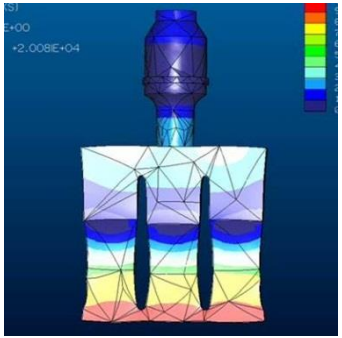
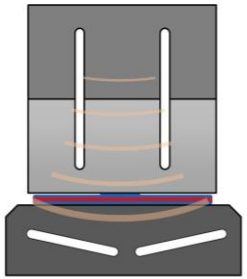
Thomas Fischer and Carsten Rehder

Emballasjedagene 2015

Ultrasonic Welding Technology

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Ultrasonic Welding Technology

fast as sound and ultra-cost effective

Ultrasonic Welding Technology
What to present?

1. Speed to market
2. Company development
3. New technologies
4. Customer orientation
5. Ultrasonic welding technology
6. Seal faster
7. Provide data
8. Reduce down time
9. Improve seam quality
10. Q & A

Ultrasonic Welding Technology
Speed to Market

Company Development

- From a small garage startup to a globally active company
- be local & act global

New Technologies

- lean manufacturing processes
- smart technologies for better quality
- think digital to be fast

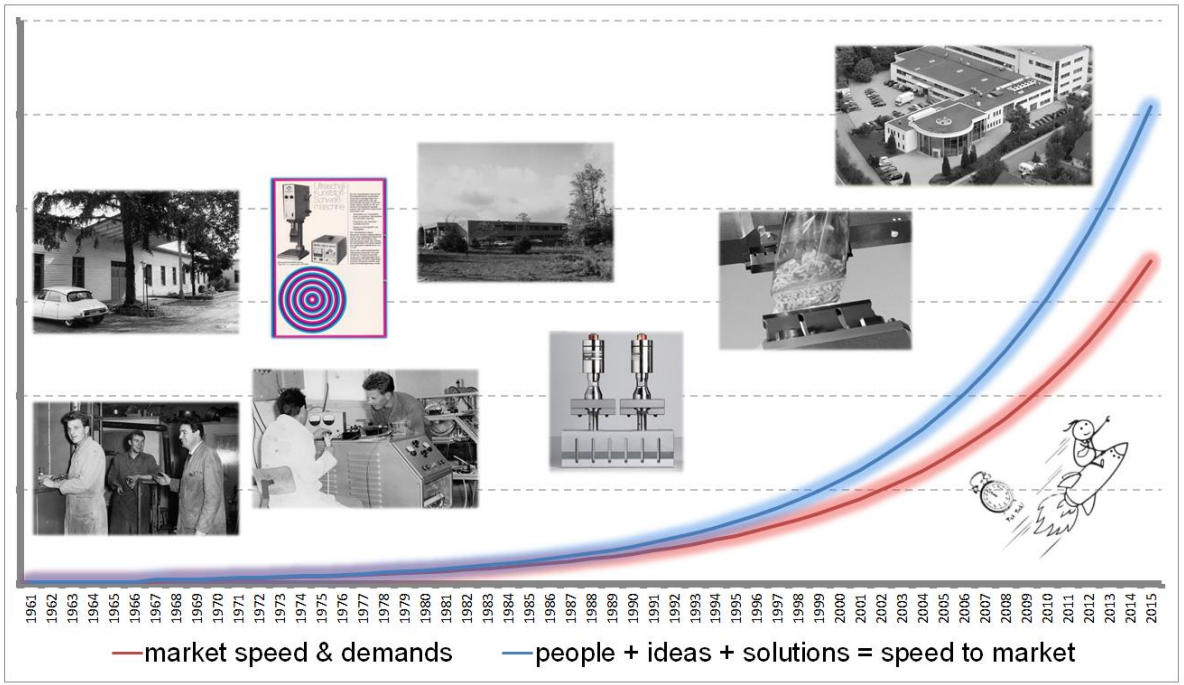
Customer Orientation

- understand your customers aim
- support from the beginning
- be a trusted advisor

Benefits for End-Users

- seal faster
- provide data
- reduce downtime
- package to ship

From a small garage startup to a globally active company



Ingredients

- ideas
- courage
- endurance
- people
- conviction
- a nose for innovation

Ultrasonic Welding Technology
Company Development

Company foundation Ultrasonic generators

1961

Ultrasonic welding machines for plastic parts

1969

Ultrasonic custom machines for welding of bigger parts

1984

PACKAGING division

1989

NONWOVENS division

1994

Building addition in Karlsbad

2000

50 Years Herrmann Ultraschall

2011

1965

Ultrasonic cleaning equipment for metal

1973

New construction in Karlsbad

1986

DIALOG process visualization

1990

Foundation of **Herrmann Ultrasonics Inc.** USA

1997

Marketability ULTRALINE

First digital ultrasonic generator

2006

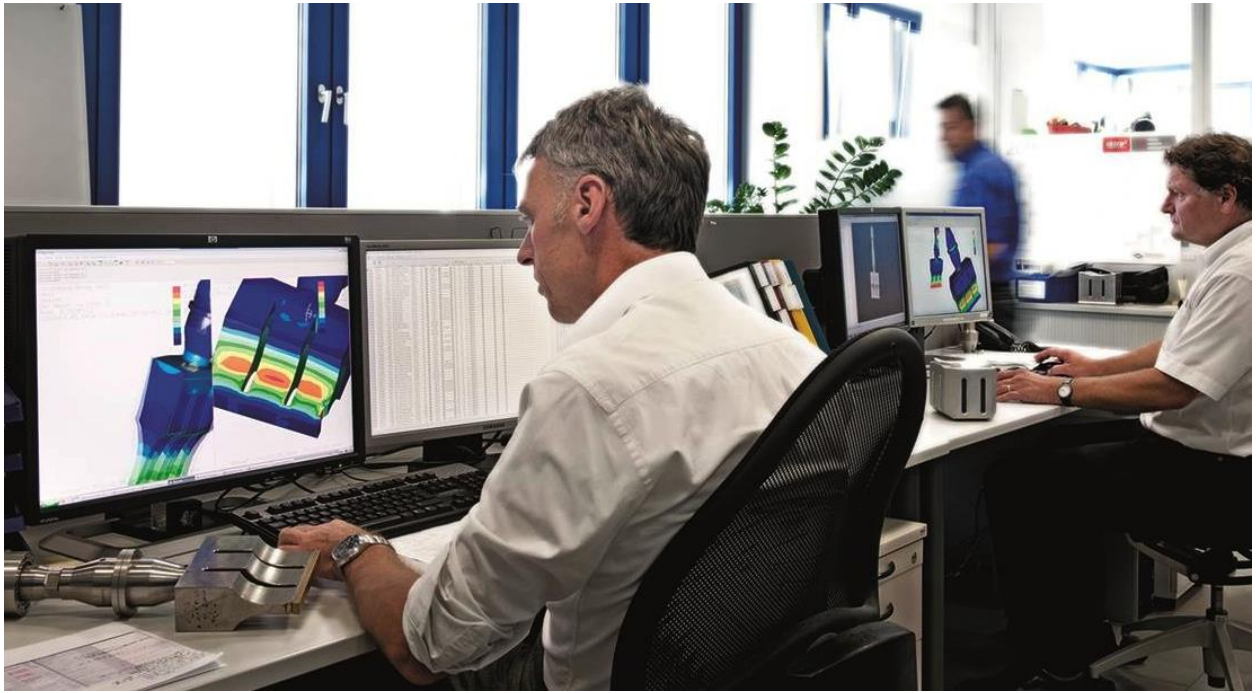
Innovations award

Foundation **of Herrmann Ultrasonics Co. Ltd**. China

Be local & act global – be where you customers are

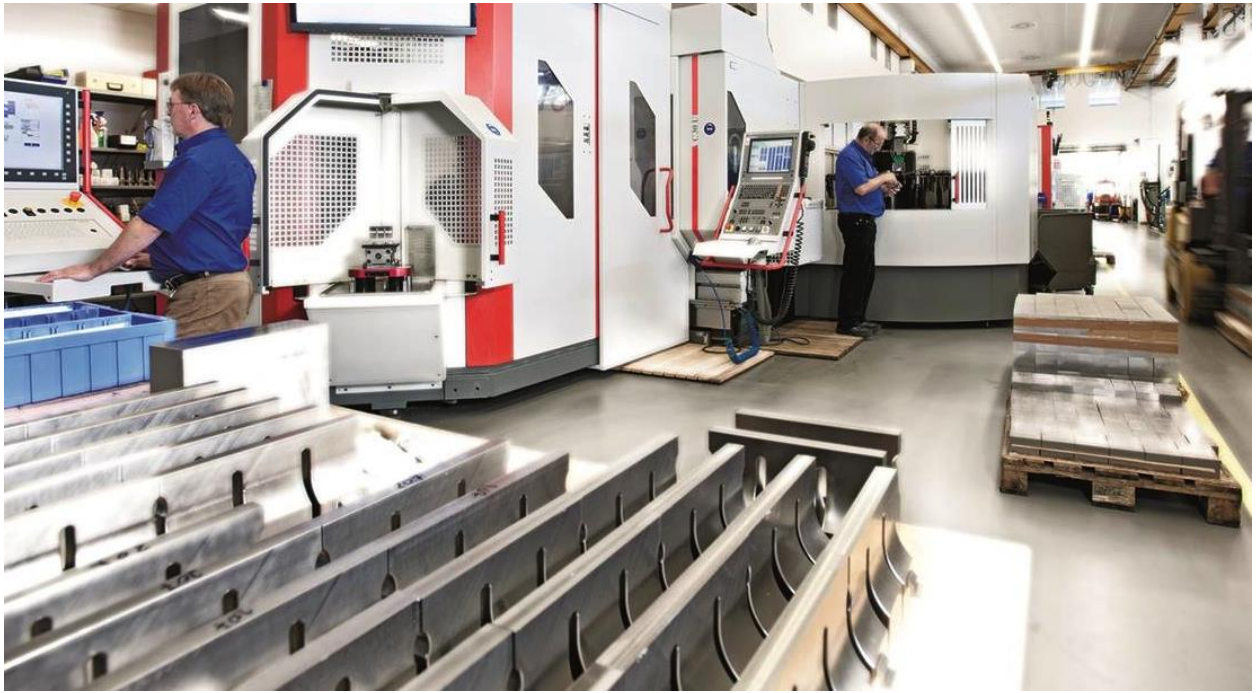
350 Employees – 55 Million Euro Sales (Group 2014/15)

Sonotrode design by FEA – shortens time for design phase



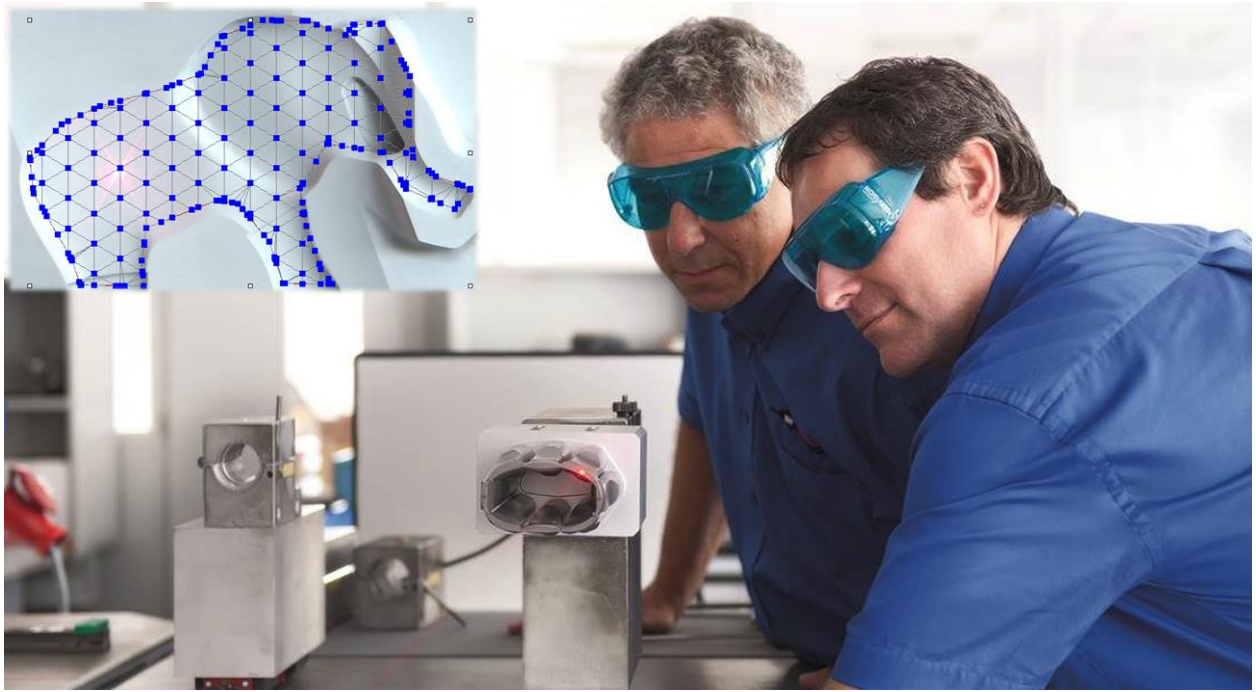
- FEA to optimize vibrating tools prior to production
- CAD-CAM for high precision manufacturing

Lean production for high efficiency



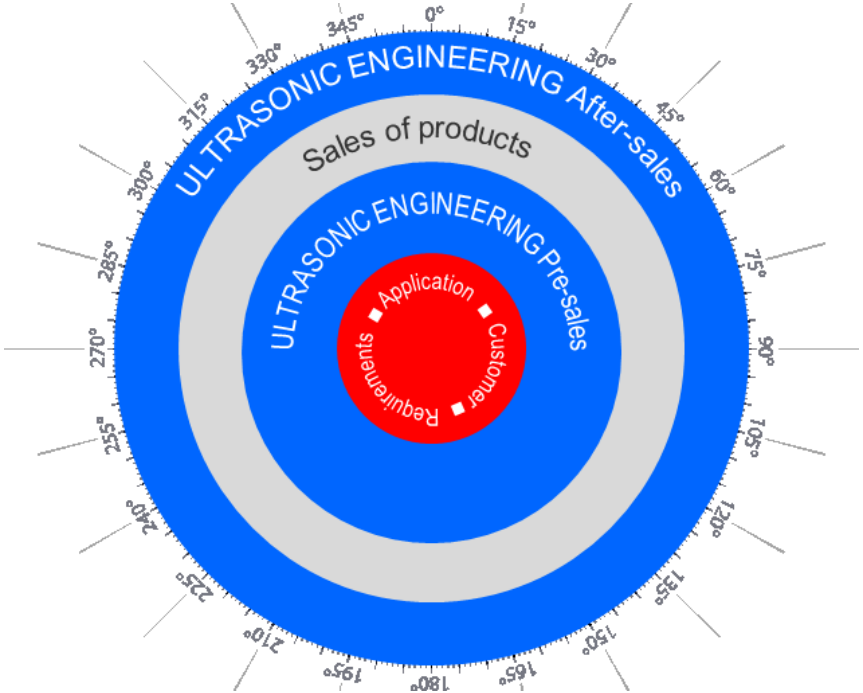
- high grade of automatization
- reduced downtime by pre set tool magazine
- run production with reduced personnel
- put focus on standard products at time, when no staff is required

Laser gauging for optimized amplitude distribution – be precise and fast



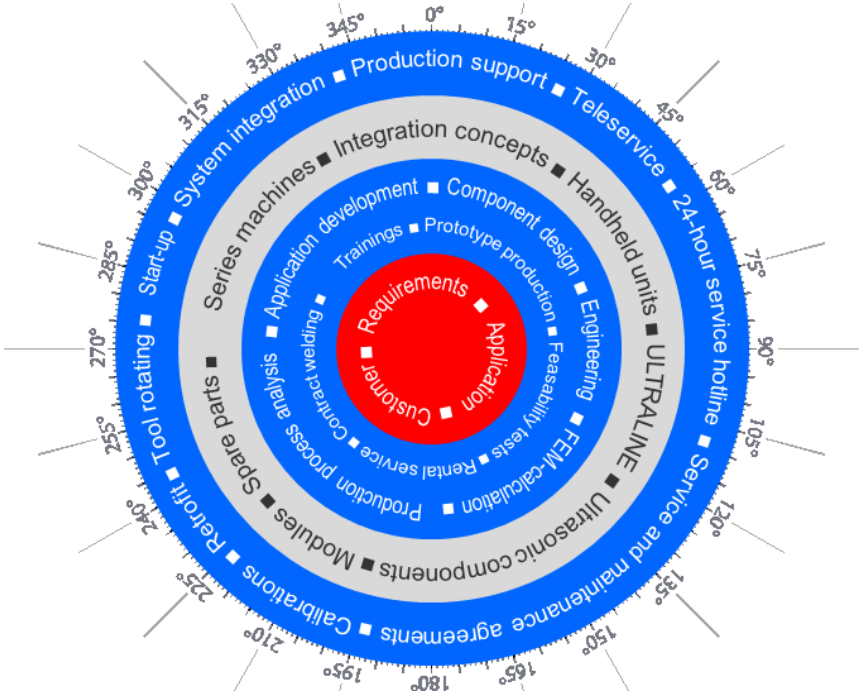
- laser vibrometer offers precise amplitude measurement at high speed
- documentation included
- lessons learned directly flow back to design
- repeat measurements without additional programming

360° Full Service Engineering – deliver solutions not only products



- listen to your customer
- understand product, application and process
- innovate and deliver better solutions
- be a trusted advisor
- become a partner from the very first beginning
- support through the complete project
- stay in touch

360° Full Service Engineering – deliver solutions not only products



- ultrasonic laboratories dedicated to business units
  - PLASTICS
  - NONWOVENS
  - PACKAGING
    - Application consulting
    - Application optimization
- training and services
- technical project management
- local tech-center
- after-sales-service

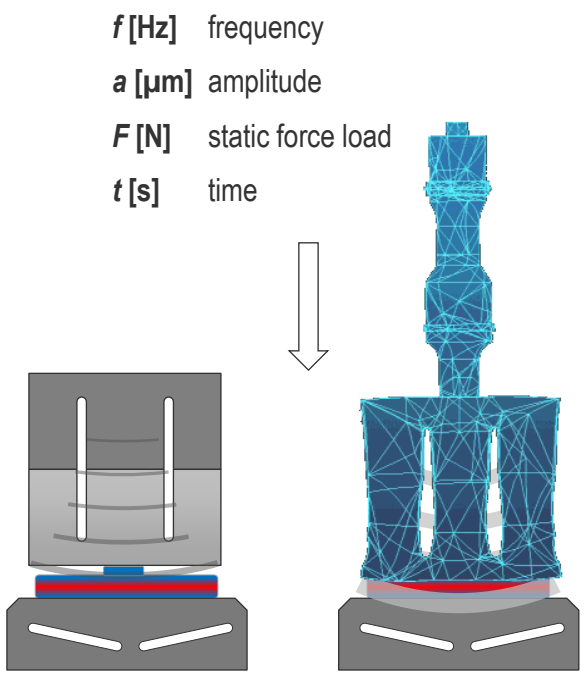
Fundamentals & Mechanism

Ultrasonic welding is a method which uses acoustic principles (mechanical sound waves) to create **frictional heat** resulting in **melt** to create **molecular bonding** thru diffusion of molecules, entanglement of molecular chains and physical/ chemical adhesion.

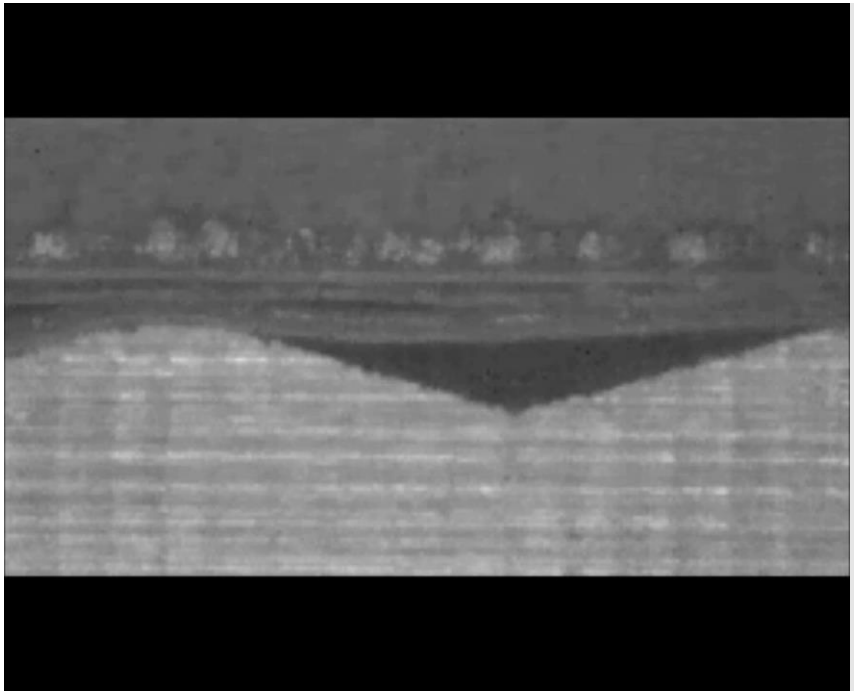
Frictional heat is a result of

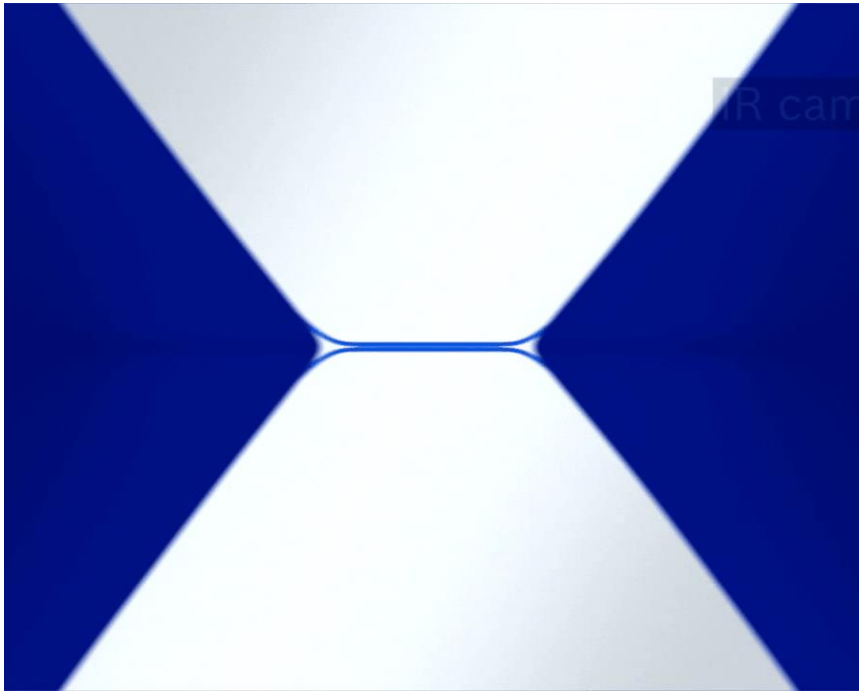
- small deformation at high speed = friction within molecular chains
- molecular displacement = friction within molecules
- interfacial friction = friction between contact surfaces

During an ultrasonic welding process mechanical vibration with defined **amplitude, force** and **duration** is applied.



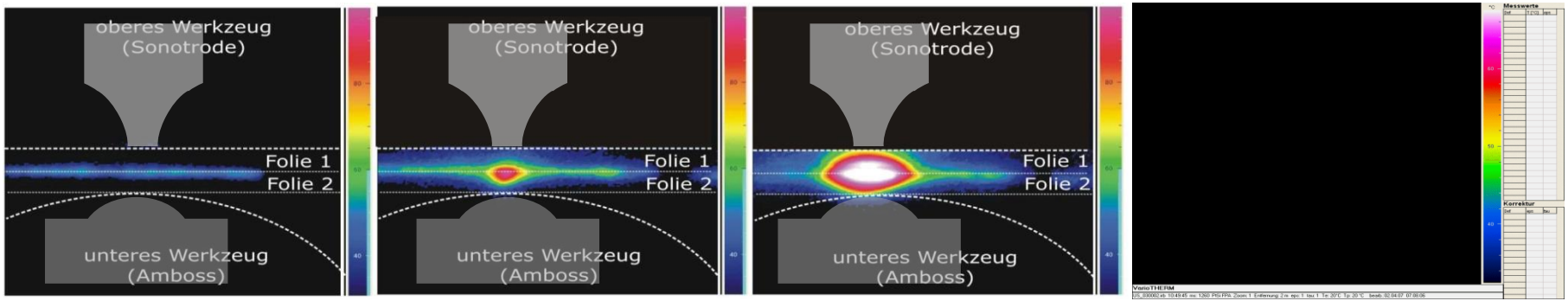
How does ultrasonic welding work?



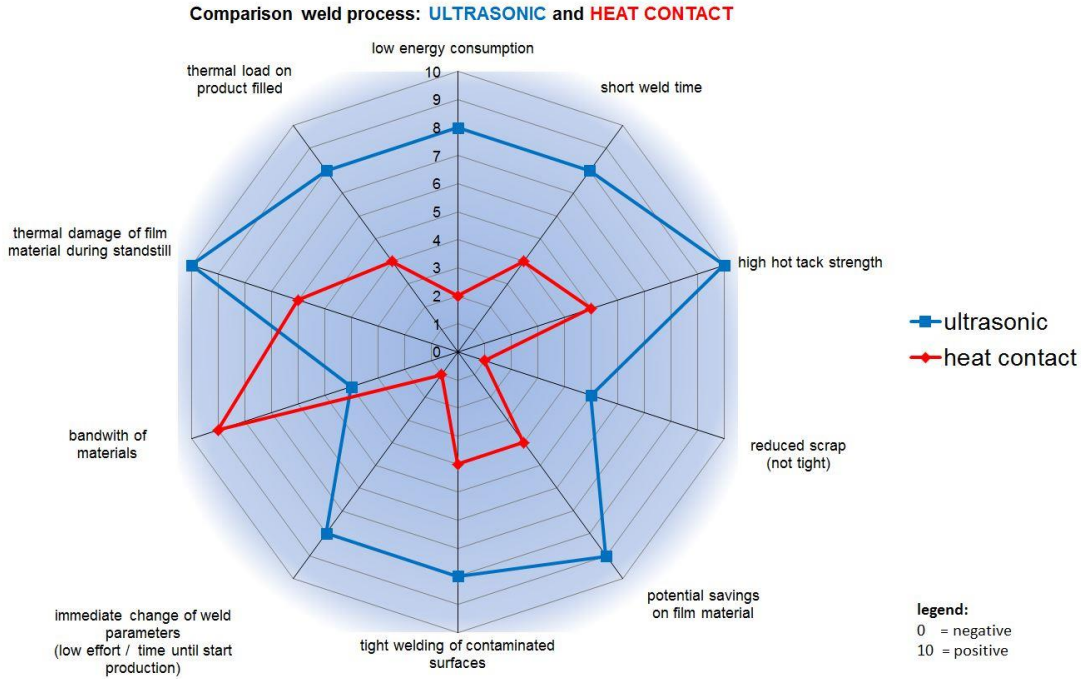


Ultrasonic Welding Technology
What does make ultrasonic special?

- heat is created directly in the sealing area
- only sealing area is melted down independent for monolayer material, coextruded or laminated films
- tools and outer layer remain nearly cold
- fast melting down of sealing layer
- digital ultrasonic generator monitors each single cycle
- no consumables required
- ultrasonic sealing is a fast and efficient sealing method



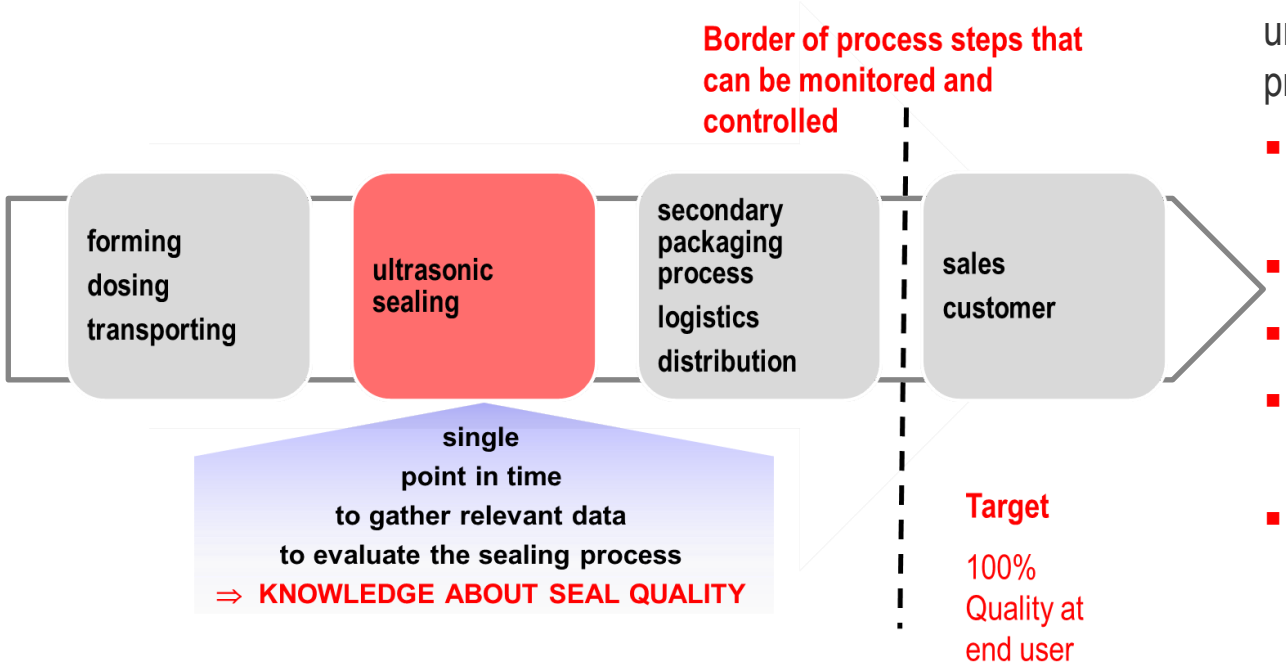
Seal faster



- ultrasonic sealing requires less time
- not hot tack issues

⇨ increase your output

Provide data



understand and evaluate the process, to:

- combine machine data with product quality
- monitor processes
- track changes
- reduce effort for inspection
- deliver 100% quality

Provide data – understand and evaluate your process

Digital ultrasonic generators are a unique source for data:

- values for each single seal on intermittent processes
- values gathered continuously for continuous processes
- values gathered by triggering for continuous processes
- limits for main parameters **ENERGY**, **TIME**, **POWER**
- additional values thru high precision distance sensor
- intelligent adaption to varying ambient conditions
  - ambient temperature
  - ultrasonic sealing tool temperature

Reduce downtime

- cold tools
  - ⇨ less effort for cleaning, less material sticks to the tools
  - ⇨ reduced cleaning time
- reduced maintenance
- no preheating, machine is instantly available
- parameter change during production
- reduced inspection effort due to higher quality
- real time data collection for inline quality control

Package to ship – improve your seal quality

- reliable seals in contaminated areas
- seal process window is controlled thru multiple parameters
  - time [ms]
  - energy [J]
  - peak power [W], average power [W], power at end of process [W]
  - distance [µ]
- full electronic documentation of sealing results
- no hot tack issues

Package to ship - facts and figures: VFFS – cross seams for salad

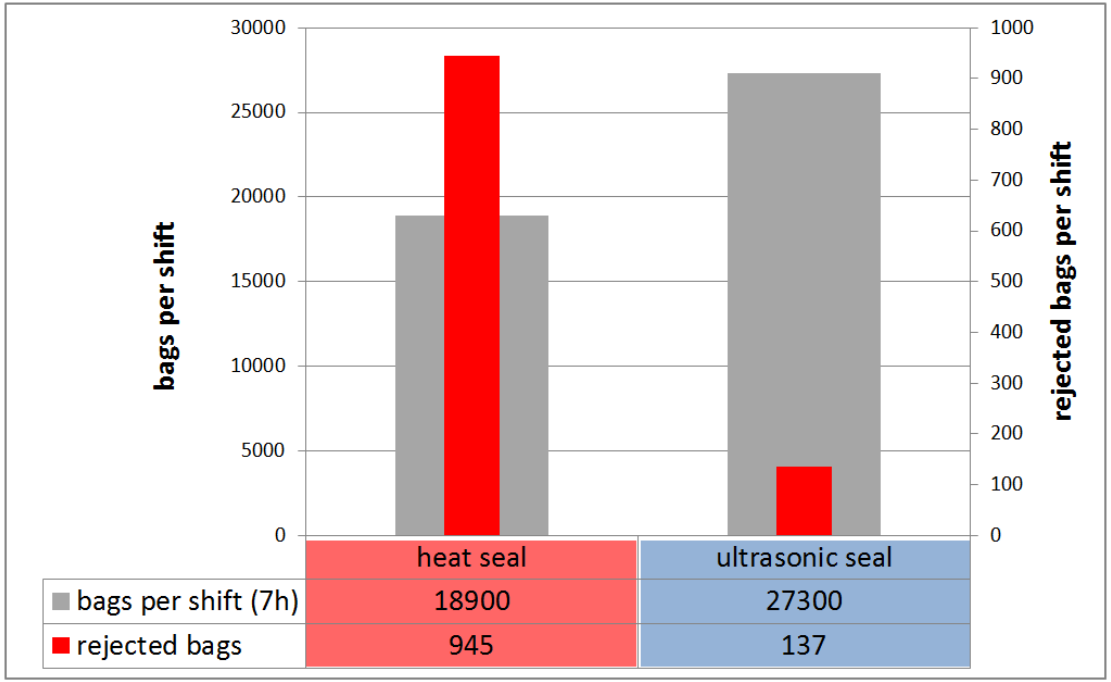
Demand for ultrasonic sealed seams

- improved seal quality
- higher output

Results with ultrasonic sealing

- output 50 to 70 bag/min., depending on dosing system and type of salad
- salad leafs in seal area are not critical → ultrasonic seals thru product
- Rejects < 1% (typically < 0,5%)
- improved seal strength especially for orientated BOPP as ultrasonic not only seals the 2,5µm sealant

Package to ship - facts and figures: VFFS – cross seams for salad



heat seal:

- 45 bags/minute
- 5% rejects

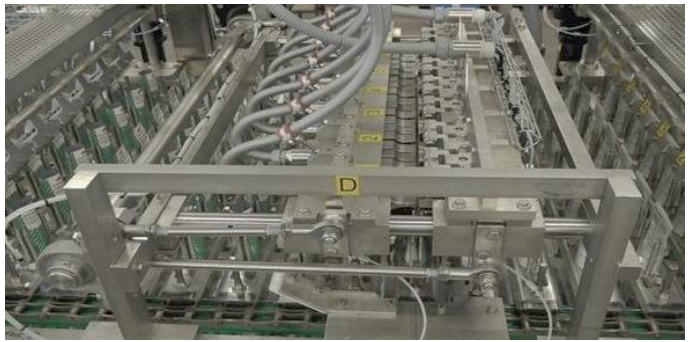
ultrasonic seal:

- 65 bags/minute
- 0,5% rejects

Package to ship - facts and figures: SUP top seam

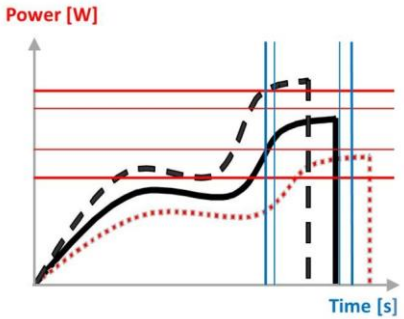
Causes for leakers

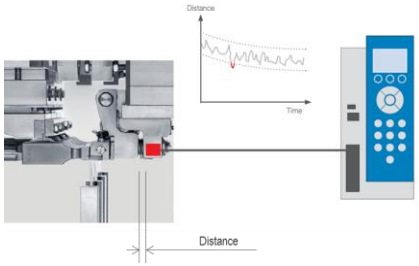
- contaminated seal area
- wrinkles due to insufficient transportation and clamping
- shrunken seams by overheated films
- steam injection → condensed water drops out
- pouch not aligned in right position
- double pouch in sealing station

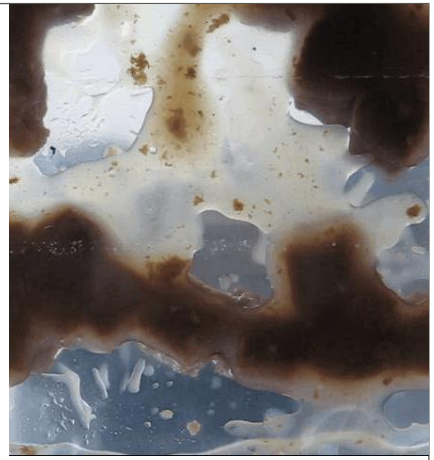


Package to ship - facts and figures: SUP top seam

SEALING MODE		ULTRASONIC PARAMETER			
		TIME	ENERGY	POWER	AMPLITUDE
	TIME	set value	min. limit max. limit	min. limit max. limit	set value
	ENERGY	min. limit max. limit	set value	min. limit max. limit	set value
	POWER	min. limit max. limit	min. limit max. limit	set value	set value







seal energy analysis

multiple parameters

seal process window definition

intelligent adaption to ambient conditions

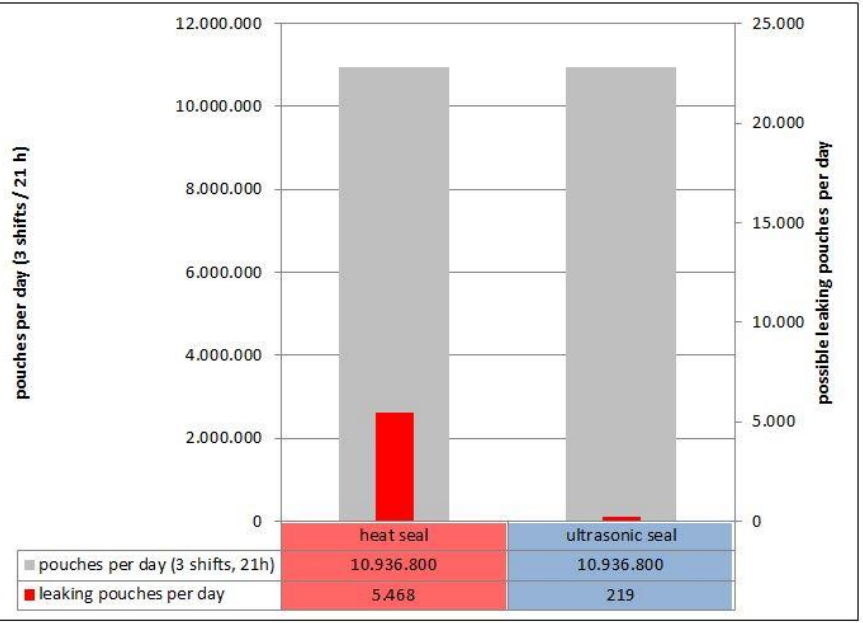
HDM Process Control

high precision distance measurement

ultrasonic seals through contaminations

Package to ship - facts and figures: SUP top seam

number of machines	35	
strokes per minute	62	
number of sealing stations	4	
pouches / minute	8.680	8.680
pouches per shift (7)	3.645.600	3.645.600
	heat seal	ultrasonic seal
pouches per day (3 shifts, 21h)	10.936.800	10.936.800
percentage of leaking pouches	0,050%	0,002%
regular / simple products	5 out of 10.000	0,2 out of 10.000
leaking pouches per day	5.468	219



Package to ship - facts and figures: SUP top seam

number of machines	35	
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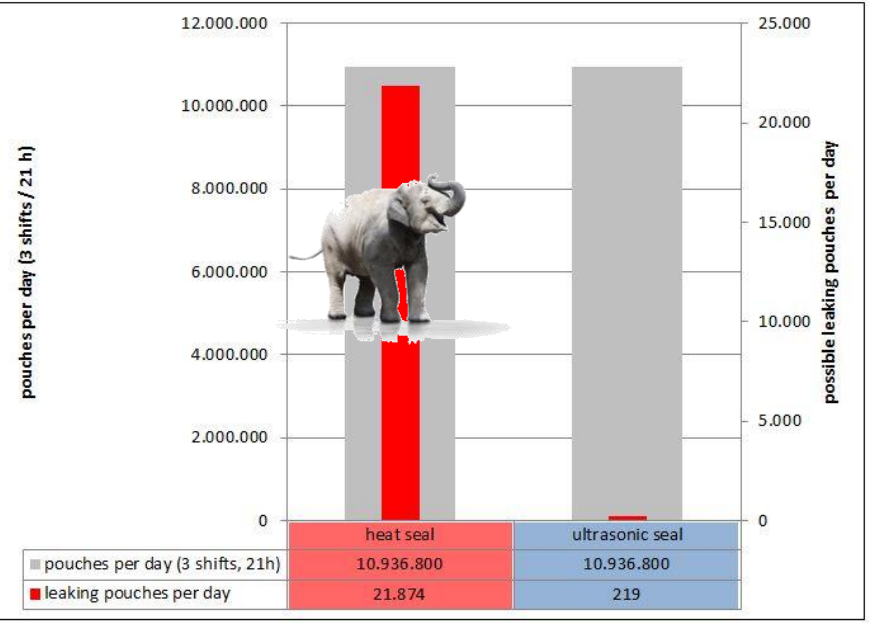
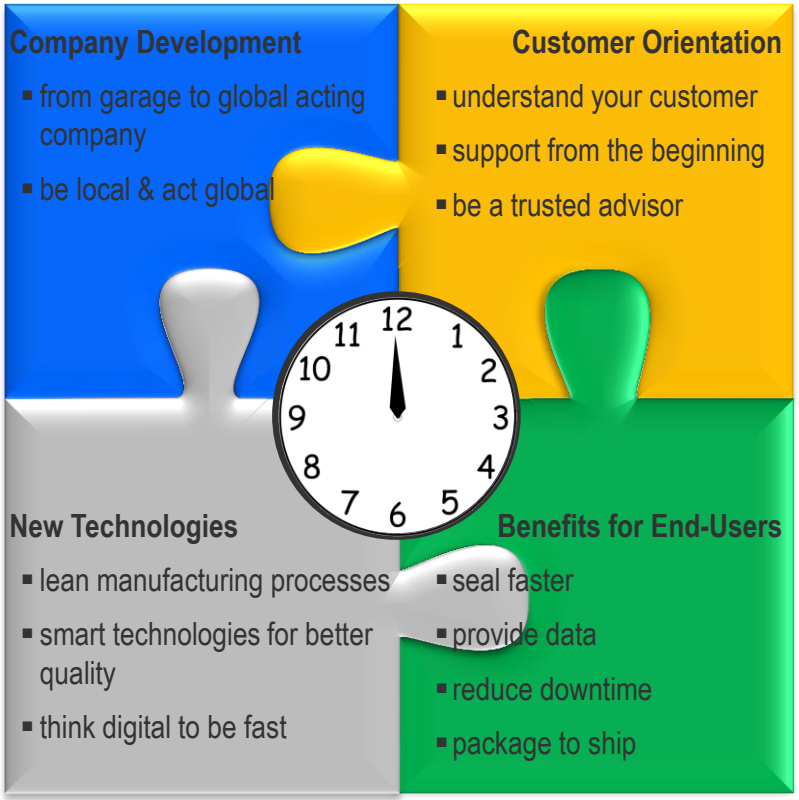
number of sealing stations	4	
pouches / minute	8.680	8.680
pouches per shift (7)	3.645.600	3.645.600
	heat seal	ultrasonic seal
pouches per day (3 shifts, 21h)	10.936.800	10.936.800
percentage of leaking pouches	0,200%	0,002%
critical products incl. fibres	20 out of 10.000	0,2 out of 10.000
leaking pouches per day	21.874	219



Ultrasonic Sealing for PACKAGING Applications

- capsules for coffee and tea
- SUP: stand up pouch (top seam)
- bags: HFFS, VFFS - cross seam and longitudinal seam
- fitments, dispenser, caps, degassing valves, zipper and slider
- beverage cartons
- blister, lid on cup, tubes
- tea bags
- carton slider to film

Ultrasonic Welding Technology
How Can We Support Your Speed to Market?



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