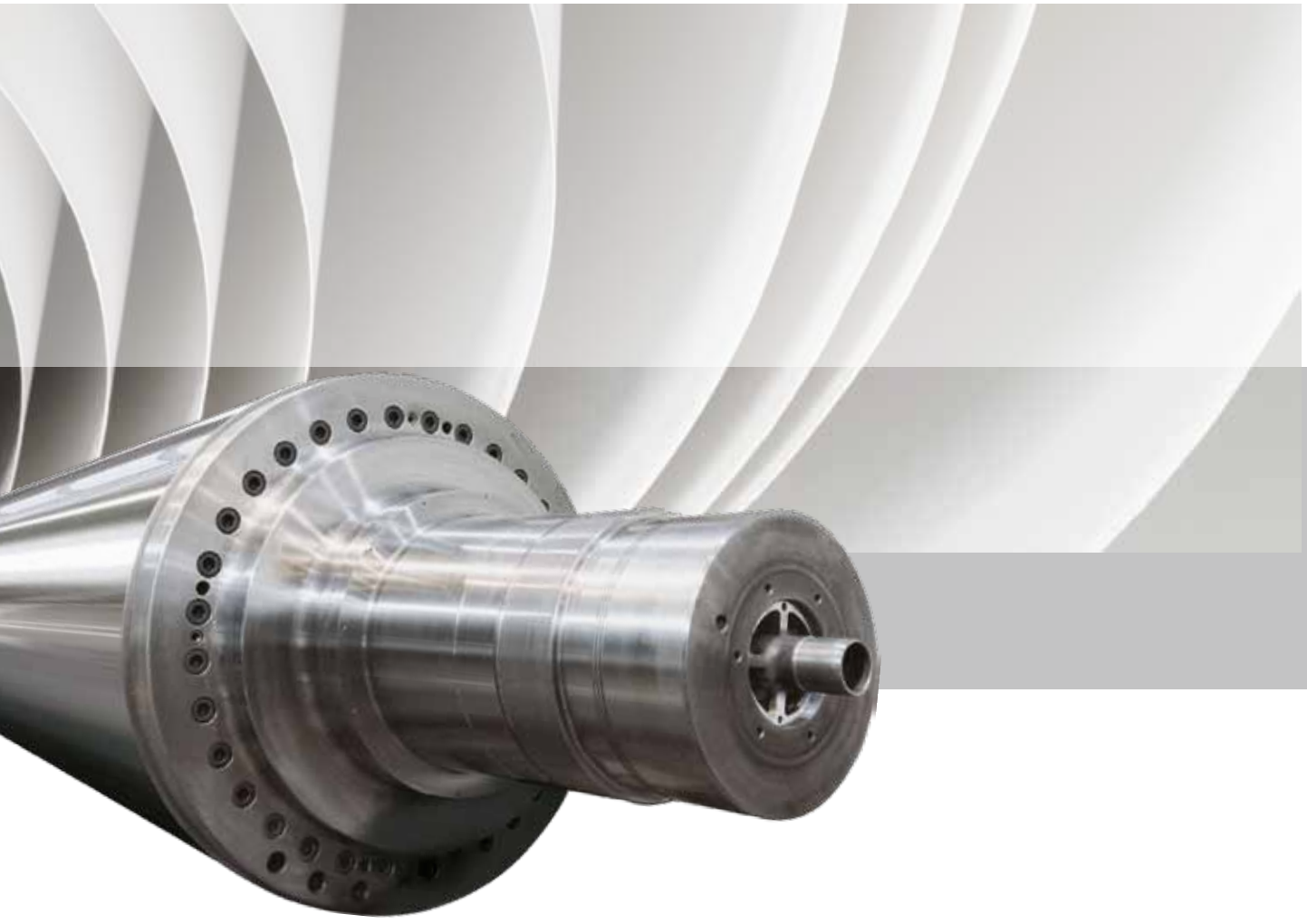
ROLLS FOR THE PAPERINDUSTRY



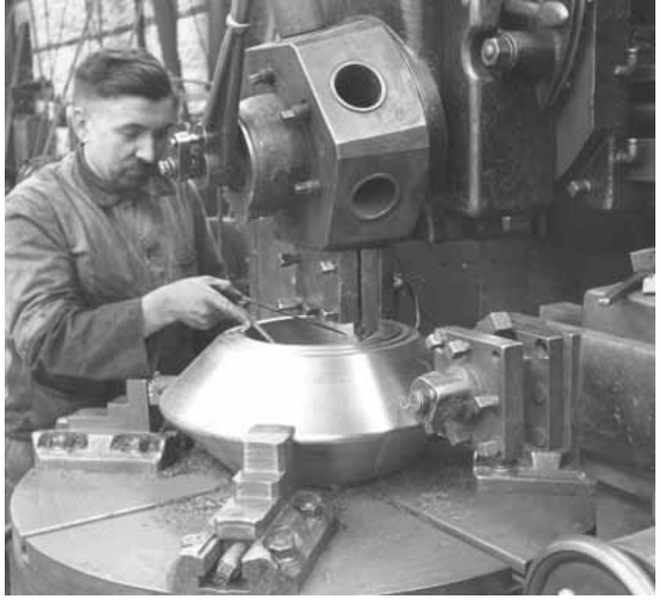
QUALITY WITH TRADITION
SINCE 1820

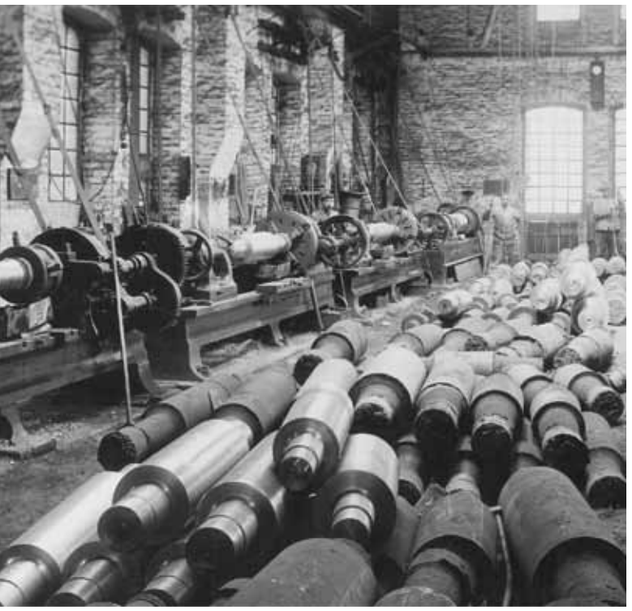
WALZEN IRLE is a worldwide leading company in the production of rolls for various areas of industries. The company stands for over more than 190 years of experience, technological competence, continuous research and development in the production of rolls.

Since 1884 we have purposefully and continually developed our, in the meantime worldwide, leading knowledge in the areas of standard rolls and heated rolls for conventional, soft, super and multinip calenders.

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 are an original parts manufacturer (O.E.M.) for all calender types in use and have at our disposal roll concepts for the complete production spectrum of the paper industry like graphical, cardboard- and packaging, tissue and special paper.
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.
INCREASE YOUR PROFIT - WITH OUR ROLLING KNOWLEDGE!





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

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
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
2000	Variable edge insulation of thermal rolls
2000	Development of the IRLE-Auto-Lock-System
2000	Market launch of hot grinding procedures for paper calender rolls
2000	Market launch of hot balancing of paper calender rolls
2001	Development of the WALZEN IRLE S-Technology for optimization of the roll geometry under operating conditions
2005	Introduction of the rapid service journal for calender rolls
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	Implementation of a complete new production line for heavy rolls
2010	WALZEN IRLE celebrates its 190st anniversary as a roll manufacturer
2012	the 300th roll has been casted at the vertical spin casting machine
until today	continuous development of different grades for the benefit of the paper industry

CALENDER ROLLS
BY WALZEN IRLE

Calender rolls provide an important basis for the success of a profitable paper production.
We develop 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.

CALROLL

Conventional calender rolls are used in two- or multi-roll-calenders as unheated, solid poured with integral or bolted on journals. We manufacture replacement rolls with improvements in material and production.

THERMO ROLLS

Heated thermal calender rolls with peripheral bores for optimal heat transfer from WALZEN IRLE utilizing the well known flow principles MonoPass, DuoPass or TriPass can be found in all types of calenders, in hardnip calenders, in super- and soft-nip calenders as well as in offline or online operating multinip calenders.

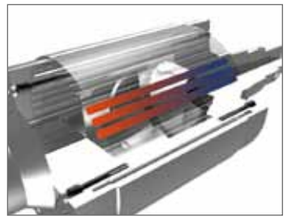
ROLL SHELLS

We manufacture the shells for multi-zone rolls and swimming rolls in various materials such as chilled cast iron, the modified chrome cast iron material KSTV or hardened forged steel. For soft covered rolls the shells are normally made of grey iron or nodular iron.

CLOSE QUALITY ASSURANCE

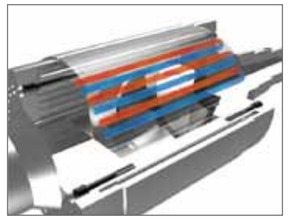
- surface hardness measurement according to LEEB, Vickers, Brinell, Rockwell and Shore C
- perthometer inspection for surface roughness
- equipment to measure bending and tensile strength properties
- a most modern dynamic balancer equipped for hot balancing operations
- turning lathes and grinders (including 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 CONCEPTS



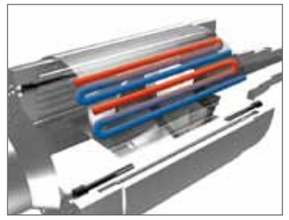
MONOTHERM

- application: two- or multi-roll hardnip calenders
- heating medium: water or saturated steam
- flow type: MonoPass system
- peripheral drills with relatively large surface distance
- max. surface temperature 120 °C



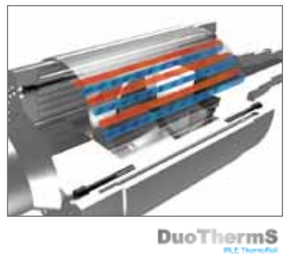
DUOTHERM

- application: two- or multi-roll calenders, soft and super calender, multinip calender
- heating medium: water, thermal oil or saturated steam
- flow type: DuoPass system
- peripheral drills close to roll surface
- max. surface temperature exceeding 200 °C



TRIPASS

- application: two- or multi-roll calenders, soft and super calender
- heating medium: water or thermal oil
- flow type: TriPass system
- peripheral drills far from or close to roll surface
- max. surface temperature 160 °C



MONOTHERM S, DUOTHERM S AND TRIPASS S

- application: soft- and multinip calender
- heating medium: predominantly thermal oil
- flow type: MonoPass, DuoPass or TriPass system
- peripheral drills far from or close to roll surface with turbulators inside
- surface temperature ≥ 160 °C

INNOVATIONS AND PATENTS

As evidence of our intensive efforts to effectively support our partners in the paper machine engineering and in the paper industry, we own more than 20 patents and innovations which we have developed in the calender roll sector.
Following we present some of our developments and patents:

S-TECHNOLOGY

Middle of the 1980´s WALZEN IRLE established peripherally drilled rolls for the paper industry. This was an important step towards higher temperatures on roll surfaces.
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.

COMPARISON OF THE ROLL PROPERTIES OF DUOTHERM AND DUOTHERM S

		IRLE DuoTherm Standard	IRLE DuoTherm S
External diameter	OD [mm]	760	760
Inner diameter	ID [mm]	380	380
Pitch circle diameter of peripheral bores	Dpb [mm]	630	630
Number and diameter of peripheral bores	# / Db [mm]	28/37	28/37
Flow rate	V [m^3/h]	70,2	70,2
		Results	
Circumferencial radius deviation	Δr [µm]	1,0	0,4
Circumferencial temperature deviation	Δr [°C]	1,85	0,6
Calculated pressure loss	Δr [bar]	0,14	0,17

INNOVATIONS AND PATENTS

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.

THERMAL ROLLS MADE OF FORGED STEEL

The requirements for thermo rolls have increased extremely in recent years. A real innovation has been thermo rolls made of forged steel with carbide or ceramic coatings. The technology has been developed by WALZEN IRLE together with the S. D. Warren Company. We acquired the exclusive rights to manufacture and market the rolls of the S. D. Warren Company, today known as Sappi Fine Paper North America.

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

DYNAMIC HOT BALANCING

The target of the WALZEN IRLE „hot balancing process“ is to optimise the operating behaviour of thermo rolls under specific operating temperatures and speed ranges during the balancing process. Cold balancing of rolls without considering operating parameters may compromise quality results.

IRLE AUTO-LOCK-SYSTEM

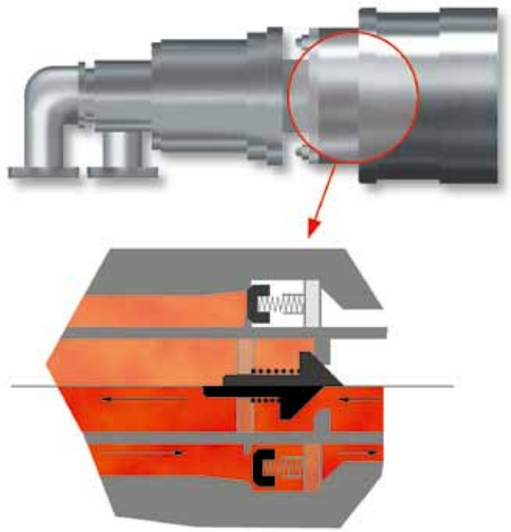
The Auto-Lock-System for heated calender rolls is an innovation of WALZEN IRLE which serves the reduction of shut down times for maintenance and repairs increasing operating safety at the same time.

The Auto-Lock-System consists of a valve which seals the heating medium (oil or water) in the roll during roll change, other maintenance work or in case of a pressure drop i.e. breach of a hose to the rotary joint.

It is possible to update your existing roll with the IRLE Auto-Lock-System.

i-HARDENING MAX. DIMENSIONS

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



VARIABLE EDGE INSULATION

To maintain optimal behaviour of the calender rolls even with varying paper widths an individually adjustable edge insulation is the logical consequence in order to avoid overpressing of the paper edges.

WALZEN IRLE has developed a system to adjust the size of the edge insulation without having to dismantle the roll.

The adjustment can be done via one central bolt on the outside of the roll for all insulation pipes at once.

INNOVATIONS AND PATENTS

THE RAPID SERVICE JOURNAL FROM WALZEN IRLE

The patented new maintenance friendly, roll journal comes with 5 technical and handling benefits:

1. Sealing and bearing function are decoupled. Maintenance work on the roll does not require the dismantling of the whole journal. Time consuming rebalancing or regrinding is not necessary.
2. An update of existing rolls with the WALZEN IRLE variable edge isolation is possible.
3. Under high operating temperatures calender rolls made from chilled cast iron tend to thermal bending (bi-metal effect). The IRLE journal allows a thermal straightening of the roll. Balance and runout will be improved and provide the best possible paper quality for you.
4. The new journal from WALZEN IRLE uses special flat seals for temperatures up to 450 degC. Surface temperatures can be brought to levels never seen before.
5. The WALZEN IRLE rapid service journal allows the use of flexible balancing weights. They can be adjusted to every position on the journal´s edge. Balancing is much easier and quicker than with conventional journal designs.

ROLLS TECHNIQUE: FKM GUIDELINE

The „Calculated Strength Verification" is a guideline of the German Institute "Forschungskuratorium Maschinenbau (FKM)" for judging the operation safety of machine parts. A basic part of this guideline is the reduction of material property values with regards to load capacity. For calender rolls from cast iron materials the FKM requires a minimum safety factor of 2,4 (forged steel 1,5).
The combination of the reduced material values and the higher level of safety requirements result in a much higher operation safety - according to the IRLE-standard calculation up to 3,2.
In case of a roll failure material inspections will always refer to the FKM guideline because it reflects the documented state of the art. WALZEN IRLE is using the FKM guideline for roll design. If the trend "faster, bigger, wider" will continue in the paper industry calender rolls will have to get bigger in diameter or alternative roll materials like KSTV or FS have to be used.

MODERN MATERIALS

K-560, KT-560

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.

FS*i* / FS*i-plus*

If roll demands exceed the possibilities of the KSTV material, high tempered forged steel is recommended. Besides the good thermal conductivity forged steel also offers excellent strength properties and shape stability characteristics under operating conditions. The surface of forged steel rolls is either induction hardened or spray coated to provide the wear resistance.
Our FS*i*-materials are distinguished by a particularly high surface hardness. The material FSi plus is being used in softnip, multinip or shoenip calenders where high temperatures and temperature transfer ratios along with a high wear resistance are extremely important.

MATERIAL INTRODUCTION
FOR CALENDER

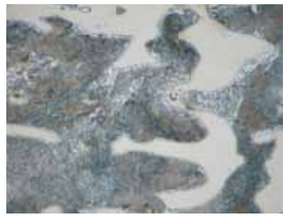
Roll Material	Chilled Cast Iron*			Nodular Iron	Forged Steel
	K	KT	KSC	KSTP	FS*i*
Applications	• = suitable				
Hartnip calender	•	•	•	•	
Softnip calender	Δ	•	•	•	•
Multinip calender		•	•	•	•
Extended nip calender		Δ			•

Specifics	standard	enhanced temperature resistance	enhanced corrosion resistance	high modulus of elasticity for covered rolls	cast steel, induction hardened
Tensile strength [N/mm²]	hard layer ≥ 200	hard layer ≥ 230	hard layer ≥ 230	≥ 450	core ≥ 800
Modulus of elasticity [kN/mm²]	≥ 130**	≥ 135**	≥ 135**	≥ 160	≥ 200
Yield strength - core [N/mm²]	-	-	-	-	≥ 650
Compression-tension fatigue strength - shell [N/mm²]	≥ 60	≥ 70	≥ 70	≥ 120	≥ 220
Elongation at break roll [%]	< 1	< 1	< 1	≥ 3	≥ 8
Hardness range HV [ø-addicted]*	520-640	500-620	520-640	220-280	540-620

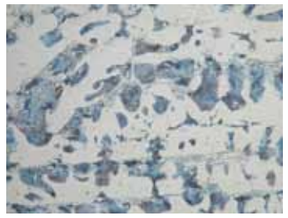
* For a surface hardness of chilled cast iron rolls up to 640 HV we recommend our compound casted rolls.
** "Average" modulus of the roll depending on diameter.

Barrel surface 100x

K



KT



KSC

FS*i*

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

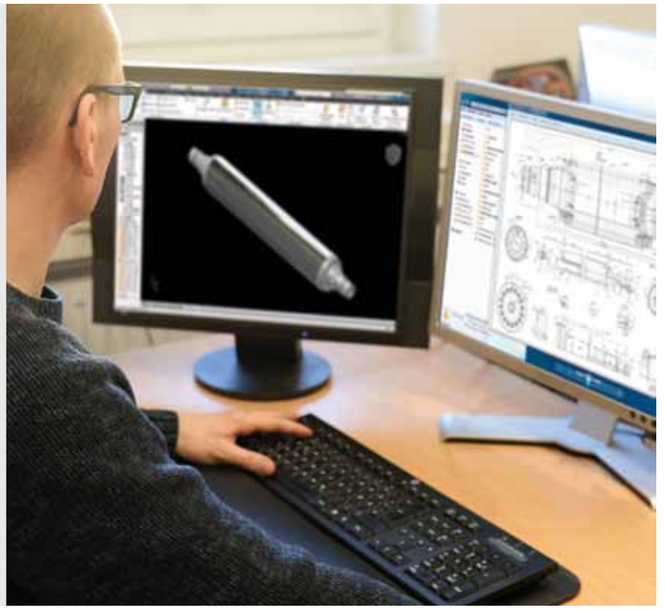
- 8 electrical melting furnaces (induction), from 3 to 30 tons capacity

HEAT TREATING FACILITIES

- 17 gas-fired heat treatment furnaces

ENGINEERING

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

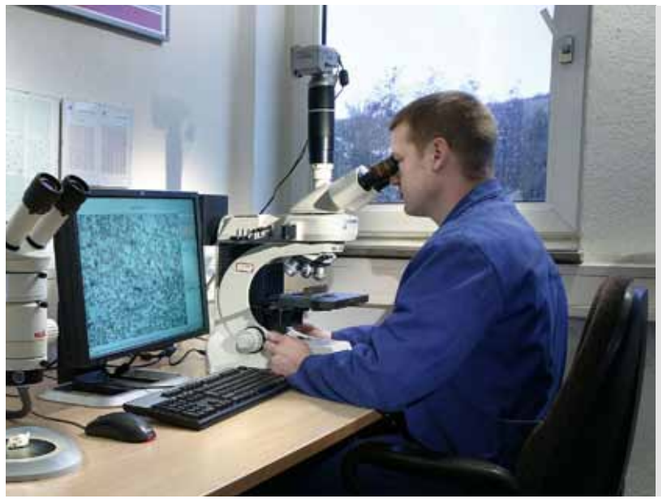
QUALITY MANAGEMENT

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 9001:2008 Quality Management, the ISO 14001:2009 Environment Management and the ISO 50001:2011 Energy Management Systems.

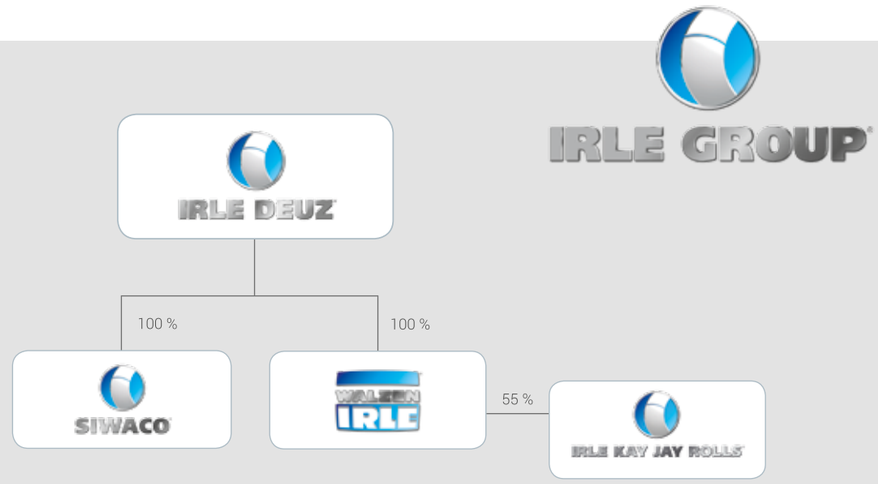


IRLE GROUP

Due to strategic decisions and developments of the structure, the IRLE GROUP had started with a spin-off into IRLE DEUZ GmbH and WALZEN IRLE GmbH in the early 70´s of the last century. WALZEN IRLE is a 100 % subsidiary of IRLE DEUZ GmbH.
IRLE DEUZ GmbH is the holding of the IRLE GROUP. The IRLE DEUZ Management actively attends strategic developments, organization and business guidelines of the subsidiary companies. The holding provides financial accounting, process planning, work organization, new constructions as well as maintenance and repairs and operates the it-systems for WALZEN IRLE, SIWACO and IRLE KAY JAY ROLLS.

In 2001 SIWACO GmbH was founded as a service and trading company. SIWACO is a distribution company which is specialized in wear resistant rolls, roll shells and tools for the tube production.

In 2007 a partnership agreement has been closed with the Indian Company Kay Jay Rolls Pvt. Ltd.. Both parties agreed to build and operate an iron foundry. For this „IRLE KAY JAY ROLLS Pvt. Ltd.“ has been founded. In 2008 the buildings for foundry and workshop have been built, factory equipment has been erected and production processes have been started.



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Holding Company
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SIWACO GmbH
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