ROLLS FOR THE RUBBER AND PLASTIC INDUSTRY

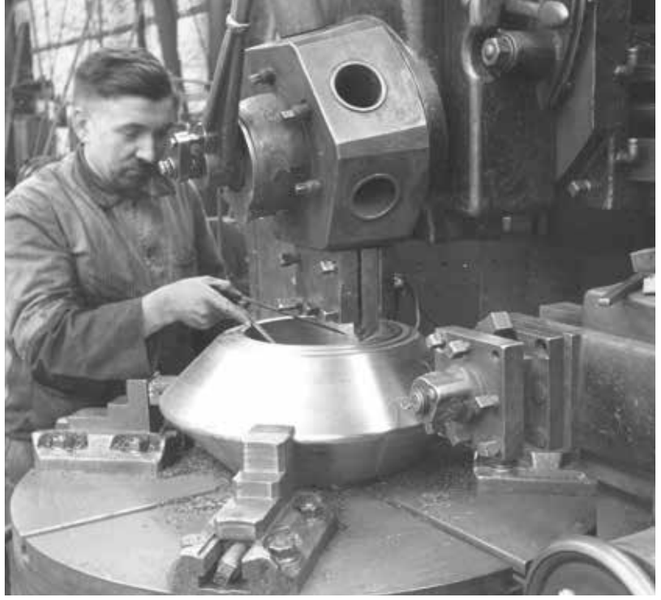
QUALITY WITH TRADITION
SINCE 1820

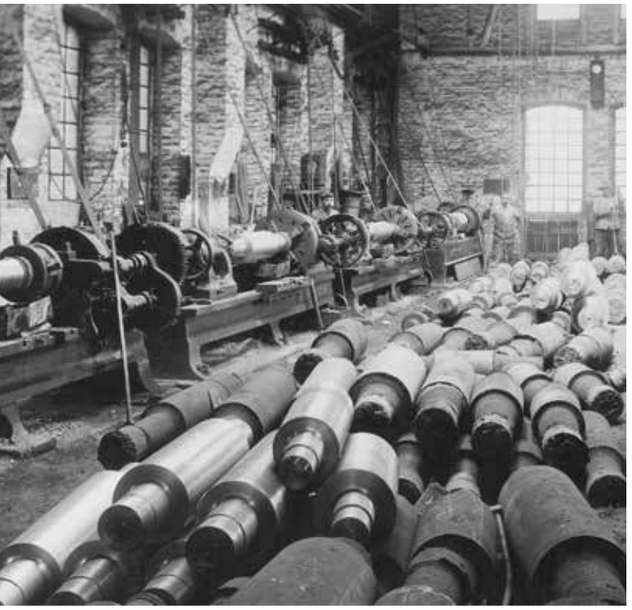
WALZEN IRLE is a worldwide leading company in the production of rolls for various areas of industry. The company stands for over more than 200 years of experience, technological competence, continuous research and development in the production of rolls.

The traditional and consequently close cooperation with machine builders and operators of constructions has lead to permanent and successful improvements of the WALZEN IRLE technologies and has made them an innovative technology leader.

We manufacture rolls for crushing, refining and mixing mills, reverse roll coaters and calender roll mills with strict precision and know exactly what is expected from our products. Starting with sophisticated design, through the use of the most modern materials for castings, through completion by extensive heat treatment facilities, *i*-hardening, hot grinding, finishing and superfinishing - our rolls satisfy the highest expectations.

HIGH PRECISION MACHINING - PRECISE IN MICRONS!





MORE THAN 300 YEARS OF FOUNDRY EXPERTISE, 200 YEARS OF ROLL CASTING

Rolls »made in Deuz« are used worldwide and have made a name for themselves for sophisticated technology and highest quality. Following the most important facts:

1693	start of casting and machining of iron parts by Johannes Irle
1820	founding year of the iron foundry in Marienborn and casting of the first chilled cast iron roll
1884	start of the production of paper calender rolls
1906	start of production of heavy rolls
1920	casting of the first cast steel roll
1950	casting of the first nodular iron roll
1970	implementing of hot grinding for plastic calender rolls
1985	WALZEN IRLE introduces the peripherally drilled roll to the paper industry
1989	development of coated thermal calender rolls made of forged steel
1990	development of the WALZEN IRLE roll material KSTV for high temperature applications
2001	development of the WALZEN IRLE S-Technology for optimization of the roll geometry under operating conditions
2006	erection of the large vertical spin casting machine (up to 80 t casting weight)
2007	production start of the new vertical spin casting machine
2007	implementing of new revised Heavy Duty Roll production line
2010	WALZEN IRLE celebrates its 190st anniversary as a roll manufacturer
2012	the 300th roll has been casted at the vertical spin casting machine
2015	delivery of the first HiCr-rolls with a successful start-up in in the plastic and film industry
2016	development and realization of a new roll design for large, weight-optimized, peripherally drilled heating rolls for e.g. the disposal foil production
2017	the 125th forged steel roll (various materials) was hardened on our induction hardening unit
2018	most successful year within machine tool business (rubber-/plastics industry), supply of more than 150 calender rolls
until today	continuous development of different grades for the benefit of the rubber and plastic industry

CALENDER ROLLS
BY WALZEN IRLE

Calender rolls provide an important basis for the success of a profitable rubber or plastic production. We develop , engineer and manufacture oil heated, water heated and cooled thermo rolls with optimal properties as individual solutions for customer specific requirements.

A flawless and precise roll geometry, uniform temperature distribution, accuracy of surface and mechanical characteristics are the key factors for the highest product quality and marketability of your product.

Being fully aware of these responsibilities, we continuously develop advanced production methods and procedures to improve the metallurgy, the design and the machining.
Our production takes place using the utmost modern technical equipment.

STRIP MATERIALS

heating or cooling rolls for use in 3 roll, 4 roll and 5 roll calenders or melting calenders.

For the production of:
ABS foils, flooring, office supply foils, roofing foils, decorative foils, landfill and pool foils and tarps, insulating foils, etc.

GASKET SHEETS

heated and cooled rolls for special roll calenders, i.e. gasket sheet calender

For the production of:
gasket sheets which are for example being used in the automotive industry but also in the aerospace industry.

RUBBER PRODUCTS

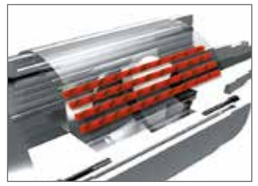
heated and cooled rolls for shredding, mixing and calendaring of rubber material, as well as rolls for cracker and refiner mills.

For the production of:
tires, straps, bands, conveyor belts, rubber profiles, sealings, gaskets, hoses, mats, pads etc.

CLOSE QUALITY ASSURANCE

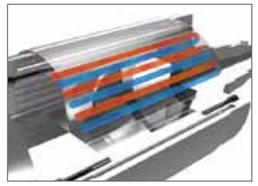
- surface hardness measurement according to LEEB, Vickers, Brinell, Rockwell and Shore C
- perthometer inspection for surface roughness
- equipment to measure bending and tensile strength properties
- a most modern dynamic balancer equipped for hot balancing operations
- turning lathes and grinders (including hot grinding) equipped with control units for automated measuring of concentricity, run-out, roll shape, etc.
- total quality measurement System assurance according to DIN ISO 9001 by German TÜV

HEATING AND COOLING CONCEPTS



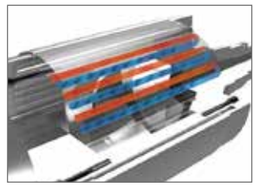
MONOTHERM S

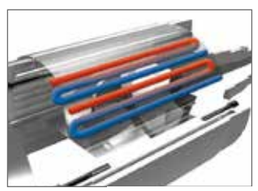
- application: two- or multi-roll calenders
- heating/cooling medium: mainly thermal oil or water
- flow principle: MonoPass system (peripheral bores close to surface with integrated patented turbulators)
- max. surface temperature: 200 °C
- optimal temperature distribution over the circumference
- perfectly adjustable temperature distribution over the barrel width and the circumference due to S-Technology



DUOTHERM UND DUOTHERM S

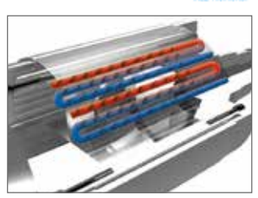
- application: two- or multi-roll calenders
- heating/cooling medium: mainly thermal oil or water
- flow principle: DuoPass system (peripheral bores close to the surface, in case of DuoPass S with integrated patented turbulators)
- peripheral drills far from roll surface
- max. surface temperature exceeding 200 ° C
- good temperature distribution over the barrel width
- perfectly adjustable temperature distribution over the barrel width and the circumference due to the optional S-Technology





TRIPASS UND TRIPASS S

- application: two- or multi-roll calenders
- heating/cooling medium: mainly thermal oil or water
- flow principle: TriPass system (peripheral bores either close to the surface or farther inside, in case of TriPass S with integrated patented turbulators)
- peripheral drills far from or close to roll surface
- max. surface temperature 160 ° C
- perfectly adjustable temperature distribution over the barrel width and the circumference due to the optional S-Technology



SURFACE AND GEOMETRY OPTIMIZATION

Grinding specifications		Journals			Rolls			
		Grey Iron (G)	Nodular Iron (S)	Steel (ST+FS)	Chilled Cast Iron (K)	Cr-Iron (CR 15)	Forged Steel (FS)	Hard Chrome Cover
Grinding	R_a µm	0,5	0,5	0,8	0,20	0,20	0,20	0,15
Fine grinding	R_a µm	0,4	0,4	0,4	0,10	0,15	0,15	0,08
Special grinding	R_a µm	0,3	0,2	0,2	0,07	0,07	0,07	0,05
Superfinsih	R_a µm				0,03	0,02	0,02	0,02
Hot grinding	R_a µm				0,3-0,4	0,5	0,6	0,7
Hot grinding with Superfinsih	R_a µm				0,03	0,02	0,02	0,02

SURFACE QUALITY

The surface quality of the roll is decisive for the product to be manufactured. Roughness measurements in R_t, R_z and R_a are the criteria to describe the surface finish of the roll.

RE-GRINDING

Depending on product quality, re-grinding operations become necessary from time to time. WALZEN IRLE provides the full range of surface finishing to achieve the required surface quality, shape and run-out tolerances of the roll.

CERTIFICATES

WALZEN IRLE reports on all quality related properties, e.g. surface roughness, roll shape and run-out values under cold and hot conditions.

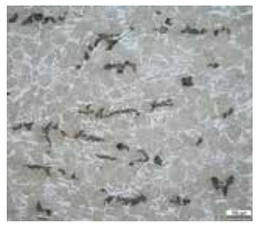
MODERN MATERIALS

The best surface quality of a roll will be reflected by the most modern roll materials.
In addition to the behaviour of adhesion, dimensional stability and strength, the increase of surface roughness and wear resistance are the most important parameters.
Contrary to popular belief „better wear resistanct can only be reach with higher surface hardness“ it should be noted that, beside the surface hardness, the microstructure of the surface is important as well. The more homogeneous the microstructure the smaller the increase of surface roughness.

Following roll materials are offered and used:

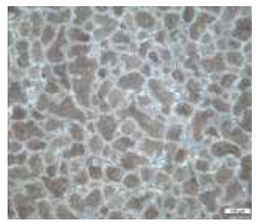
CHILLED CAST IRON (K) SINGLE POURED

Chilled cast iron rolls, single or compound material, cast statically or centrifugally, consist of cementite, ledeburite and the metallic base material matrix (Perlite). Surface hardness and wear resistance is depending on the percentage of cementite in the matrix and the constellation of the matrix.



INDEFINITE (I)

The main metallurgical feature of the statically or centrifugally cast indefinite rolls is the material matrix which is directed radially from the roll surface to the core. Cementite and graphite are arranged in arrays perpendicular to the roll surface. This makes indefinite rolls best suitable for applications where high wear resistance, high mechanical or thermal requirements are important.



CR-IRON (CR 15-C-S)

Rolls made of chrome steel are manufactured with the centrifugal casting method. Due to the special structure of the Cr-Carbides the chrome alloys have superior mechanical strength and toughness in comparison to other carbide containing materials. Further positive properties are high pressure and thermal resistance. The amount of Cr-carbides in the microstructure is variable in a wide range. Increasing amounts of Cr-carbides increase the wear resistance and decrease toughness and mechanical strength. Depending on the amount of Cr-carbides surface hardness up to 740 HV can be obtained by heat treatment.

FORGED STEEL (FS 1 / FS 2)

Forged steel rolls contain annealed martensite in the hardened surface layer and a homogeneous tempered matrix in the core and journal material. After forging, tempering and pre-machining the rolls will be induction hardened and annealed.

INNOVATIONS AND PATENTS

i-HARDENING

i-hardening is a special thermal process which has been developed by us for hardening of the roll surface in order to achieve a quality improvement of the calender roll. The achievable hardness is dependent on the material and the tempering temperature (exact specification is required).

Advantages:

- the induction hardening process provides a very homogeneous concentric hard layer which gives the roll an excellent run out behavior
- results in highest values of roll characteristics
- best run out at hot operation of rolls
- opposed to a hard coating or the hard layer of a standard chilled cast iron roll the induction hardening procedure will not create a thermal insulation
- reduced residual stresses
- potentially the roll can be re-hardened when the initial layer is ground off

HOT GRINDING

In order to eliminate concentricity deviations and edge deformation of the thermo rolls during operation the hot grinding process has been developed and implemented in our production.

The rolls will be heated up to the respective operating temperature of the production calender, will then be ground to shape and finish machined at a temperature which reflects the medium operating range of the calender. Deviations of concentricity and shape at operating temperature are reduced to a minimum. Furthermore calenders running with rolls manufactured using this grinding procedure show a higher performance and provide better quality products than with conventionally machined rolls.

S-TECHNOLOGY

The impulse to develop the WALZEN IRLE S-Technology was to further improve the transition of thermal energy from the peripheral bores to the roll surface. The thermal transfer is improved by spindles (turbulators) inserted into the peripheral bores which force the heating medium into a spiral motion thus increasing the speed of the fluid and the area it is passing by.

WALZEN IRLE S-Technology is applicable for every peripherally drilled roll type as a basic feature and also for upgrading existing rolls. Using the S-Technology tolerances for temperature and shape accuracy can be reduced by up to 50% compared to conventional peripherally drilled rolls.

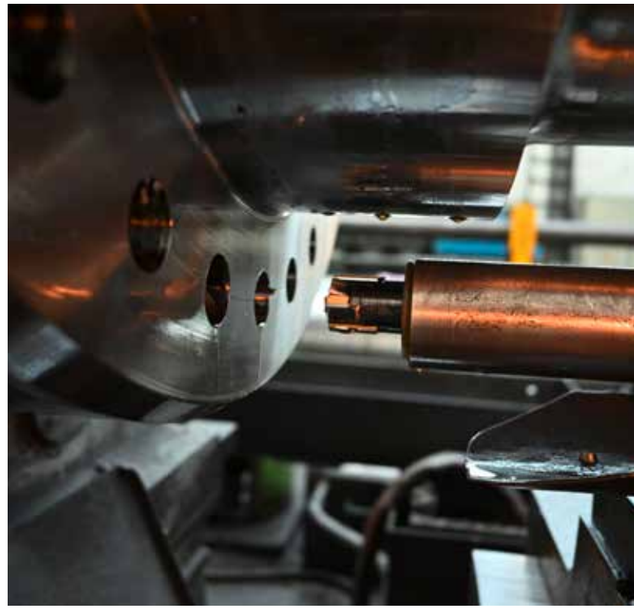
ROLL SERVICE

We can ensure a continuously excellent performance by frequently servicing your rolls. Besides cold or hot grinding with or without crown control we perform necessary cleaning of the flow system of the heating and cooling rolls, refurbishing of bearing seats and fluting of roll surfaces.

A possible rebuild of older rolls to the S-Technology can provide a much better temperature distribution on the surface.

i-HARDENING MAX. DIMENSIONS

- diameter up to 1.350 mm
- barrel length up to 10.000 mm
- finished weight up to 60 t



CHROME PLATING / THERMAL COATING

If a surface coating or plating is required we can provide a hard chrome plating or a thermal spray coating according to customer's application.

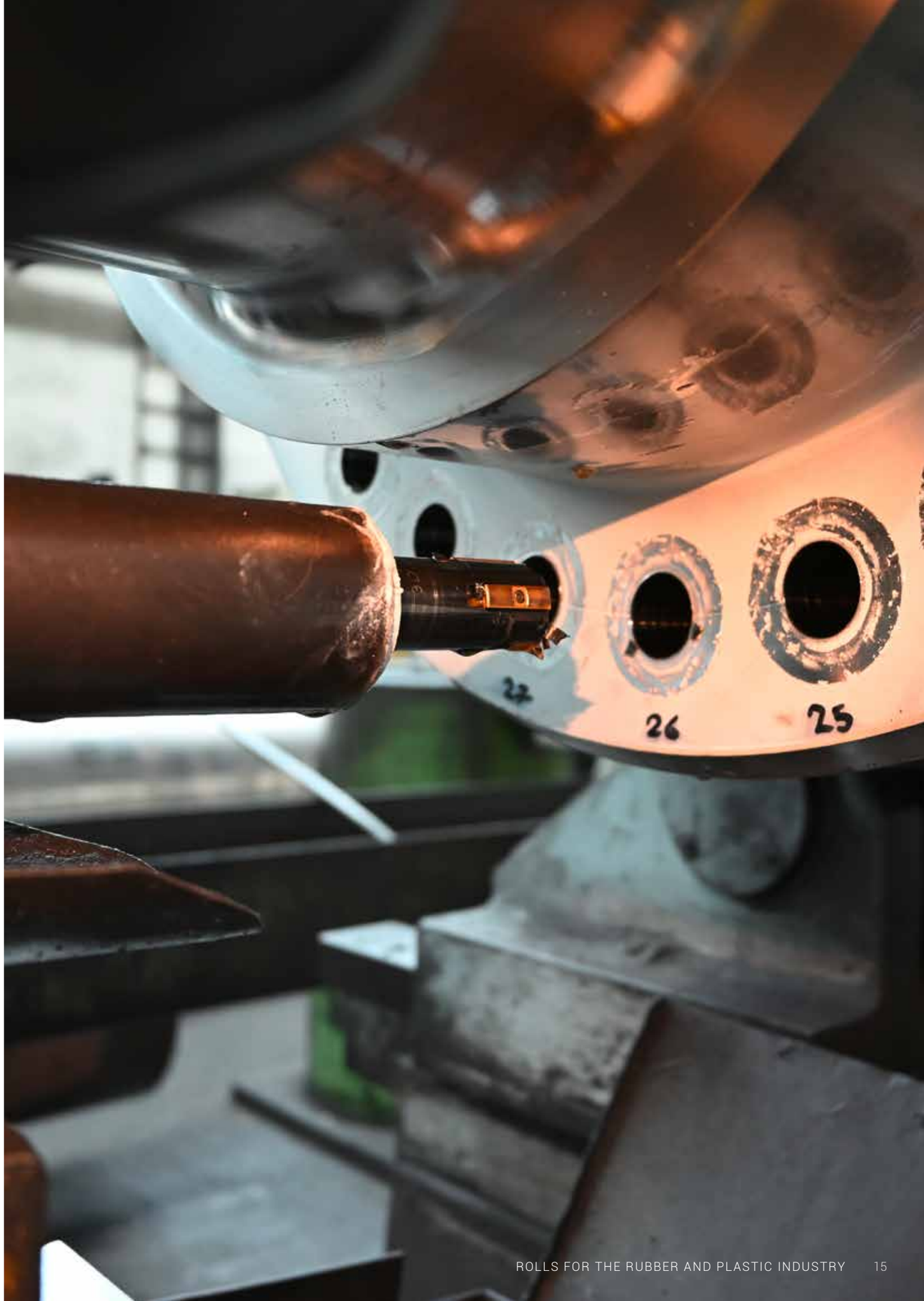
MATERIAL INTRODUCTION
FOR CALENDERS

Material	Chilled Cast Iron	Indefinite	Cr-Iron	Forged Steel
	K	I	CR15-C-S	FS*i*
Applications	**• = suitable**			
Breaker mills (fluted rolls)	•			
Mixing mills	•			
Coaters and reverse roll coaters	•		•	
Gasket sheet calender	•	•		
Rubber calender	•			•
Plastic calender	•		•	•
Melting calender			•	•

Specifics	static mono or compound casting or spin casting	static mono or compound casting or spin casting	classic hardened	*i*-hardened
Tensile strength core [N/mm2]	Hard layer ≥ 160	Core ≥ 400	Core ≥ 400	Core ≥ 900
Modulus of elasticity roll [N/mm2]	≥ 130**	≥ 170**	≥ 180**	≥ 200*
Yield strength core [N/mm2]	–	-	≥ 390	≥ 500
Compression-tension fatigue strength core [N/mm2]	Core ≥ 60	Core ≥ 80	Core ≥ 150	Core ≥ 220
Elongation at break core [%]	< 1	< 1	< 1	≥ 8
Hardness range HV [ø-addicted]*	500-600	500-560	500-700	500-700
Usable hardening depth [mm]	10-20	10-20	10-20	6-15

* depending on temperature ** „mean modulus“

The above mentioned proposals of roll materials for the individual applications are based on general experience and the production capabilities of WALZEN IRLE.
The optimum design and material may deviate depending on the specifics of the individual application.



PRODUCTION CAPACITY

CASTING FACILITIES

- static single poured and compound casts - single pieces up to a maximum cast weight of 130 tons, over a diameter of over 1,700 mm and 13 m length
- horizontal centrifugal casting machine for single poured and compound cast pieces up to a barrel length of 6 meters
- vertical spin casting machine for rolls up to 11,5 m length and 75 tons finish weight

MACHINING

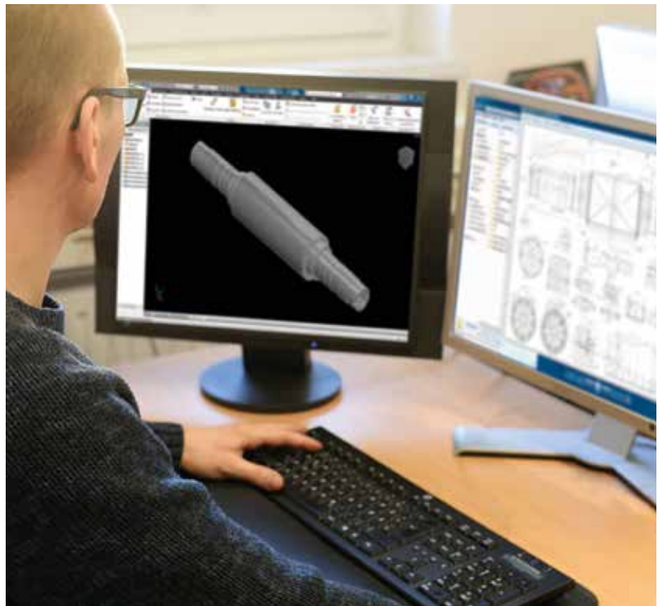
- CNC-controlled turning-, milling-, grinding-, drilling-, and balancing machines in 12 processing halls, for finished size:
  - max. barrel length up to 13 meters,
  - Ø over 1,700 mm,
  - 120 tons finished weight
- approx. 1.500 tons finished products per month

MELTING FACILITIES

- 8 electrical melting furnaces (induction), from 3 to 30 tons capacity

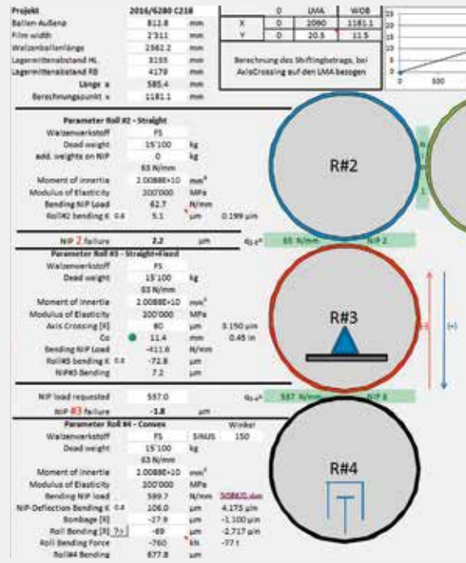
HEAT TREATING FACILITIES

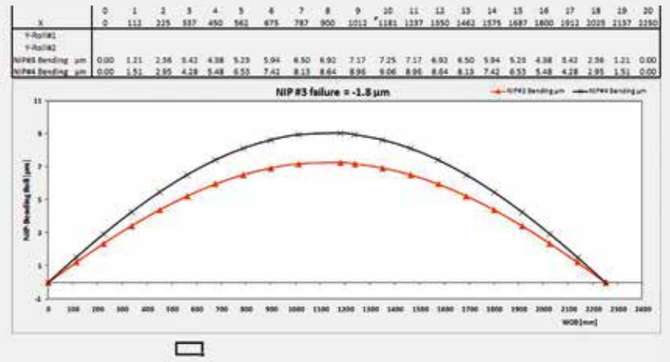
- 17 gas-fired heat treatment furnaces



ENGINEERING AND DEVELOPMENT

WALZEN IRLE has its own engineering- and calculating department (amongst others, according to FEM-Methods of Finite Elements). Thereby the customers get supported effectively by the construction of new plants or major rebuilding of existing rolling mills.





Apart from the preparation of drawings- and order documents the following areas are also covered:

- on-going technical support of the customer regarding our products
- planning of the technical documents for our products
- research and development especially in the area of heated calender rolls in cooperation with the metallurgic laboratory
- Patent monitoring

Technical consultation and constructional support

- technical sales support
- dimensioning of components according to customers demands
- load-carrying capacity of the components- and fatigue strength analysis
- optimising of the components according to the customer's requirements

QUALITY MANAGEMENT

The high requirements of our customer in the material properties of our products are fulfilled by the specialists in our materials laboratory.
The standard tasks are continuous chemical analyses during the melting- and casting processes, permanent quality controls during all production steps and description of the metallurgic criteria for the manufactured products.

The following essential operations are carried out in the laboratory:

- sales support in the area of application specific material recommendations
- chemical analysis using spectrometer
- measuring the bending and tensile strength
- testing the surface hardness with all, in the industry, accredited measurement- methods
- non-destructive measurements with ultra sonic devices
- non-destructive measurements with eddy-current gauge
- magnetic powder testing
- material tension testing
- surface testing with perthometers
- research and development especially in the area of production methods

The high qualification of our staff in combination with our experience enables us to realise tailor made solutions and customer specific improvements. We are continuously optimising our work process according to the ISO 9001:2018 Quality Management, the ISO 14001:2015 Environment Management and the ISO 50001:2018 Energy Management Systems.

WALZEN IRLE GmbH
Huettenweg 5 · 57250 Netphen · Germany

phone +49 (0)2737 / 504-0
fax +49 (0)2737 / 504-111
email information@walzenirle.com
web www.walzenirle.com