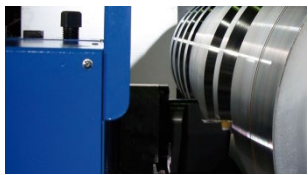


The HERKULES P600 Power for Nucor Berkeley

Turing Lathes made in Germany

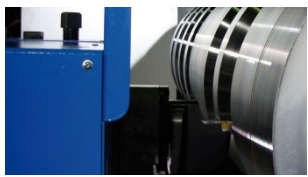


Herkules – Data Summary



Headquarter in Siegen, Germany

Foundation	»	1911
Employees	»	~ 1000
Production Facilities	»	2 x Germany, USA, India
Sales Offices	»	8 locations
Service Facilities	»	5 locations
Export Quota	»	> 90%
Products	»	- Notch Milling Machines - Ring Grinders - Turn Key Roll Shops - Lathes - Roll Grinding Machines - Roll Texturing Machine - Revamps



Herkules USA



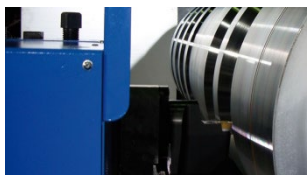
Herkules USA Corporation – Administration office building

Herkules USA facts:

- Location: Ford City, PA (USA)
- Employees: 160
- Foundation: 1985

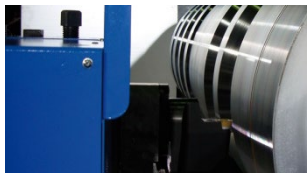
Product portfolio:

- Roll grinding machines
- Modernizations
- Maintenance and Service (emergency 24/7)
- comprehensive in house and infield training



Project Overview of Nucor Berkeley

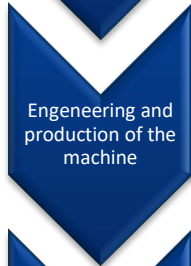




Time Schedule – P600 Power Nucor Berkeley



- In September 2015 the inquiry has been made
- Contract signing date - July 2017



- The Engineering starts directly after contract signing



- The assembly started in end of september 2019 and finished beginning of October



- FAC signing November 2019

Herkules Heavy Turning Lathe – Requirements



Nucor Berkeley decided to purchase a P600 Power from Herkules in July 2017

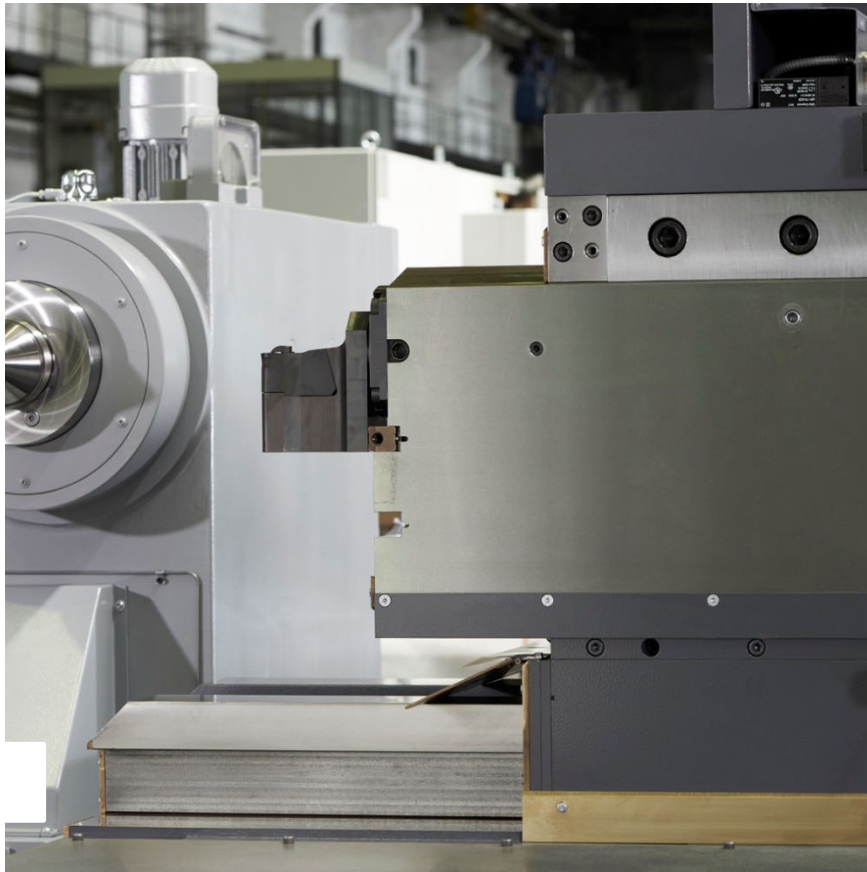
General Requirements

- Max. Diameter 1250mm (49,2")
- Length between centers 3000mm (118")
- Cutting depth 250mm (9,8")
- Weight 10 tons

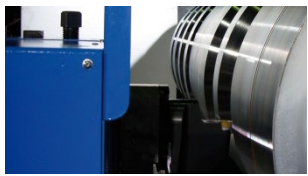
Special requirements from Nucor Berkley were considered:

- Softloader to load the roll
- Reuse of the existing tooling system
- Faceplate similar to existing lathes

HERKULES P600 Power – Technical Data



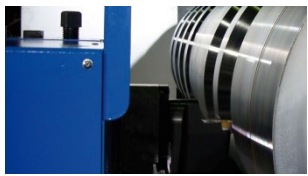
- Type: P 600 Power
- max roll diameter: 1250mm
- max roll weight: 10tons
- Tailstock quill adjustment: 250 mm
- Cutting depth max.: 250mm
- Cutting force on tool holder: 120.000N
- Headstock torque: 50.000Nm
- Headstock power: 120kW
- Gear steps: 2
- Headstock speed: 1-250
- Ballscrew diameter in Z-axis: 80mm
- Ballscrew diameter in X-axis: 80mm



Goals

1. High stock removal rates
2. Machining with highest accuracy
3. Long-term troublefree operation, long-term maintenance of value
4. Roughing and finishing on the same machine

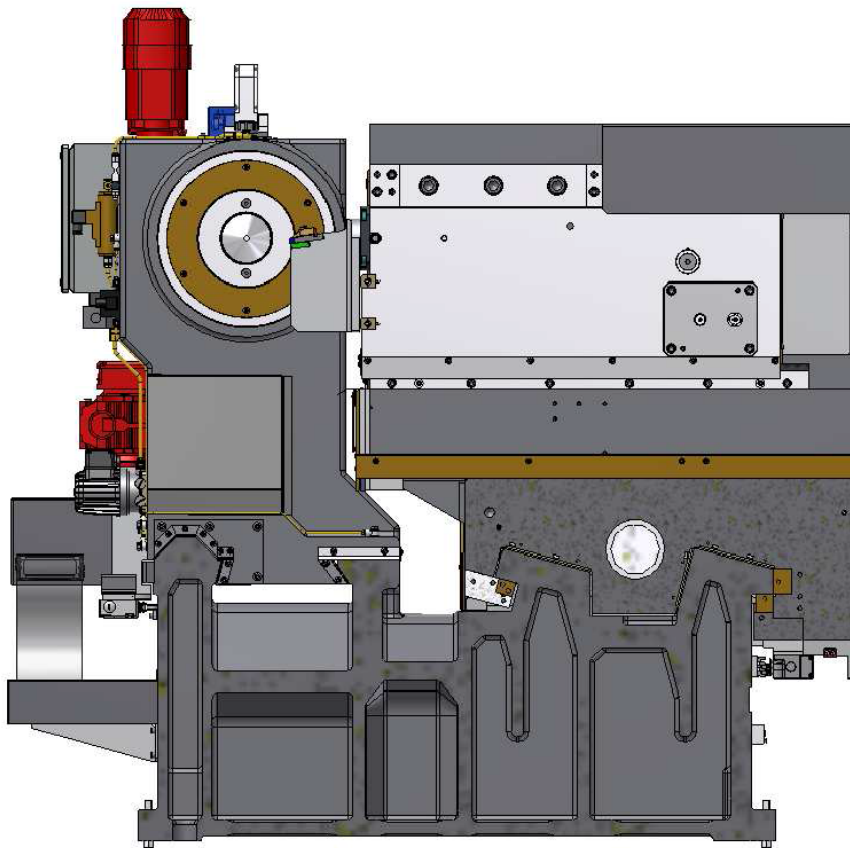




Fundamentals of Design

1. Induction hardened guideways in longitudinal and transverse direction
2. Generous dimensioning of bearings
3. One-piece housings for headstock, tailstock, bed slide and cross slide
4. Main bearings contained in closed housing bores
5. Stiff main drives
6. Selection of fit-to-purpose materials (casting material with excellent damping properties)
7. Use of components of reputable manufacturers with international availability

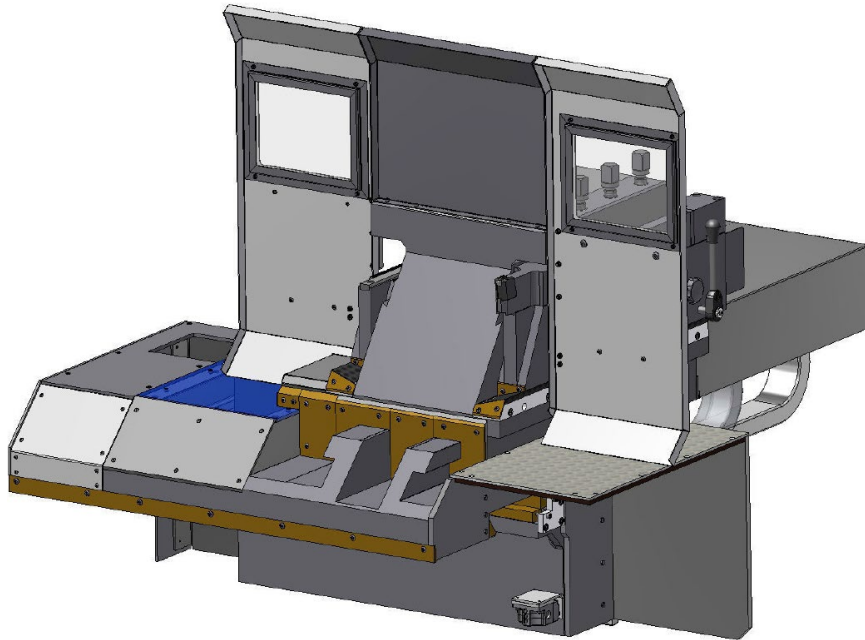
Machine Bed Design for High Accuracies



- cast iron material for excellent dampening
- V-guidewas for steady rest and tailstock for high positioning accuracies
- V-guideways for support guideways for highest positioning accuracies forced by gravity and cutting forces
- induction hardening of support guideways for wear resistance
- optimal (lowest) center height (no intermediate plates are used)

Cross section of the HERKULES Power

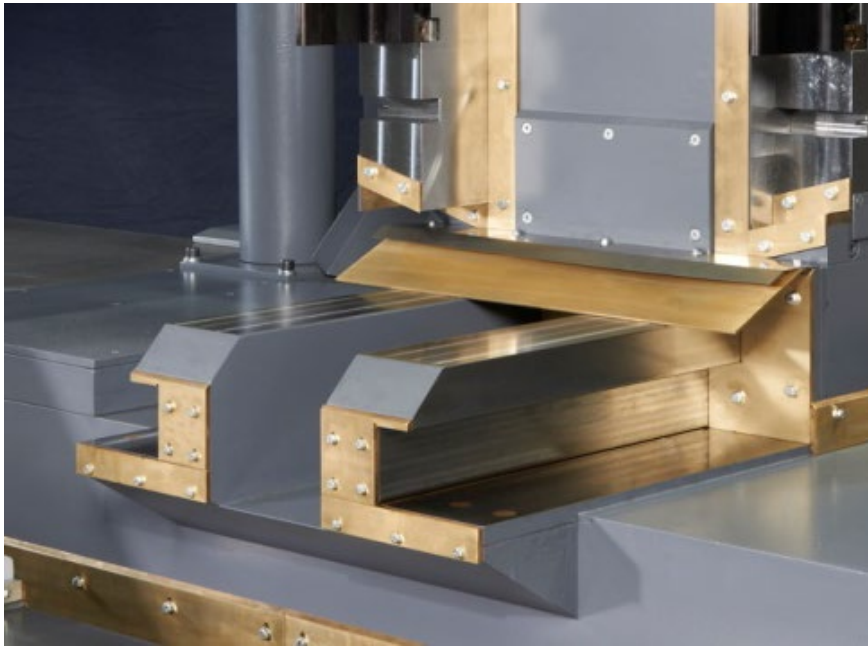
Upper carriage



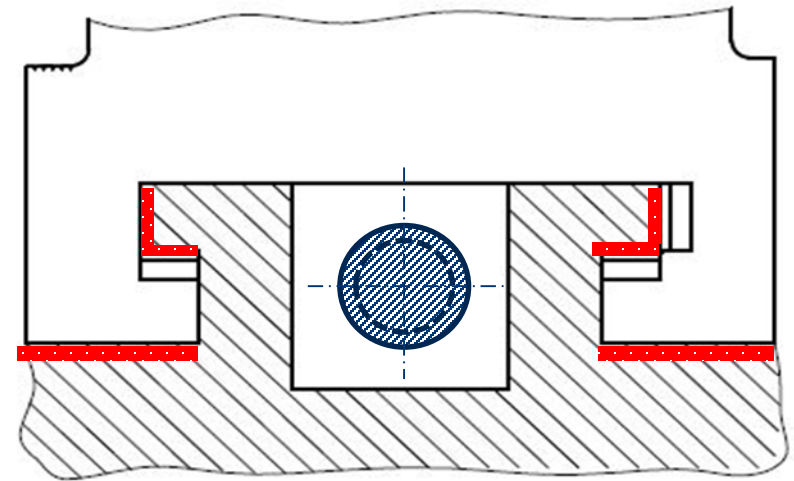
- massive one piece cast iron support, higher stiffness and damping properties
 - less vibration
 - higher surface quality
 - longer tool life
- very ridged tool slide clamping system for shaft tools or optionally tooling systems like Capto or Kennametal – Special solution for Nucor Berkeley
 - high cutting forces
 - low maintenance
- cross and longitudinal travel by double nut prestressed backlash-free ball screw spindles, driven by frequency-controlled AC servo motors
- cross and longitudinal travel controlled via rotary measuring system

Carriage P500 with two tool slides and chip protection doors

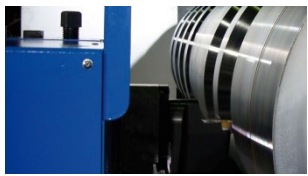
X-Axis Guideways



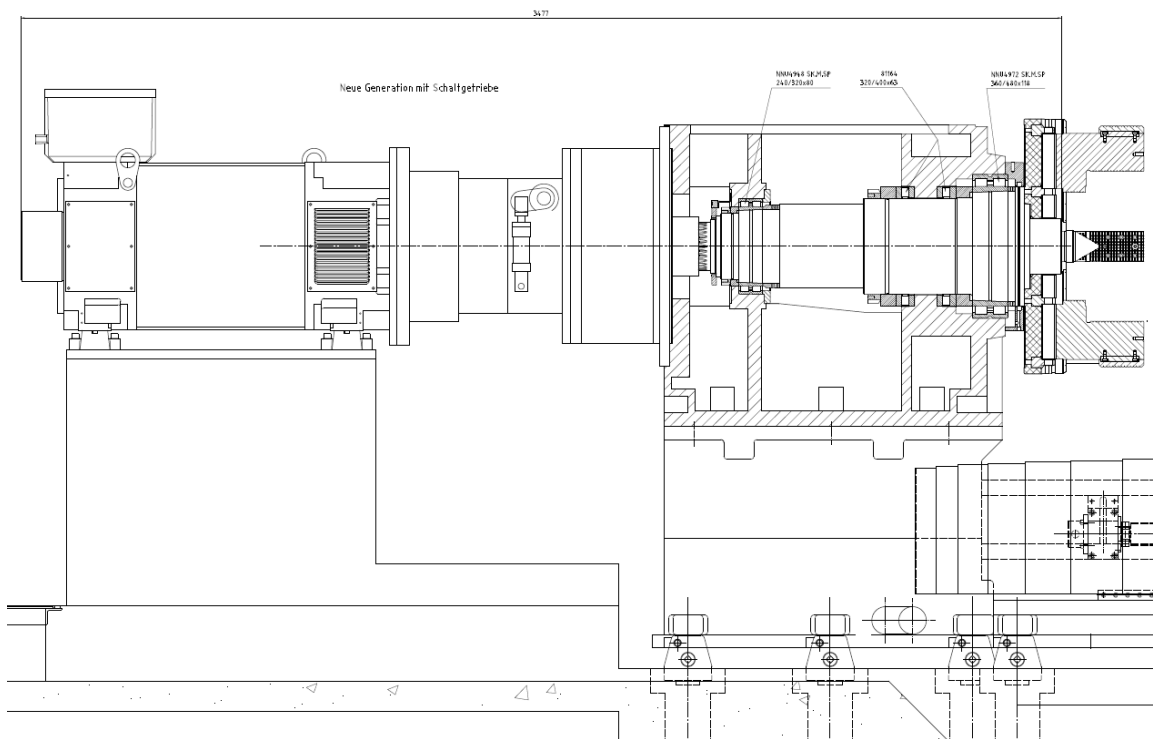
- higher long term accuracy guideways compared to wedge type X-guides
- preloaded ballscrew in X-axis
- large ballscrew diameters



- High stiffness of “Box-Type” guideways
- high accuracies in X-direction movements
- induction hardened guideways
- practically no wear and less maintenance



New headstock design with planetary gear drive



- one piece heavily ripped cast iron construction
- main bearing right in the front, near the faceplate as double roller bearing for high stiffness and vibration prevention
- optimal distance between front and rear bearing – less bending of the main shaft
- optimized arrangement of back pressure bearings
- all gears helical - for low noise running (less vibration) and highest gear forces
- high headstock positioning accuracy

Headstock design with planetary gear drive

Coaxial Headstock Design



- Headstock P50 koaxial
 - Main Bearing 300/420x118
 - Gear Steps 2
 - Max. Torque 50.000 NM
 - Power 120KW

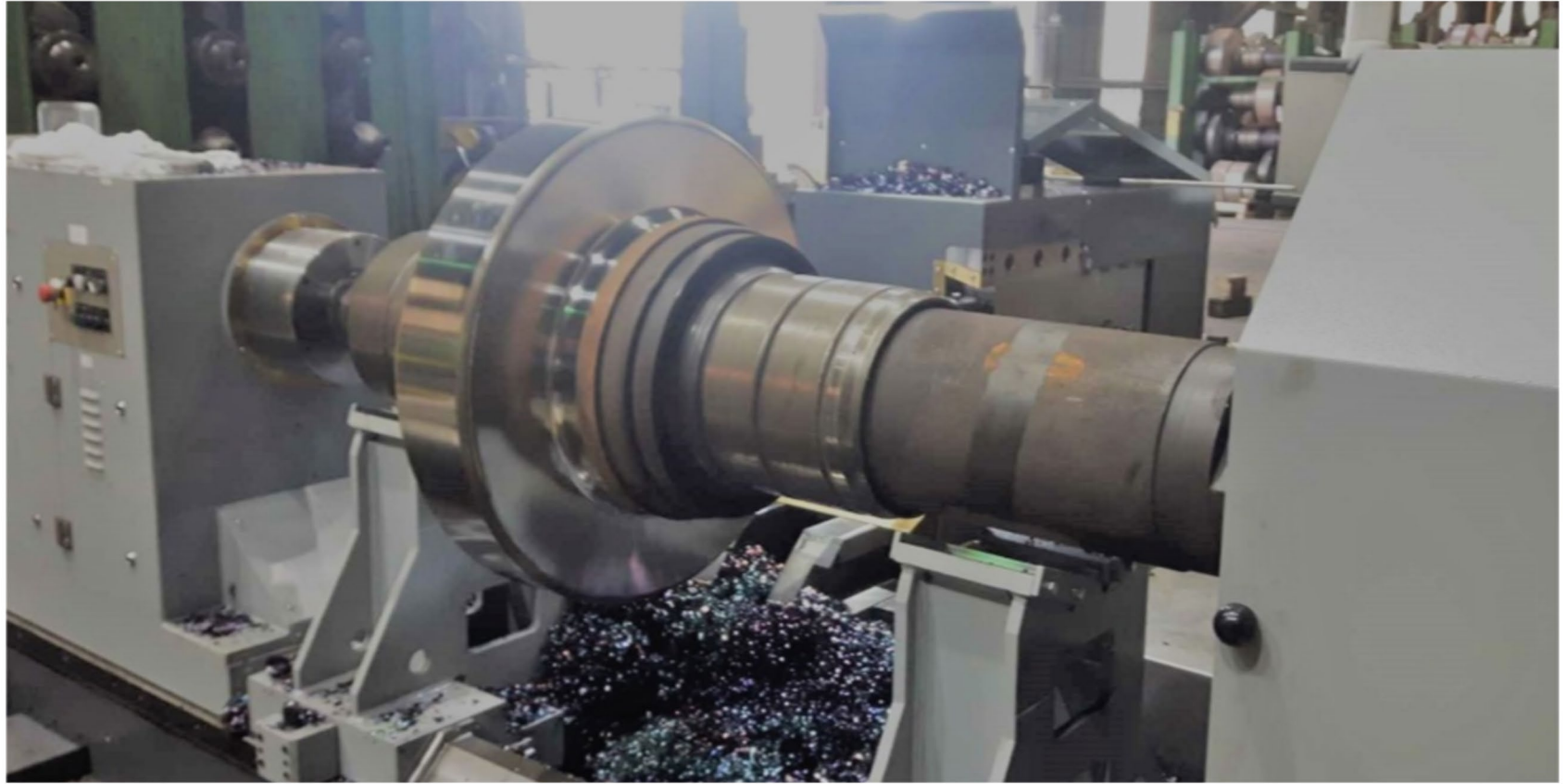
Siemens Sinumerik 840 D sl



The Herkules Turning lathe is controlled by a Siemens CNC system providing all necessary control functions. The Siemens Sinumerik 840D sl with HMI operate is consisting of:

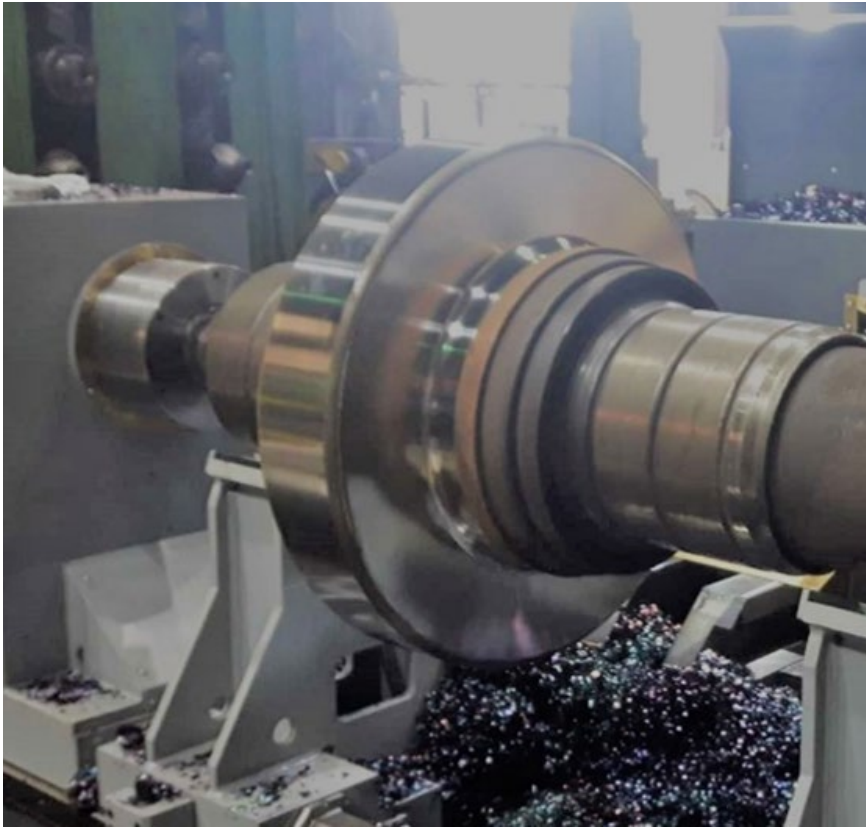
Hardware

- Operator panel OP 019 (19" TFT – color display)
- 19" keyboard
- 19" machine control panel
- PCU 50.5, 1,8 GHz, 4 GB, Windows 7
- USB-Ports for data transfer
- NCU 710.3, Intel Pentium 4M, 1,7 GHz, 3MB program memory



The Specials for Nucor Berkeley

Softloader



- Rolls will be placed directly from the crane in the soft loader
- self centering system
- roll accommodation by motorized tailstock
- Two adapter for two different neck diameter

Softloader for pre-positioning of the rolls

Cassette Tool – Reuse of the existing tooling system

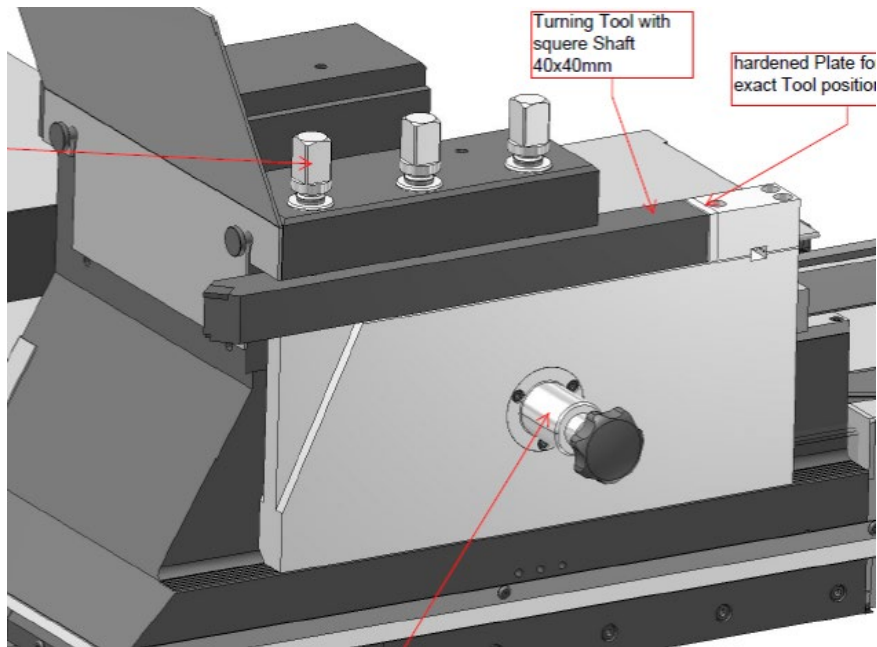


- Existing tooling system in the roll shop

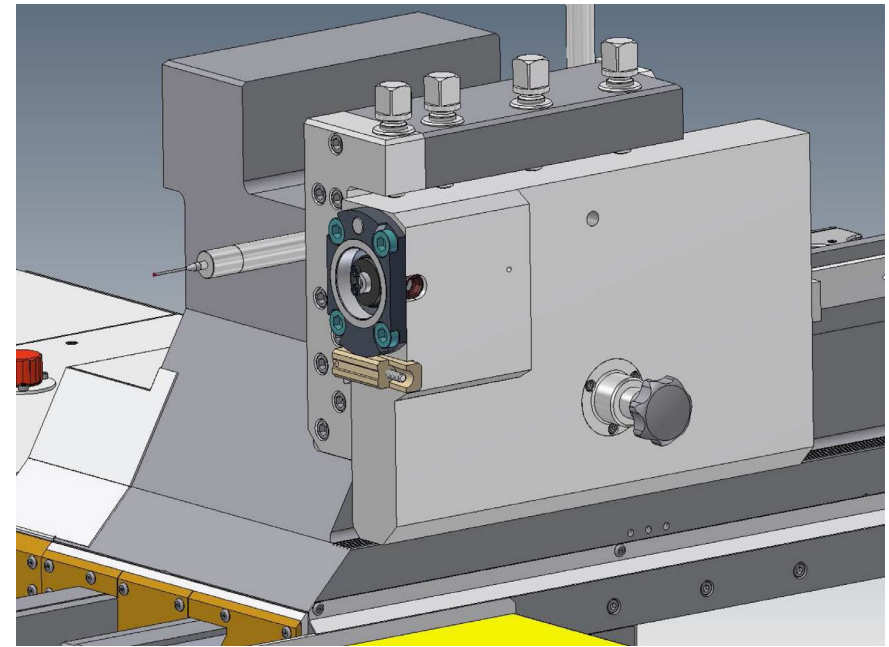


- Cassette Tool of Herkules

Upper carriage with Tool Slide (standard)



- Tool holder and Tool slide are made in house
- Tool slide position is indicated to CNC
- shaft tools hardened plate for exact tool positioning

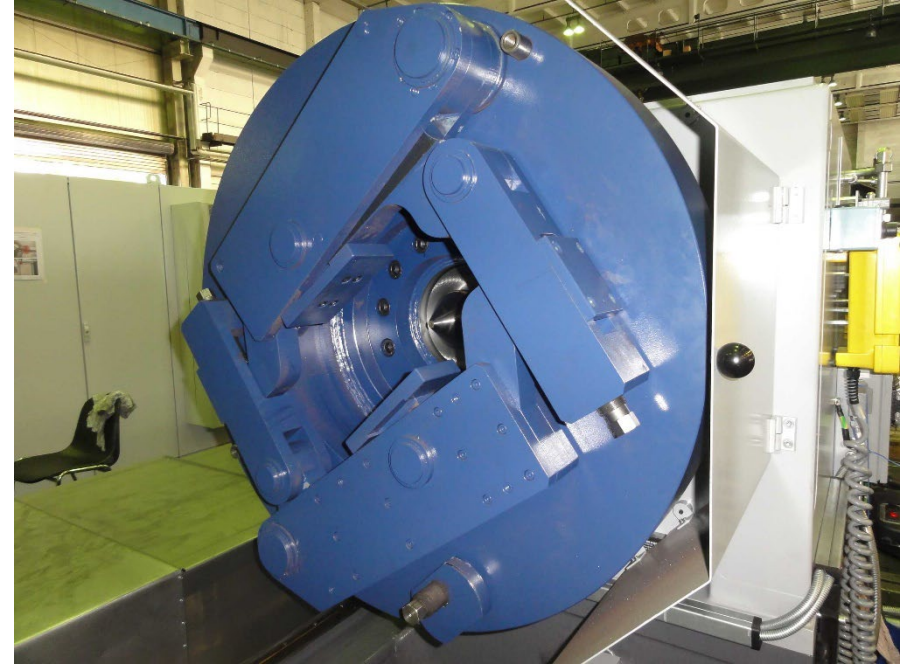


- Optionally flexible tooling systems e.g. Capto or Kennametal possible
- Higher stability in deep cuts
- Additional tool support possible

Faceplate – Faceplate similar to existing lathes

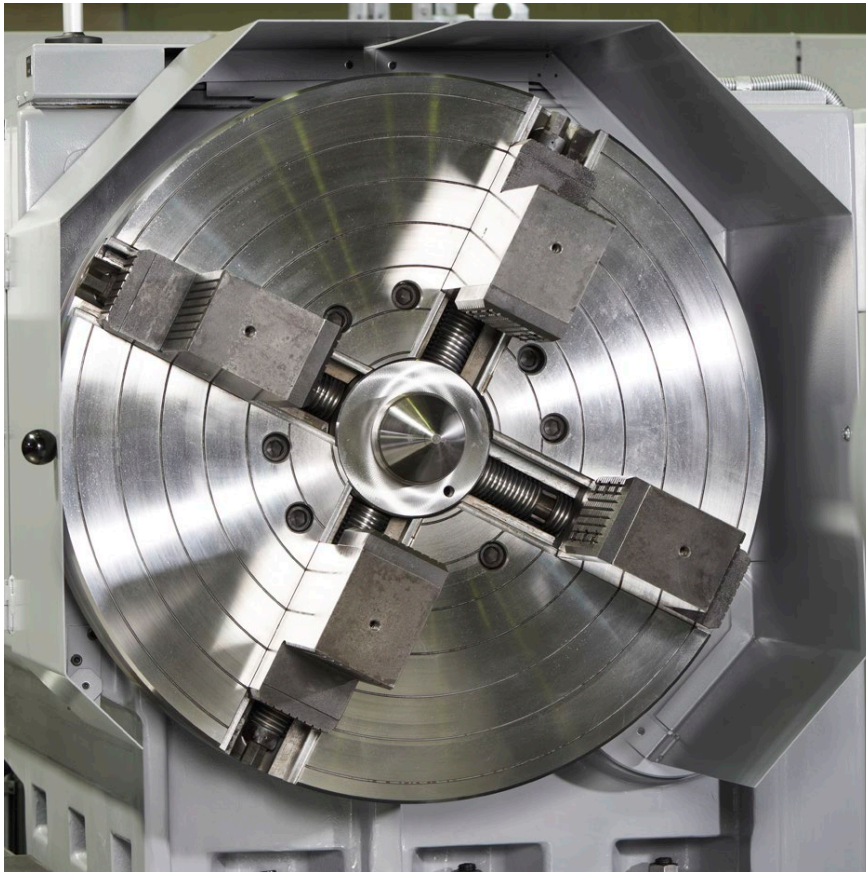


- Faceplate of AMTAC



- Faceplate of Herkules

Herkules Faceplate Design

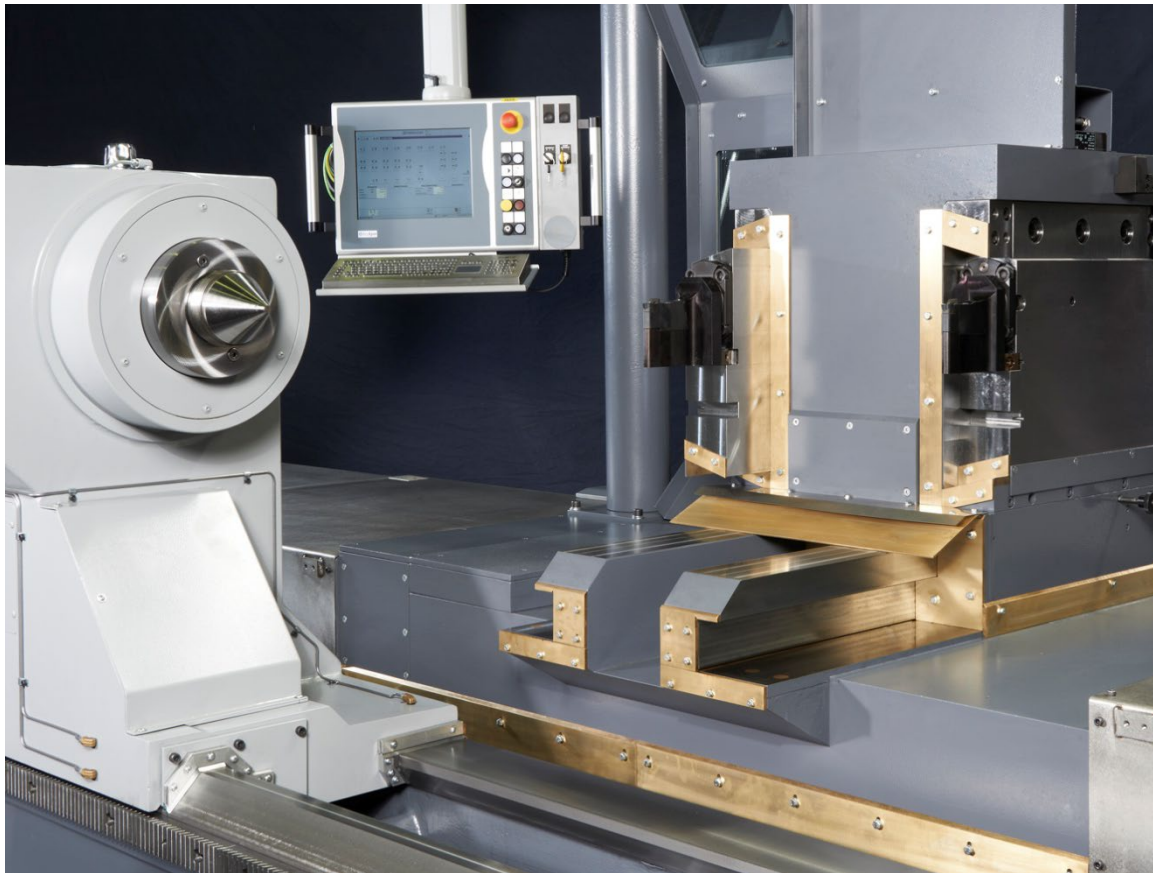


Faceplate on a P500 turning lathe

All our faceplates are made in house:

- cast iron base
- very good dampening and low vibration
- high stiffness
- four strong jaws made from special steel
- high strength in clamping forces
- steel inserts for high wear resistance

Heavy Duty Lathe Machines



Herkules P 500 x 5.000 CNC

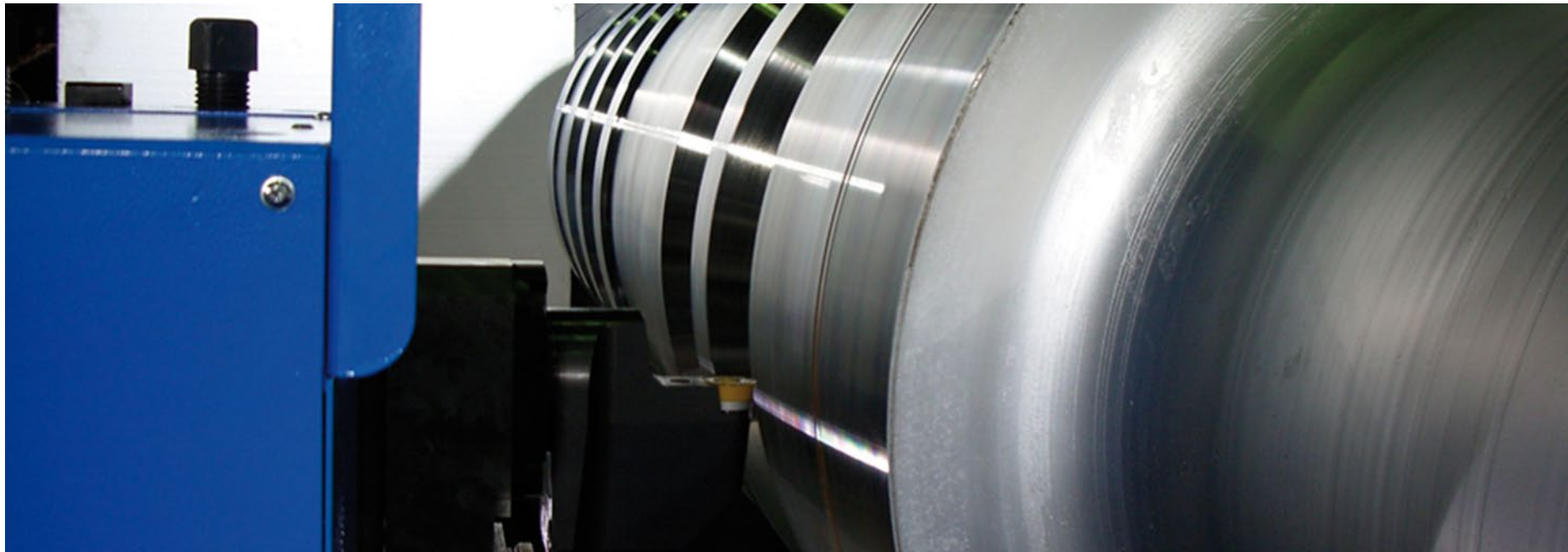
All same philosophy:

- cast iron based construction
- high strength casting housings
- high quality manufacturing
- high quality main bearings
- hardened guideways solutions
- preloaded ballscrews for high precision positioning
- average life time before modernization 25-30 years



- Summery

Nucor Berkeley signed the FAC November 2019
P 600 is full in production to the satisfaction of the customer since 2019



Thank you very much for your attention.