FRIESE

Specialized in corrugating rolls engineered and made in Germany

Everywhere
Every Challenge
Every Single Facer

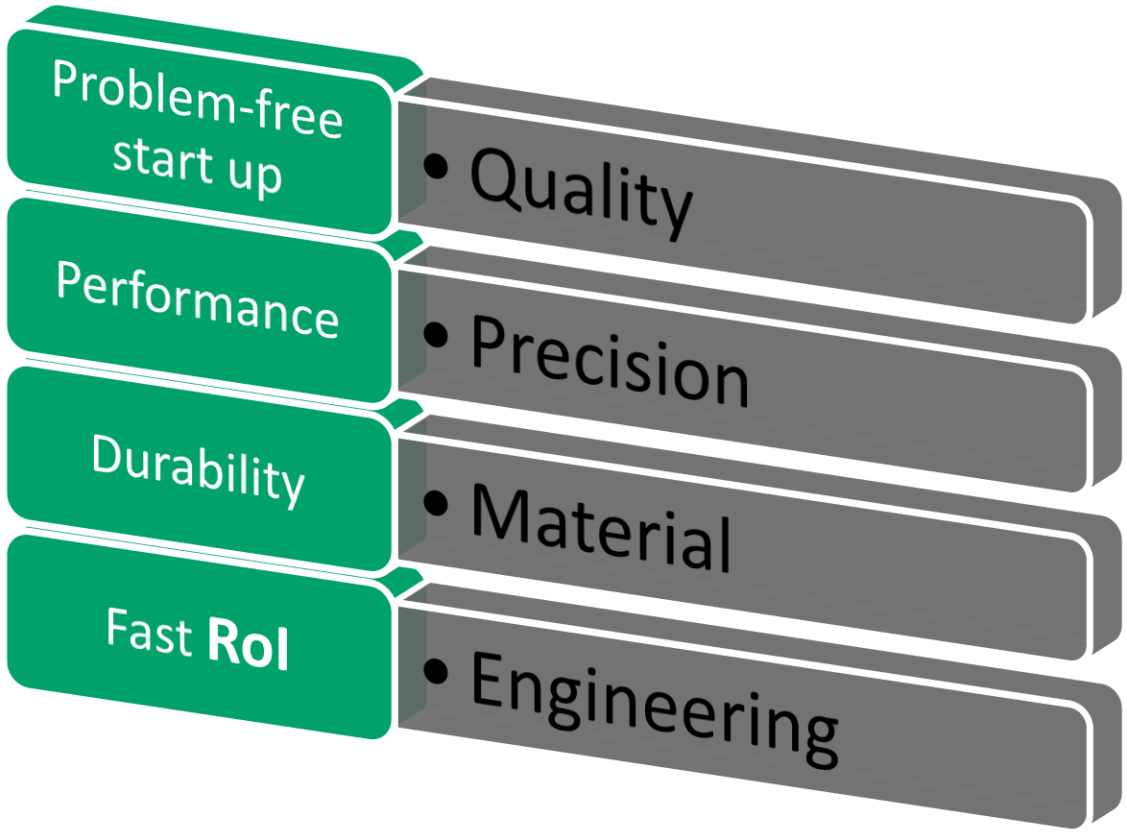
FRIESE – history

1993	Production start
1995	CCS/Thermogrooves
1996	Tungsten-carbide coating
1997	ROCKWELLE
1998	ROCKWELLE-polishing procedure
1999	Profile optimization ROCKPROFILE
2000	170 sets of corrugating rolls
2001	200 sets of corrugating rolls
2002	Own coating facilities
2003	290 sets of corrugating rolls
2005	3rd Waldrich grinder
2006-11	new buildings and machine modernization
2012	4th Waldrich grinder
2013	350 sets of corrugating rolls
2014	Latest production hall finished
2015	5TH Waldrich grinder
2016	450 sets of corrugating rolls
2017	New max size precision lathe
2018	Deep hole drilling machines
2020	First in Business audited on Sedex / SMETA

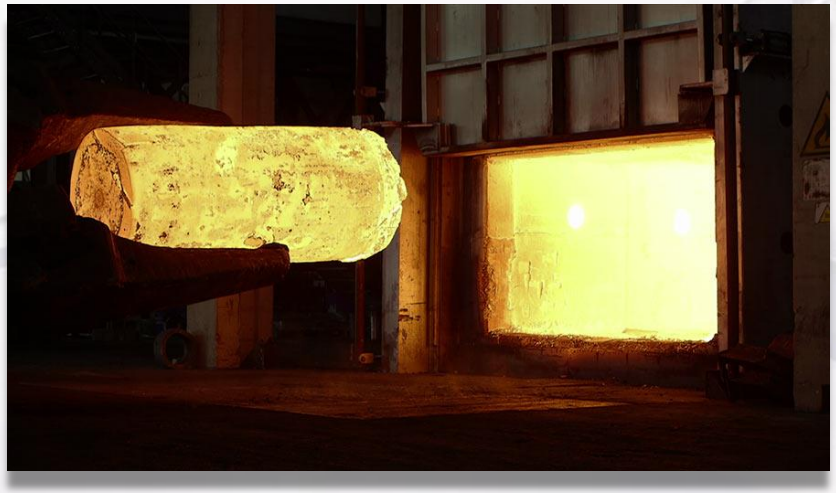
FRIESE – figures

Investment volume since 2014	7 Mio. €
Building area	6000 sqm
Employees	79
Overall Capacity	450+ set

Outstanding Quality creates Outstanding Performance



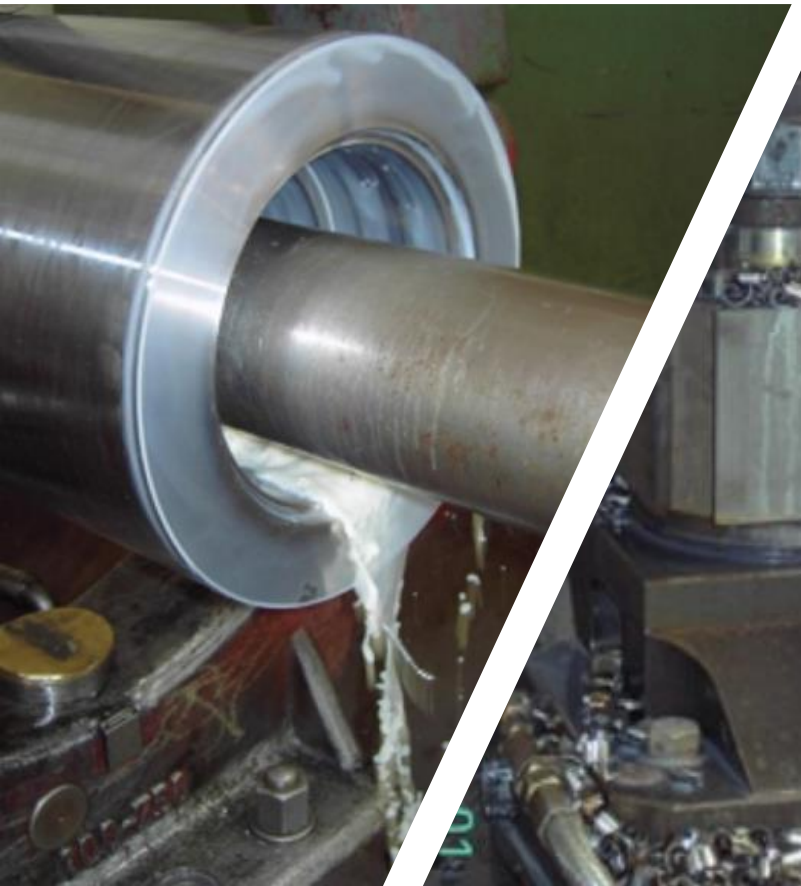
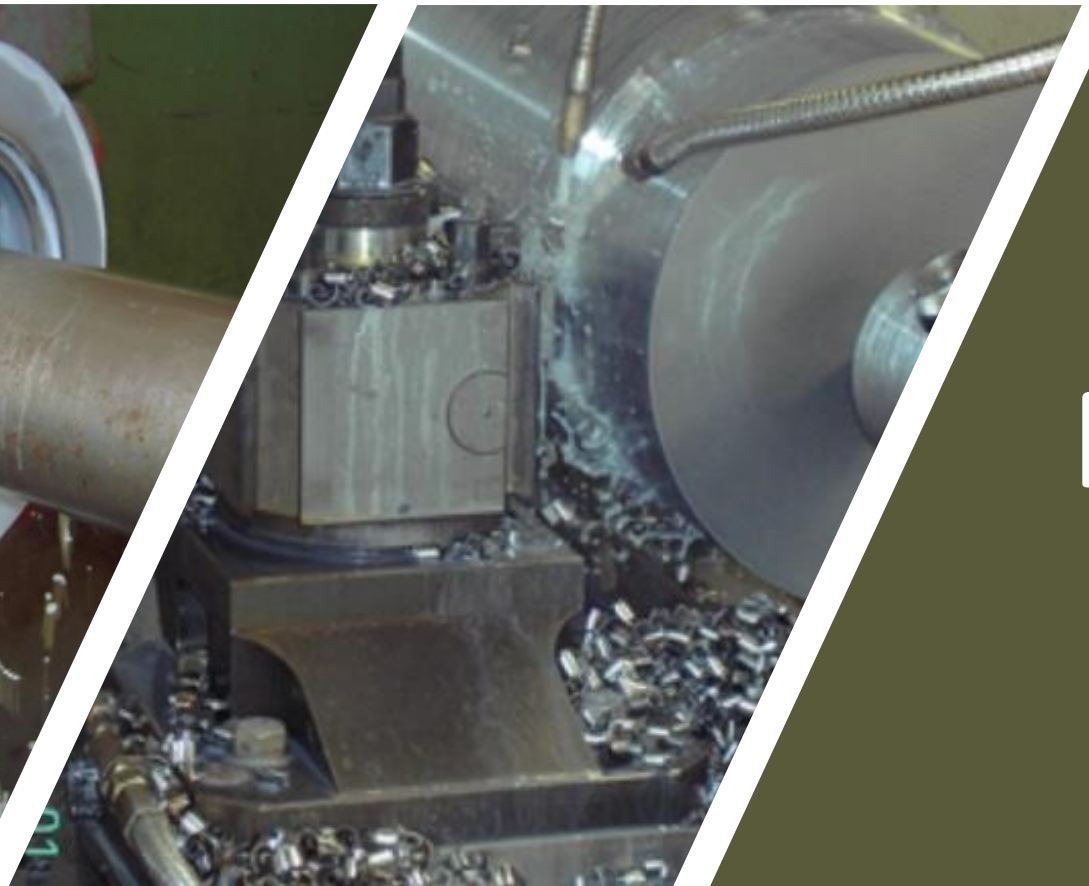
FRIESE – material



- **Process optimized steel**
- **Single forged hollow tubes for each roll**
- **No „core material“ in our process**





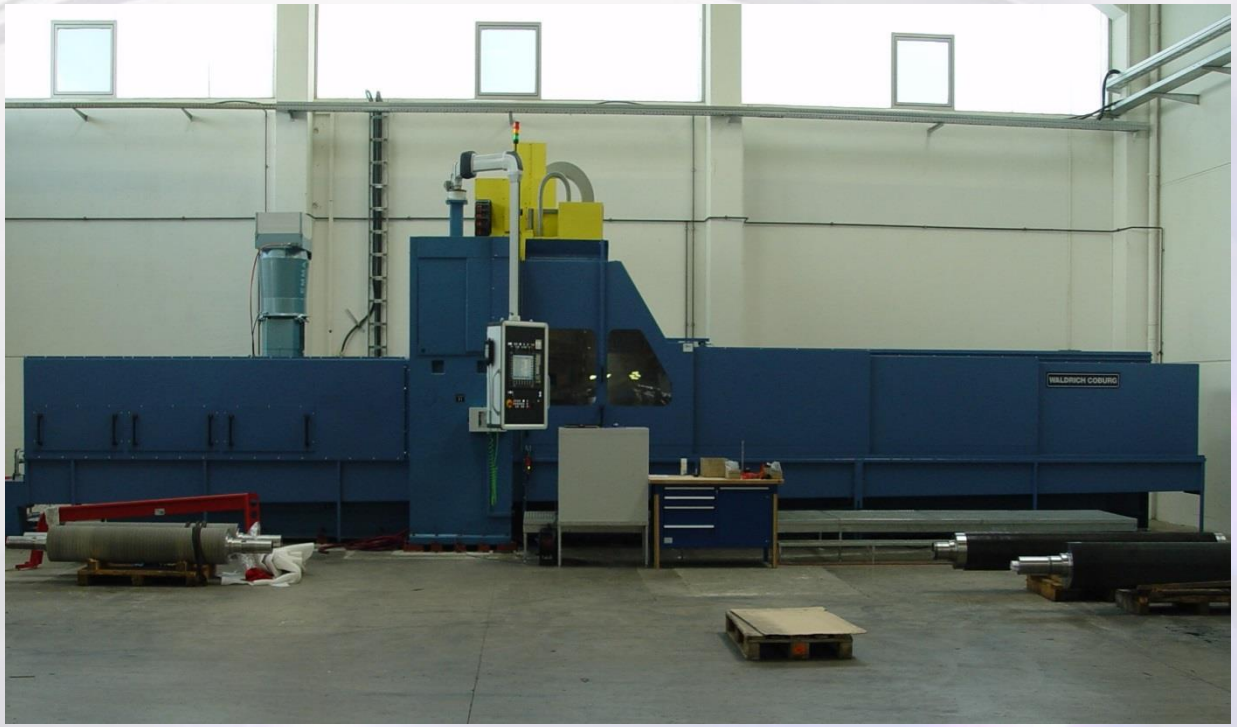
FRIESE precision

FRIESE – machining

Newest Investments :

- 5th Waldrich Corrugrinder
- New max size lathe

to shorten delivery times, improving quality and flexibility



FRIESE – machining

All Journals produced in house on modern CNC lathes to assure

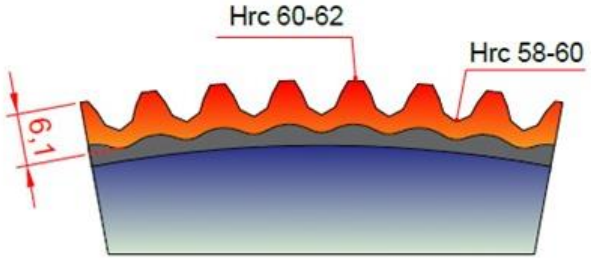
- highest quality in surface and dimension

Pre - Machining of the steel tubes in house to assure

- egalized inner diameter for perfect condensate evacuation
- best roll performance without any imbalance

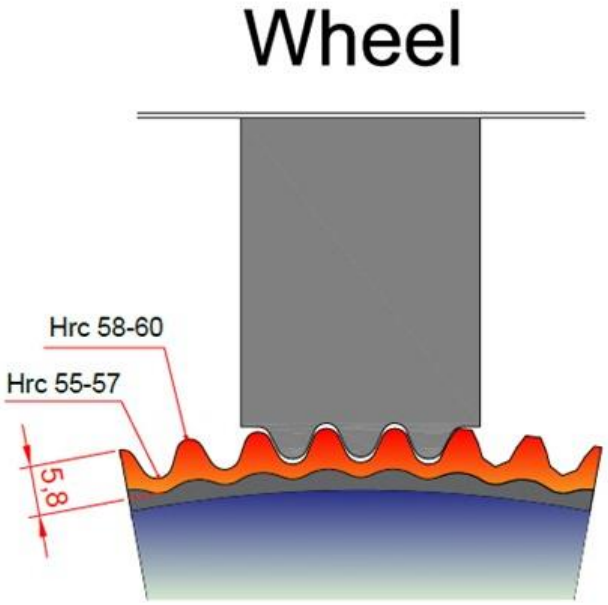
FRIESE – induction hardening

FRIESE Technology



A Flute tooth height 4 mm.

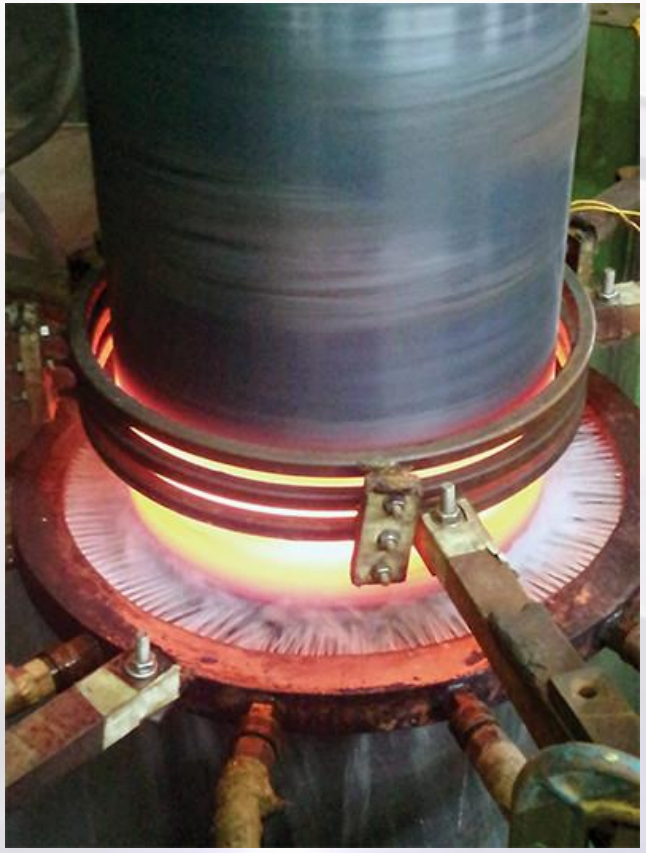
Hardening after fluting



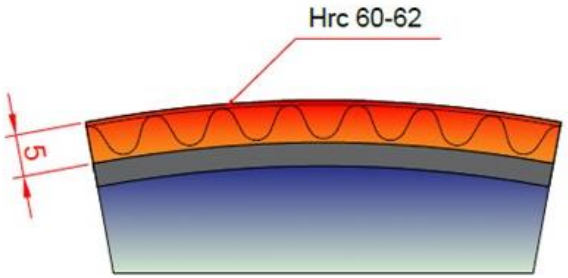
A Flute tooth height 4 mm.

Grinding after hardening

others – induction hardening

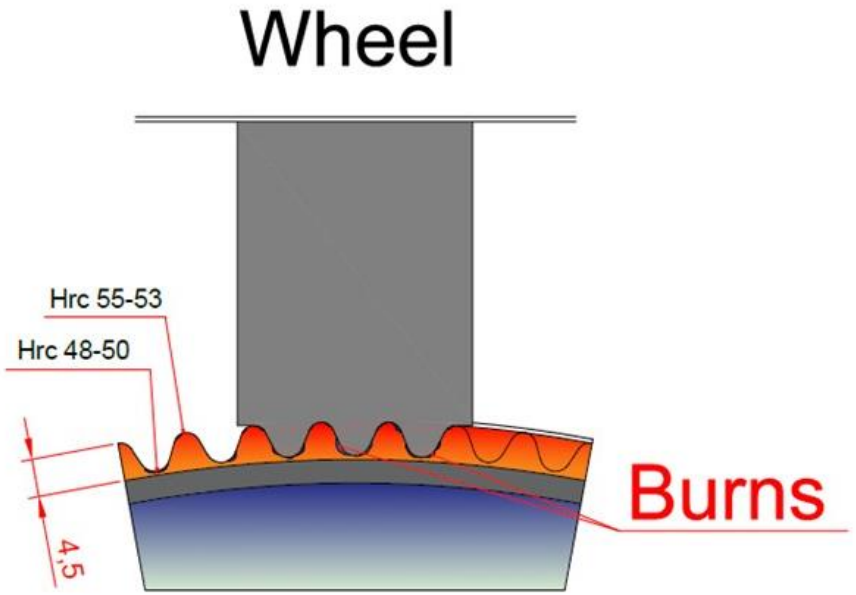


Competitors Technology



A Flute tooth height 4 mm.

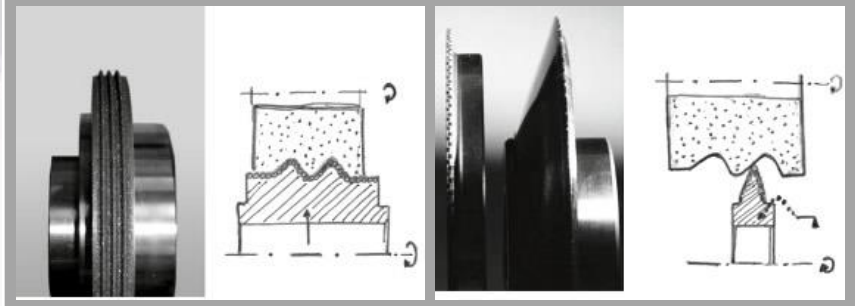
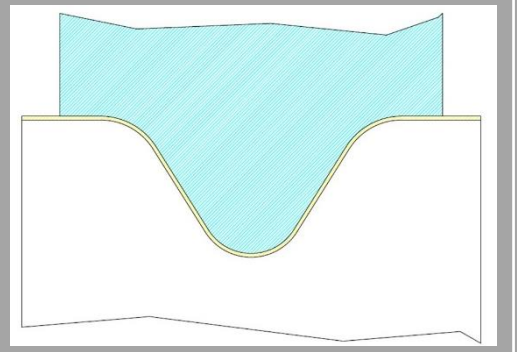
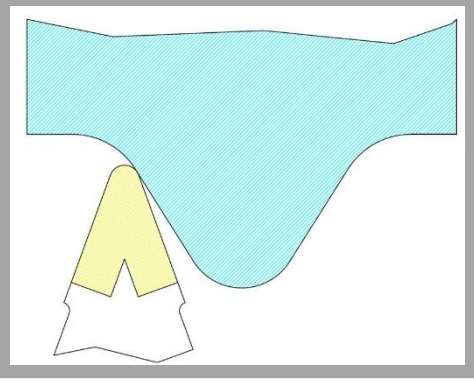
Hardening before fluting

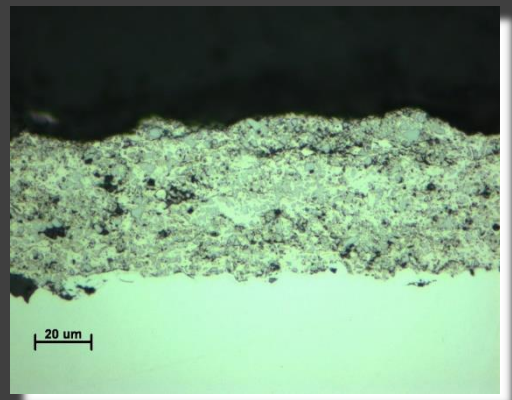


A Flute tooth height 4 mm.

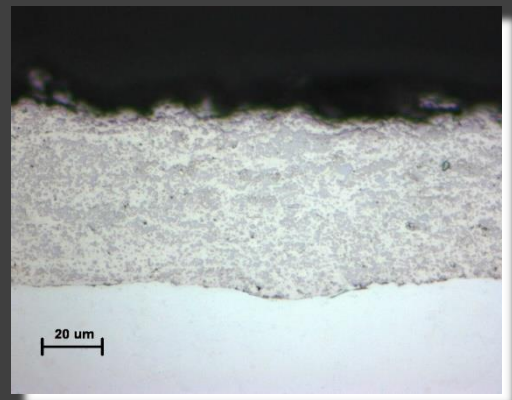
Creep feed system

Profile grinding - comparison

Comparison grinding process	others	Friese
		
Type of dresser	Diamond **Form**-dressing roll	Diamond **Profile**-dressing roll
Profileform of the dressing roll	Fixed form – e.g. C1 or C2 etc.	Radius form and angled flanc
Producible profile	Fix - to the form of the dressing rolls	Unlimited
Ability to optimize existing profile ?	No	Yes
Operation expenses for the profile-grinding process	Low (1 dressing stroke)	High (many single dressing strokes)
Possibility of profile changes to reduce the paper consumption	Very limited	No limits
Experience about the impact of profile changes to the performance of the corr. Rolls ?	Less	Very high



Low quality

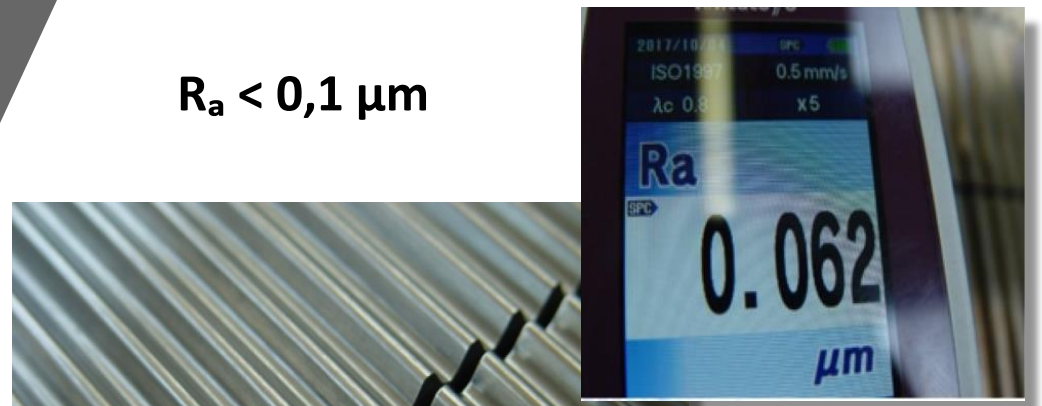


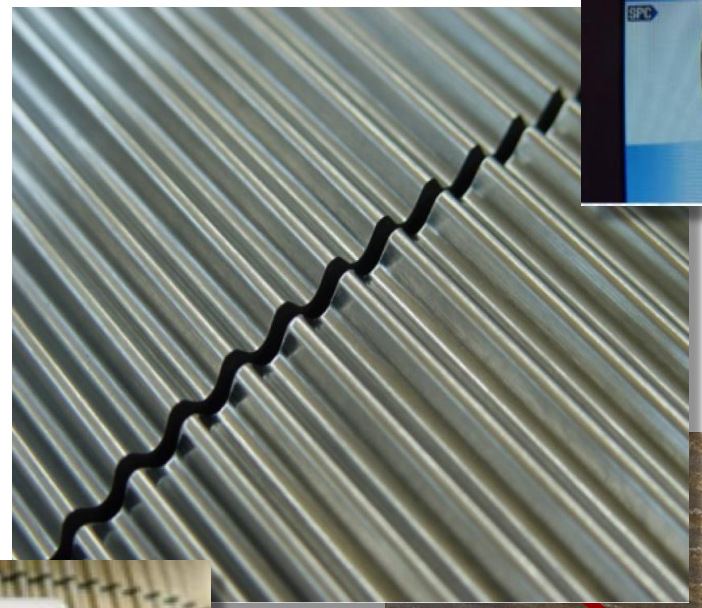
Friese Rockwelle ®

ROCKWELLE
Tungsten Carbide Coating

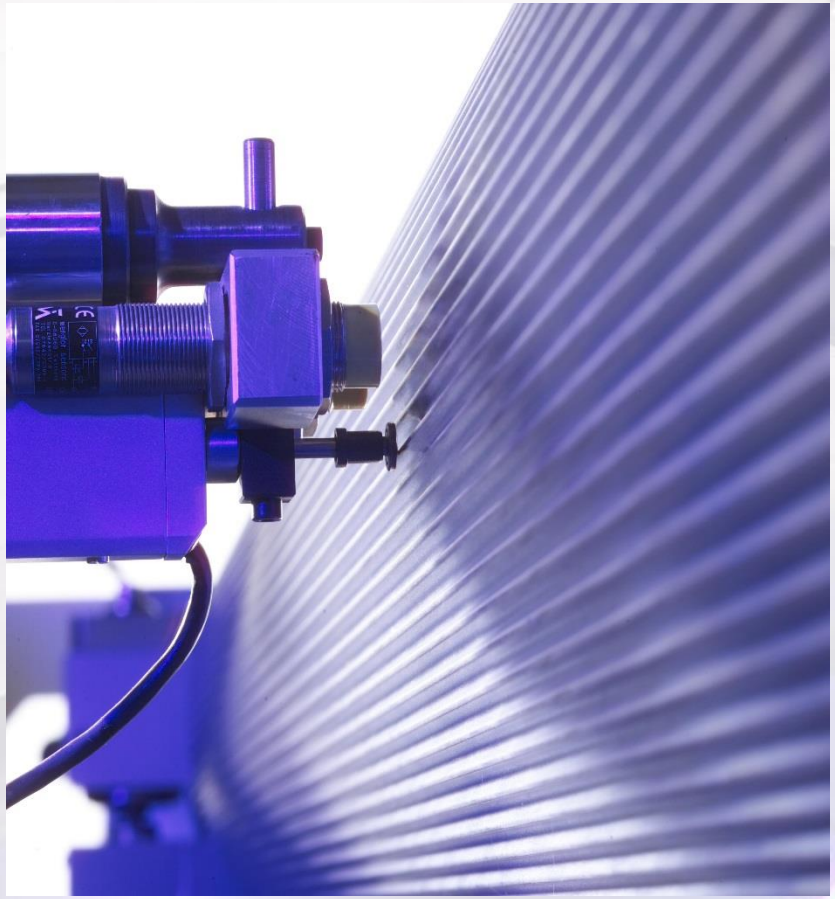
FRIESE quality

$R_a < 0{,}1\ \mu m$





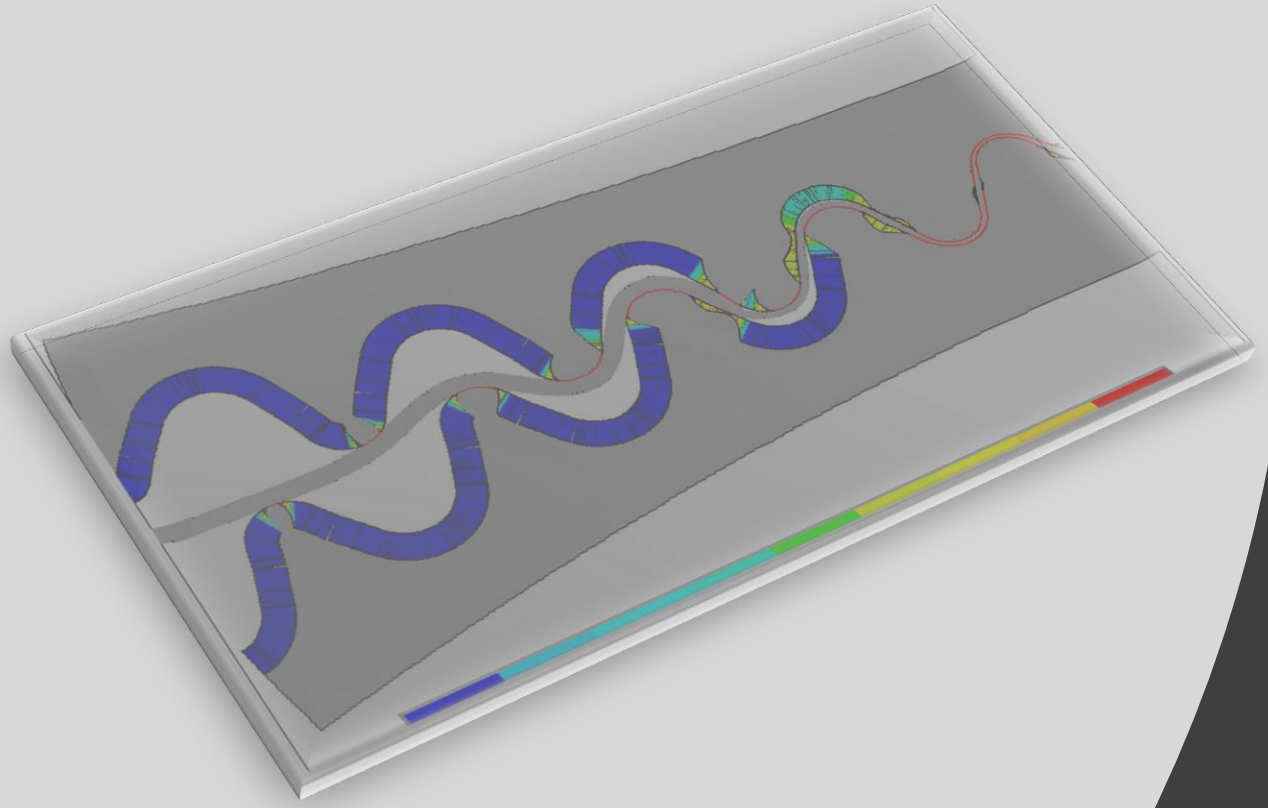
FRIESE – quality



· We are manufacturing to the finest tolerances:

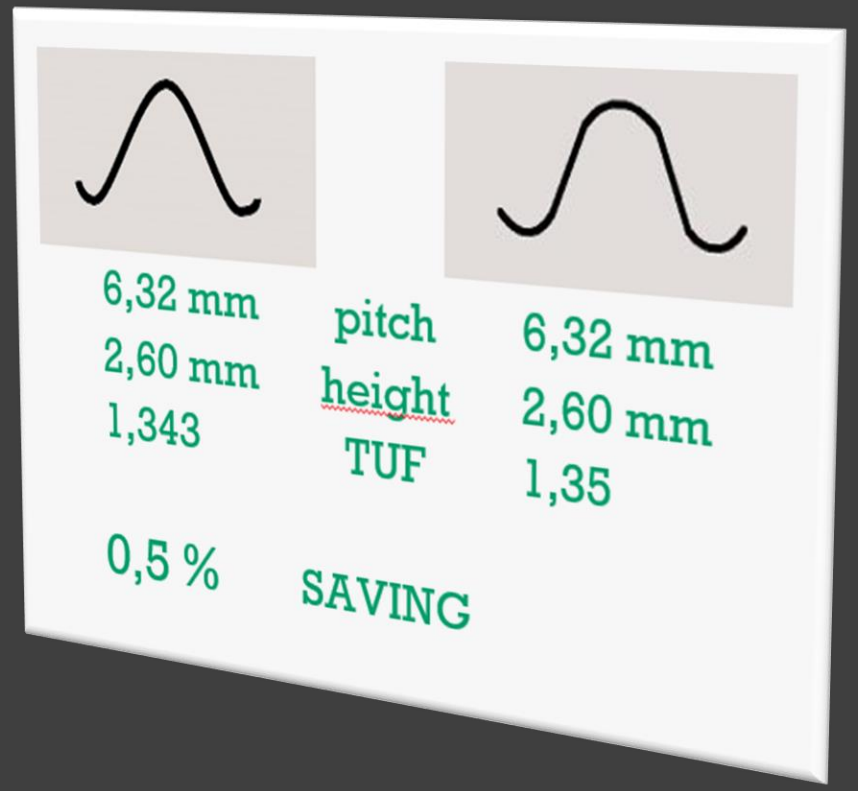
Corrugating rolls	< 20 µm
Glue rolls	< 10 µm
Pitch tolerance	< 5 µm
Flute height tolerance	< 20 µm
Surface roughness	< 1 µm
with special polishing	< 0,1 µm

· We maintain regular controls according to our QM System DIN ISO 9001 and ASME.



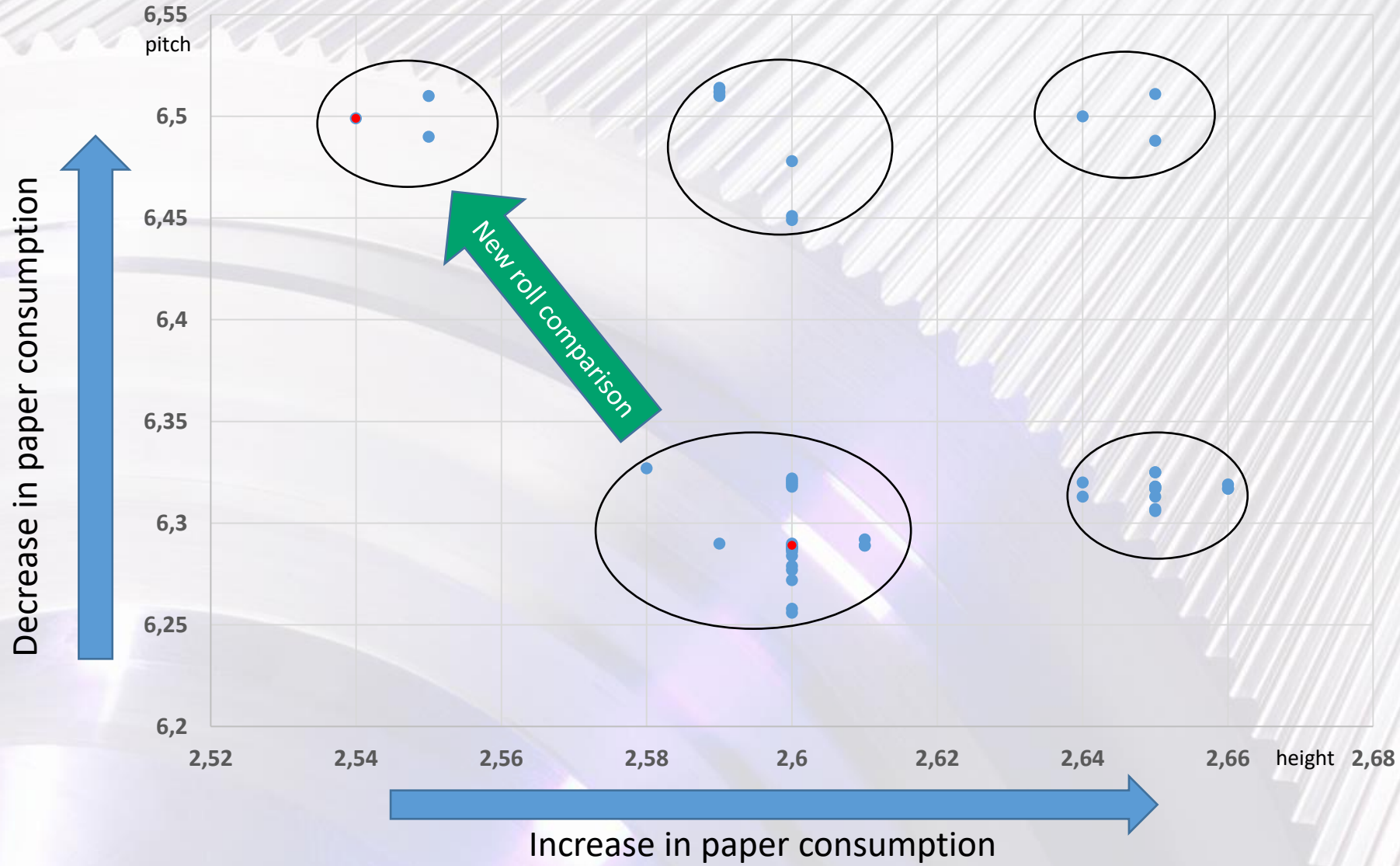
The Competition offers Standard-profiles with equal pitch and flute height as Friese, but the Friese ROCKPROFILE is optimized and, compared to the standard profile, has

- **Less take-up ratio**
- **Improved board strength**
- **Less glue consumption**

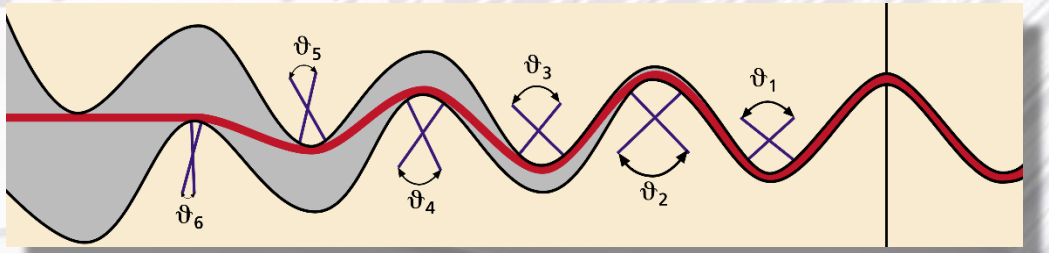


FRIESE Engineering

FRIESE – PACE (Profile Analysis and Comparison Estimate)



FRIESE – PACE



$$T = T_o e^{\mu v}$$

		actual	Friese Rockwelle			
		BC3	I	II	III	IV
corrugating roll diameter	in mm	**500 / 325**	**500 / 325**	**500 / 325**	**500 / 325**	**500 / 325**
fluting height	in mm	2,48	2,45	2,40	2,40	2,30
pitch	in mm	6,51	6,51	6,51	6,35	6,11
number of teeth		241 / 157	241 / 157	241 / 157	247 / 161	257 / 167
tension factor	in %	100,0	95,4	90,9	0	108,1
tension		5,83	5,56	5,3	5,83	6,3
take-up factor		**1,305**	**1,296**	**1,286**	**1,301**	**1,303**
fluting paper saving	in %	0,0	0,7	1,4	0,3	0,1
mechanical strength						
ECT-value	in %	100,0	99,7	99,4	99,9	100,0
BCT-value	in %	100,0	99,1	97,8	98,3	96,3
FCT-value	in %	100,0	103	106,7	108,8	121

PACE (profile analysis and comparison estimate)

Single facer: **BHS Bandleader**

C9 PROFILE

		C_9 in use	Friese Rockwelle (TC)	
			Option 1	Option 2
				Super C_9
Corrugating roll diameter	in mm	**500 / 325**	**500 / 325**	**500 / 325**
fluting height	in mm	3,61	3,6	3,5
pitch	in mm	8,300	8,300	8,300
number of teeth		189 / 123	189 / 123	189 / 123
tension factor	in %	100,0	97,0	90,1
tension		6,25	6,06	5,63
take-up factor		**1,385**	**1,38**	**1,361**
fluting paper saving	in %	0,0	0,4	1,7
mechanical strength				
ECT-value	in %	100,0	99,8	99,27
BCT-value	in %	100,0	99,7	97,8
FCT-value	in %	100,0	101,4	106,8

FRIESE – PACE

		actual B-flute	**Friese B-flute**
corrugating roll diameter	in mm	**408 / 408**	**408 / 408**
fluting height	in mm	2,60	2,54
pitch	in mm	6,29	6,51
number of teeth		204	197
tension factor	in %	100,0	82,1
tension		7,71	6,33
take-up factor		**1,352**	**1,317**
fluting paper saving	in %	0,0	2,6
mechanical strength			
ECT-value	in %	100,0	97,3
BCT-value	in %	100,0	96,1
FCT-value	in %	100,0	100,6

production data

⇩

paper price per [ton]
300 € [EUR]

average working width
2,20 [m]

average grammage
100 [g / m²]

paper saving
2,59% [%]

expected roll life time
50 [mio m]

costs for corr. Rolls

⇩

orientation price for new set of rolls
40.000 € [EUR]

savings

⇩

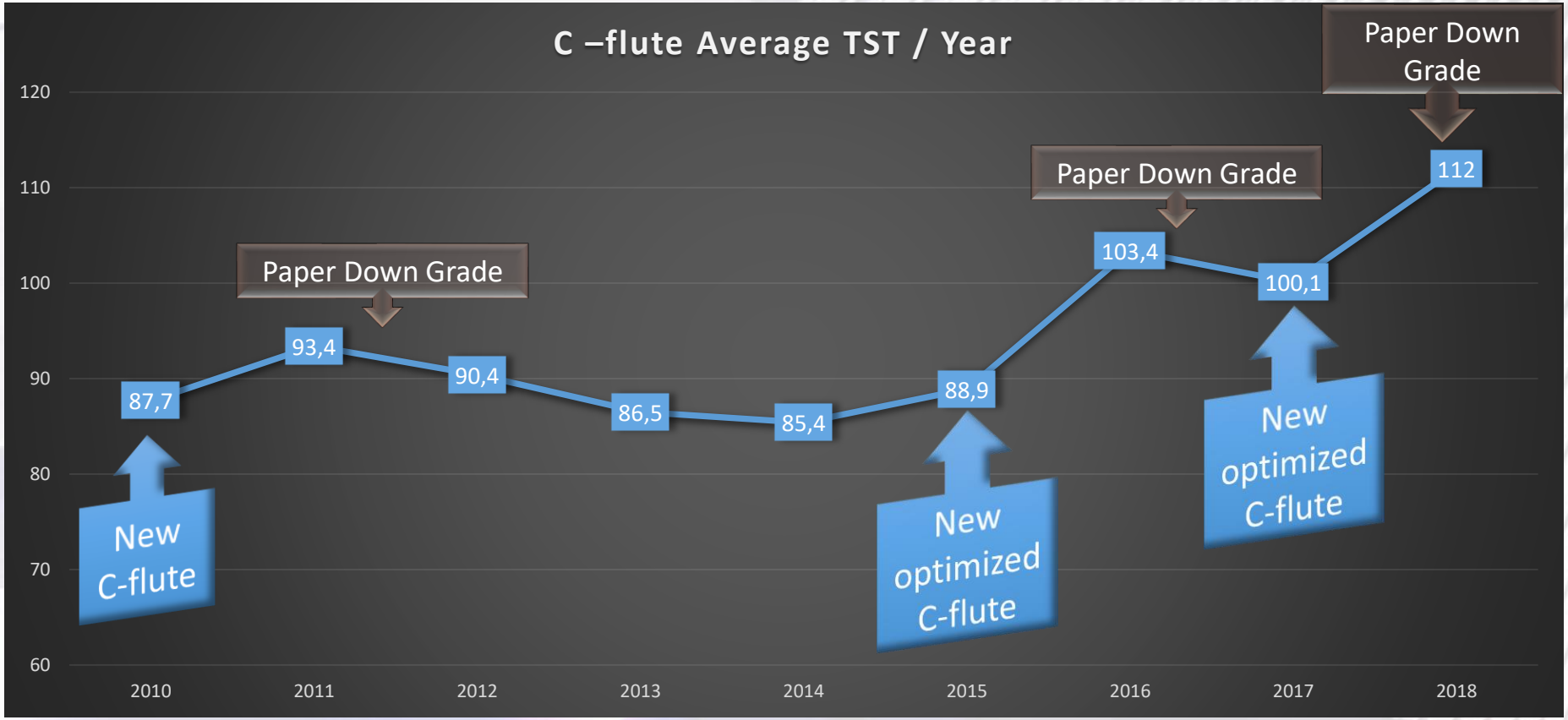
paper saving at expected roll life
115.500,00 € [EUR]

cost compensation of new set of rolls at
17 [mio m]

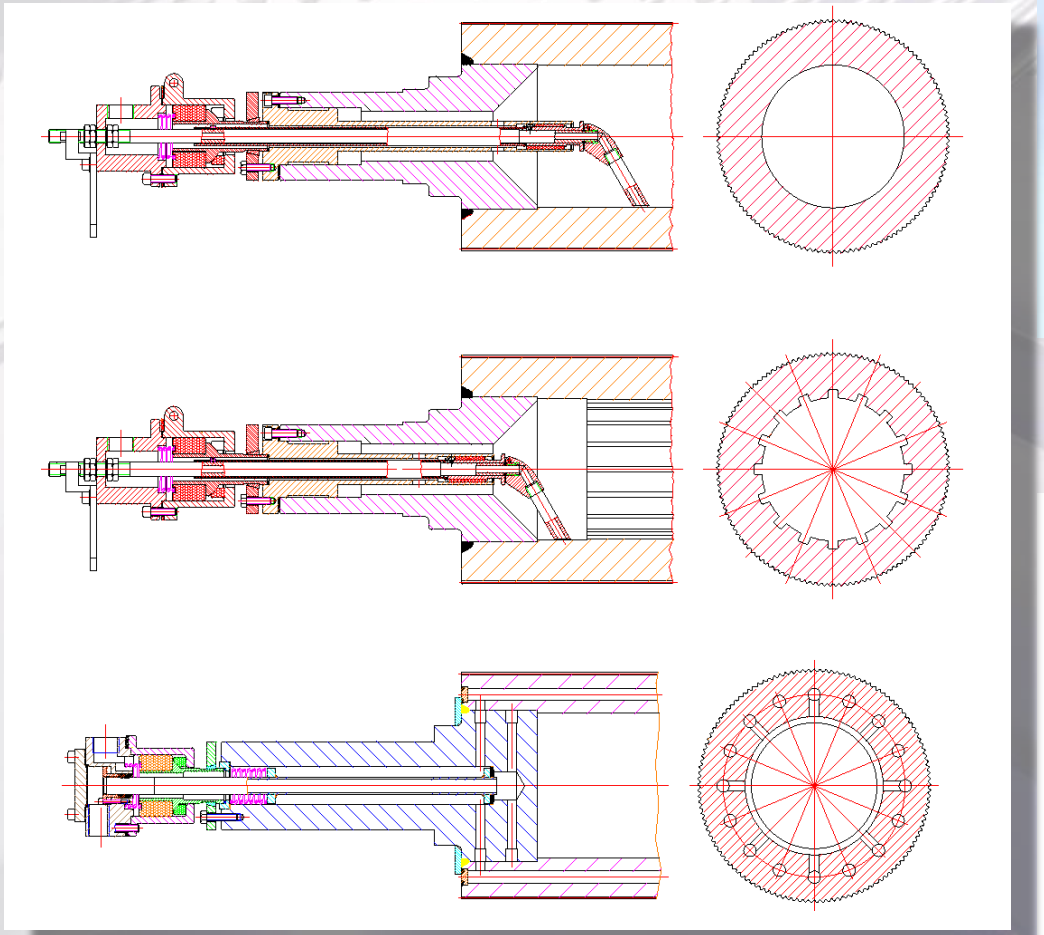
effective costs for a new set of rolls
-75.500 € [EUR]

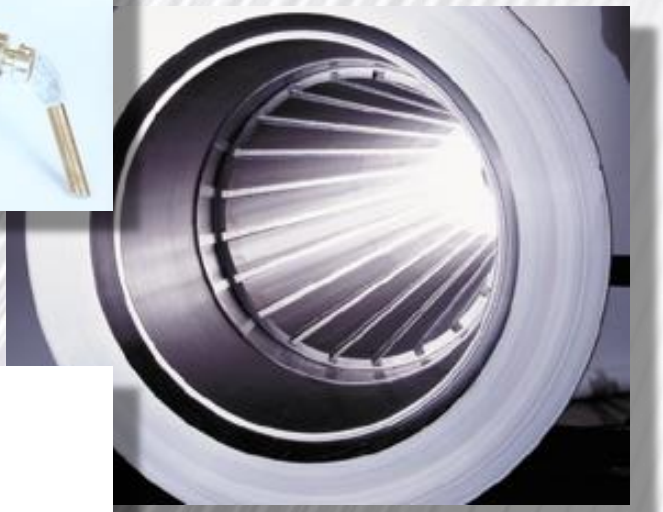
FRIESE – PACE

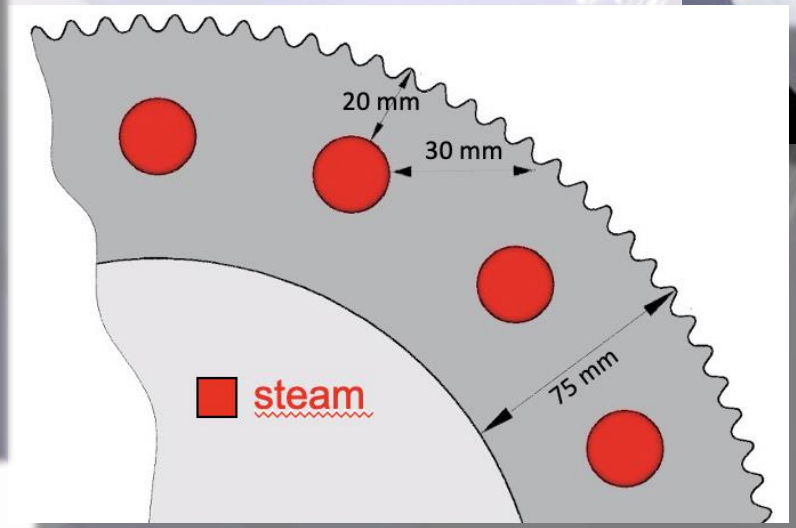
Customer Quote: „TST is going thru the roof!!!
Average TST 8 years back have gone from 87,7 to 112 = 24,3% up.
AND We have done a downgrade on fluting 2 times 2012 and 2017 that lowers the value by 5-10%.
So in fact it's up 30-35% over a span of 8 years."



FRIESE – Thermogrooves – CCS – Peripheral Heating



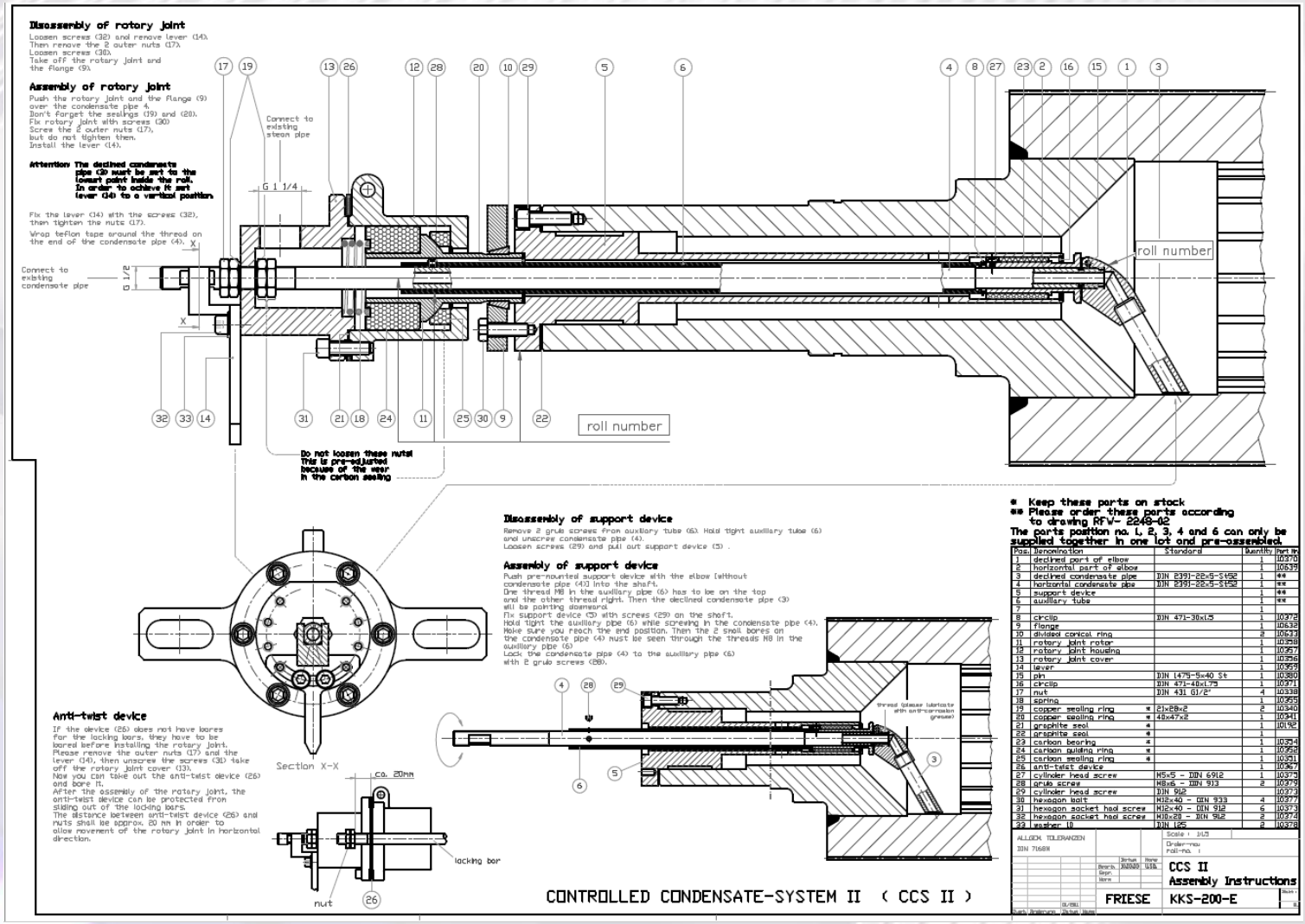




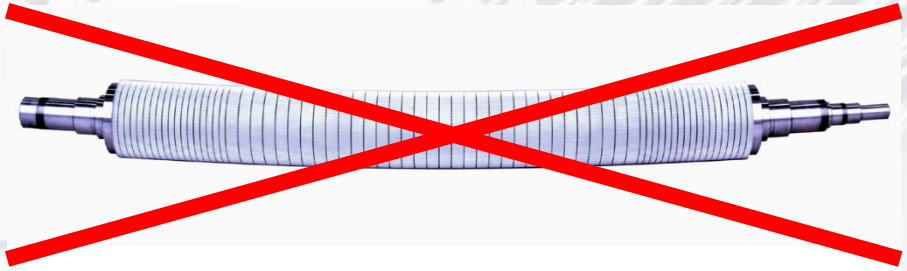
FRIESE – CCS (Controlled Condensate System)

- unique syphon pipe
- readjustments are not necessary
- carbon bearing guided syphon
- gap to roll bottom always 3 mm
- maintenance free rotary joint,

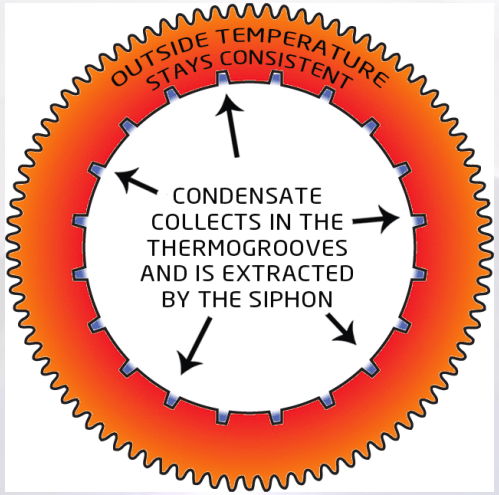
  for the complete roll lifetime



FRIESE – Thermogrooves



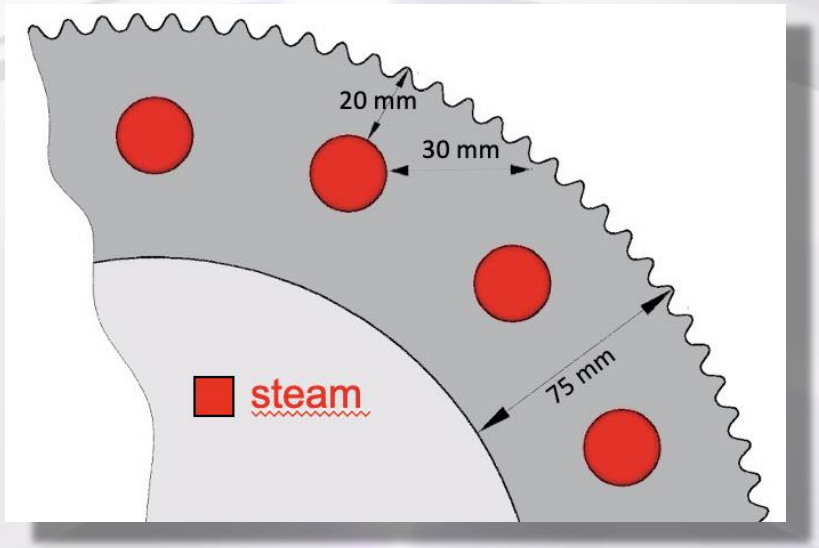
NO banana effect =
NO waste



Cost saving by using Friese CCS-System

Single facer Working Width	mm	2500
Average paper width	mm	2300
Profile type		B
Average take-up factor	K =	1,400
Shifts per day	nr.	2
Working days per year	nr.	230
Single facer stops per shift	nr.	8
Wasted paper produced after each stop	linear meters	25
Standard cost of the paper	Euro / Ton	350
Paper weight (grammage)	gr. / sqm	120
Exchange rate USD / Euro :		1,1
Result		
Liner paper waste per shift	sqm	460
Fluting paper waste per shift	sqm	644
Saving of liner paper per shift	Euro	19,32
Saving of medium paper per shift	Euro	27,0
Total amount of money saving per year	**Euro**	**21.329**
Total amount of money saving per year	**USD**	**23.462**

FRIESE – peripheral Heating



Less steam pressure

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Energy saving

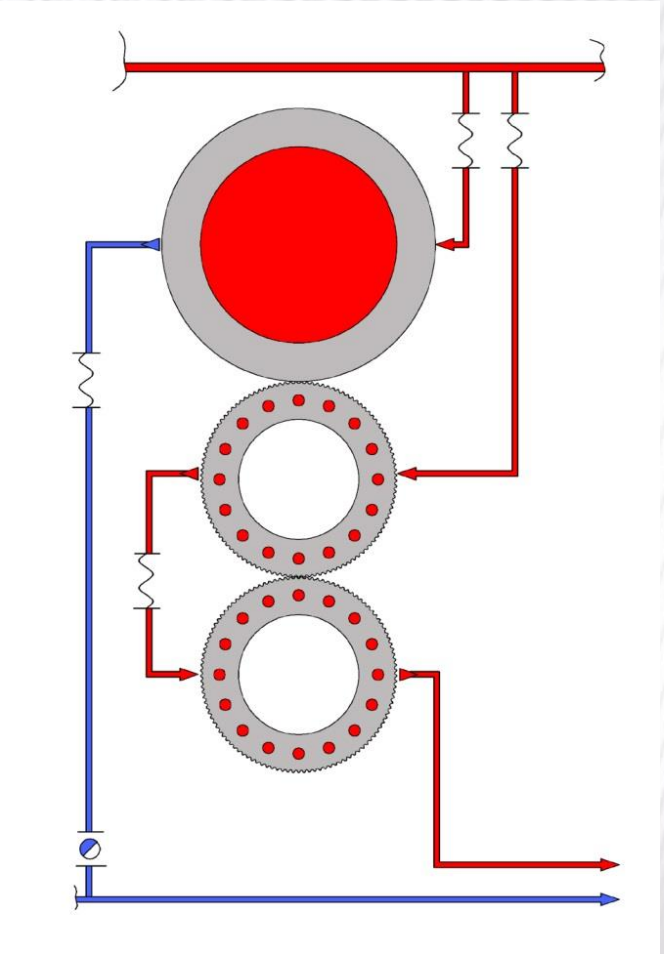
NO condensate deposit

⇩

NO roll deformation

⇩

NO waste at production restart

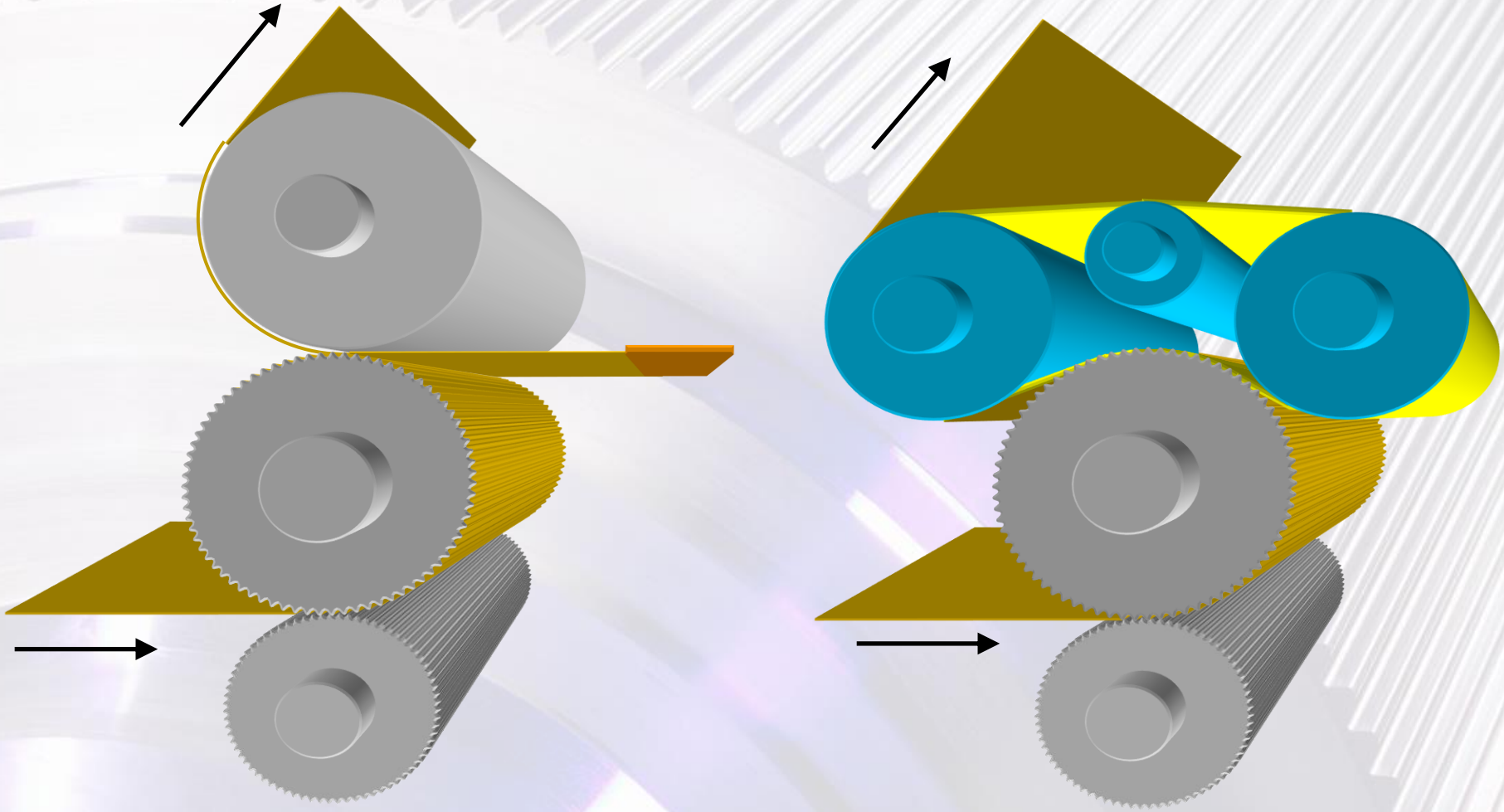


Outstanding Quality creates Outstanding Performance

- **E-flute , 2800 mm**
- **Rockwelle coated**
- **After 40 million produced lm**
- **On the 5th regrind**

FRIESE – performance

for Pressure Roll Machine – for Belt Machine



FRIESE – service

Our experienced consultants and sales responsible will support you on site with their knowhow:

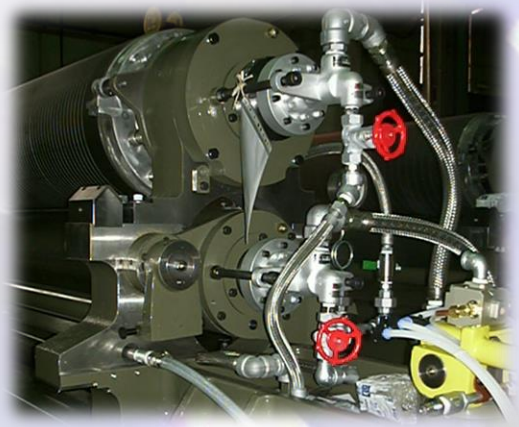
- Check on the condition of operating rolls
- Assistance with production problems
- Training at the single facer
- Fast reaction time in case of emergency

FRIESE – service

Our service technicians are specialized in roll changes on all sorts of single facers.

AGNTATI, ASITRADE, BHS, FOSBER, HSIEH HSU, ISOWA, K&H, LANGSTON, MARTIN, MASSENZANA,MEDESA, MITSUBISHI, MWU, PETERS, SIMON, S&S, TCY, OLIVINI,….

We provide overhauls of most used corrugated roll modules.



We create partnerships

- 1700 customers
- in 77 countries
- 91 different Single Facer
- 140.000 different roll Profiles

- One result

Our strongest references are our world-wide satisfied customers

INTERNATIONAL PAPER

VISY BOARD

VPK Packaging Group

board 24

SAICAPACK

Nampak packaging excellence

Smurfit Kappa

cepac Together we achieve more

KLINGELE PAPIERWERKE

ORORA

Rigid

DS Smith

schumacher

YFY

storaenso

THIMM THE HIGHPACK GROUP

ROSSMANN GROUPE

GISSLER & PASS WELLPAPPE·VERPACKUNG·DISPLAY

Dunapack Packaging PRINZHORN GROUP

MODEL

mondi

SFT group

PALM GRUPPE

Brohl WELLPAPPE

rondo

OJI Beyond the Boundaries

STI GROUP

Our success in the market is proven by numerous and long-termed supplier contracts

AGNATI BRIVIO PIERINO GROUP

Fosber simply better

MarquipWardUnited A BW Papersystems Company

HSIEH HSU

Thank you for your attention