - Reducing the wall thickness will elongate the part.
  - Arrangement of the flow-forming rollers (shown in one plane)



q_1,q_2	radial roller position
a_1,a_2	axial offset
k	lead angle for setting of rollers
SO	starting wall thickness
S_1	finial wall thickness
V	direction of feed

WSC SERIES

Resource-Saving Flow-Forming Technology

PERFORMANCE FEATURES

- Flow forming of cast and forged wheel preforms
- Advanced CNC controls i. e. Siemens or Fanuc
- Processing of steel, aluminum, and other metals
- Warm or cold working, depending on raw material
- Flexible integration into existing production processes
- Quick tool change
- Output: more than 500,000 wheels per year

APPLICATIONS OF WSC MACHINES

Highly Efficient Manufacturing of Steel and Aluminum Wheels

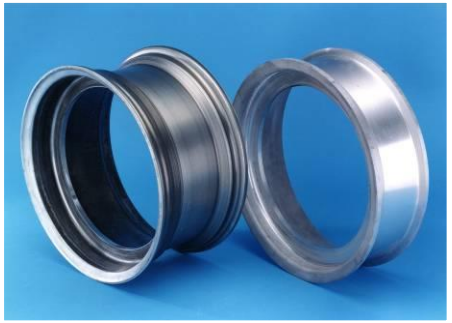
BRANCHES

- Automotive industry
- Motorcycle industry
- Commercial vehicle industry
- Rail car industry

PRODUCTS

- Wheels for passenger cars
- Wheels for motorcycles
- Truck wheels
- Bus wheels
- Railway car wheels



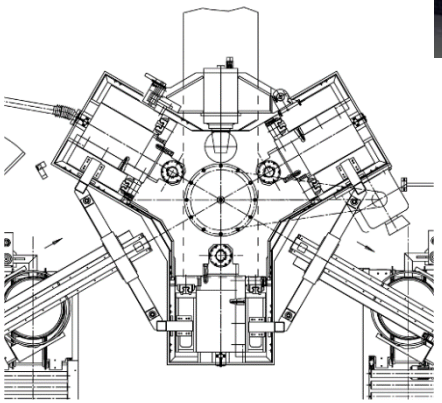



WSC SERIES

Weight-Optimized Casted Wheels

BENEFITS

- Vertical machine design with integrable media feed and discharge
- Slides mounted to each other at 3x120° of the radial axes and flow forming roller respectively
  - Optimal distribution of forces
  - No radial tool deflection
- Feed of slides
  - Servo hydraulic cylinders
  - Cylinder internal measuring system
- Use of energy efficient motors (up to 10% savings)



WSC SERIES

Weight-Optimized Casted Wheels

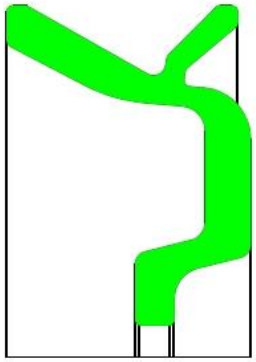
BENEFITS

- Three access areas to the operating area
  - Two access areas:
    - Synchronous loading and unloading of the machine by two robots
    - Time saving about 8 seconds cycle time
  - The third access area:
    - To use additional processing unit
    - For the unhindered tool change
- High forming capacities, short cycle times
  - Only slightly machining

RESOURCE-SAVING FLOW-FORMING TECHNOLOGY

Forming Principle for Cast or Forged Aluminum Wheels

Three fundamental process steps:



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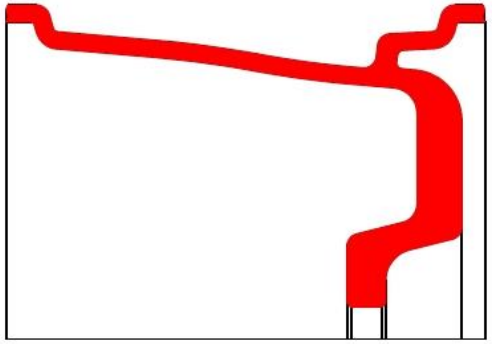
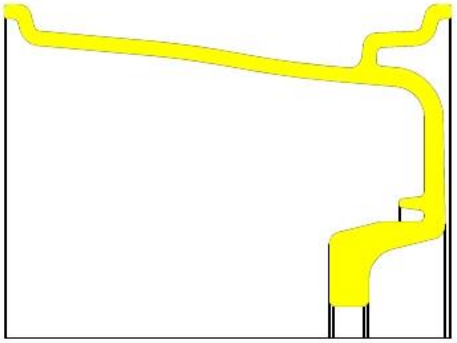


After flow forming

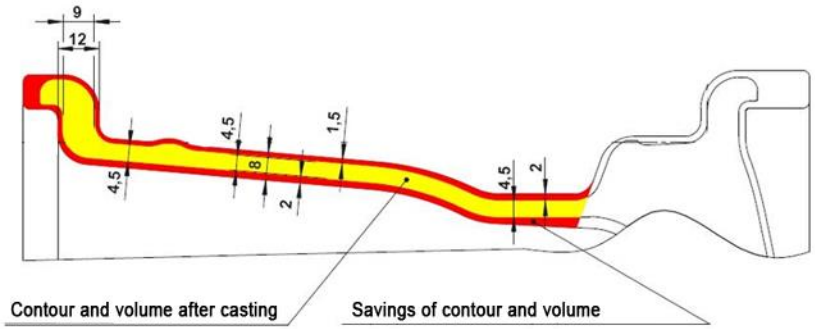


After final cutting

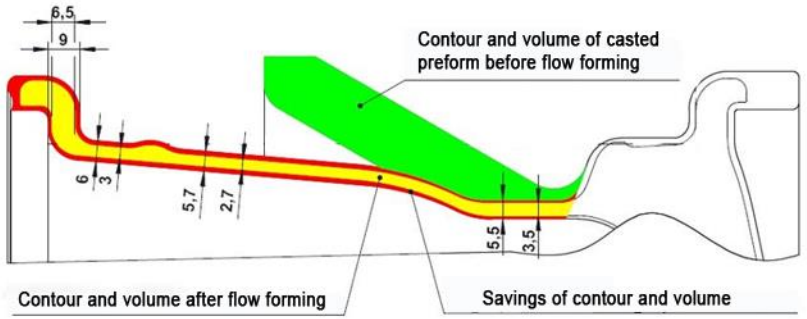
RESOURCE-SAVING FLOW-FORMING TECHNOLOGY

Comparison of Material Input for Cast Wheel 7J x 16

Conventional Cast Wheel



Flow-Formed Cast Wheel



- Reduced material usage of 1.3 kg when casting
- Reduction of cutting about 0.4 kg
- Weight optimization for finished wheel is 0.9 kg
- CO2-savings of 0.286 g/km diesel fuel resp. 0.292 g/km petrol

LEIFELD

WSC SERIES

Technical Details

	WSC 600/4 H	WSC 600/6 H
Final products	Casted or hot forged wheels	Casted or hot forged wheels
Outer diameter (min)	320 mm	320 mm
Outer diameter (max)	620 mm	570 mm
Rim diameter (min)	15 inch	15 inch
Rim diameter (max)	22 inch	20 inch
Rim width (max)	10 inch	10 inch
Workpiece length approx. (max)	300 mm	300 mm
Main spindle drive	100 kW	100 kW
Hydraulic drive approx.	37 kW	60 kW
Tailstock spindle drive approx.	-	-
Axial force max.	100 kN	100 kN
Rest force radial (max)	100 kN	100 kN

WSC SERIES

Technical Details

	WSC 700/6 H	WSC 700/6 C
Final products	Casted or hot forged wheels	Forged aluminum or steel wheels
Outer diameter (min)	410 mm	410 mm
Outer diameter (max)	720 mm	720 mm
Rim diameter (min)	18 inch	18 inch
Rim diameter (max)	26 inch	26 inch
Rim width (max)	17 inch	17 inch
Workpiece length approx. (max)	480 mm	480 mm
Main spindle drive	75 kW	100 kW
Hydraulic drive approx.	67 kW	110 kW
Tailstock spindle drive approx.	75 kW	100 kW
Axial force max.	100 kN	250 kN
Rest force radial (max)	100 kN	250 kN

WSC SERIES

WSC 700/6 H

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SARL au capital de 100 000 €
SIRET : 350 241 378 00016
Code APE : 4662Z - N° EORI : FR35024137800016
N° d'identification européenne : FR 67 350 241 378