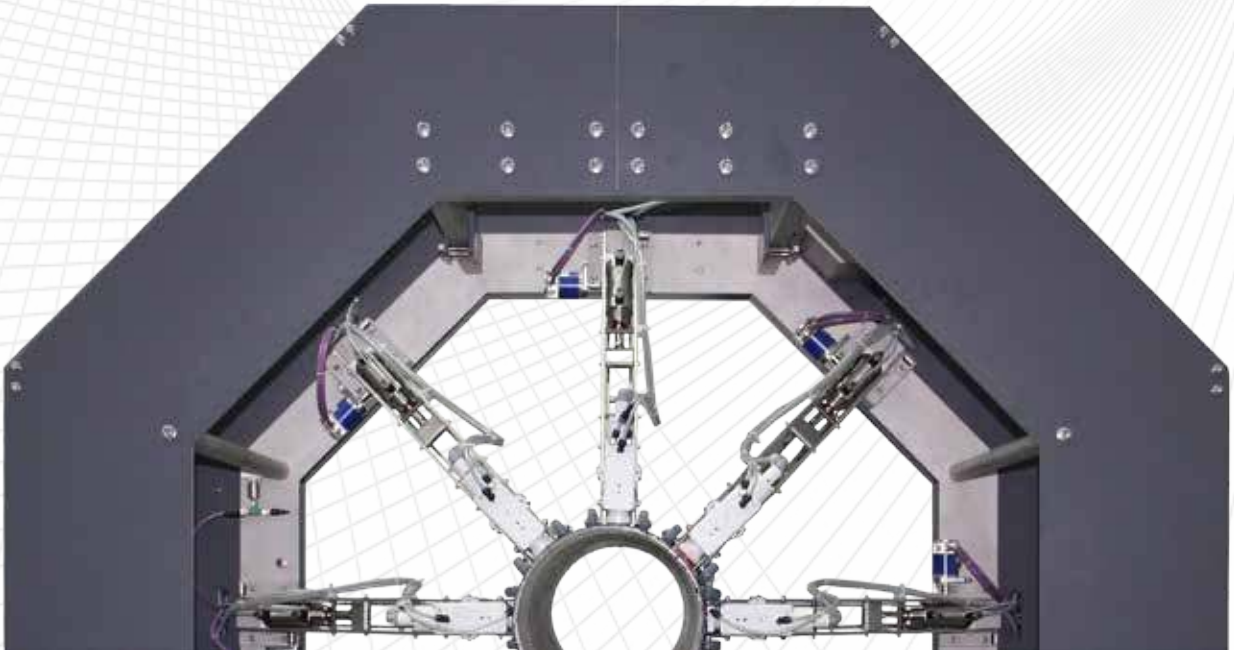
INOEX
THE FUTURE OF EXTRUSION

AUREX

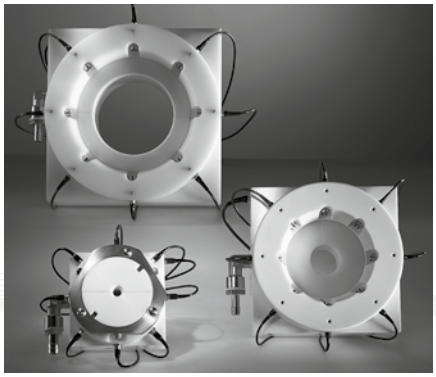
The next dimension of ultrasonic wall thickness measurement



"AUREX is a most flexible and economic ultrasonic measuring system for the production of plastic pipes. It is able to significantly reduce production costs and to increase productivity to the benefit of your economic success."

Marius Thiel
Product Management Technology

THE NEXT DIMENSION IN ULTRASONIC WALL THICKNESS MEASUREMENT



AUREX MK

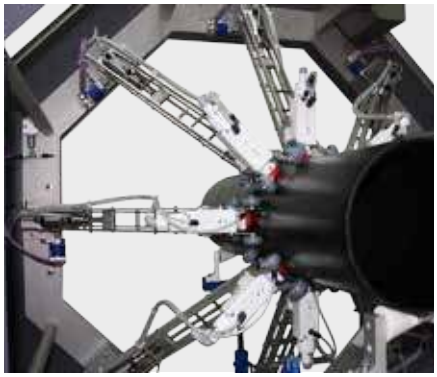
AUREX MK measuring chambers are perfectly adapted to the extrusion process. They supply accurate measuring values, offer a minimum conversion time and stand for an economic complete solution for geometry measurement between 0.5 - 400 mm (0.02 - 15.75").

Reliable and proven!

AUREX AFM

AUREX AFM measuring mechanics weredeveloped for complex tasks. Within a broad working range the output is increased to a maximum level. The same applies to material savings.

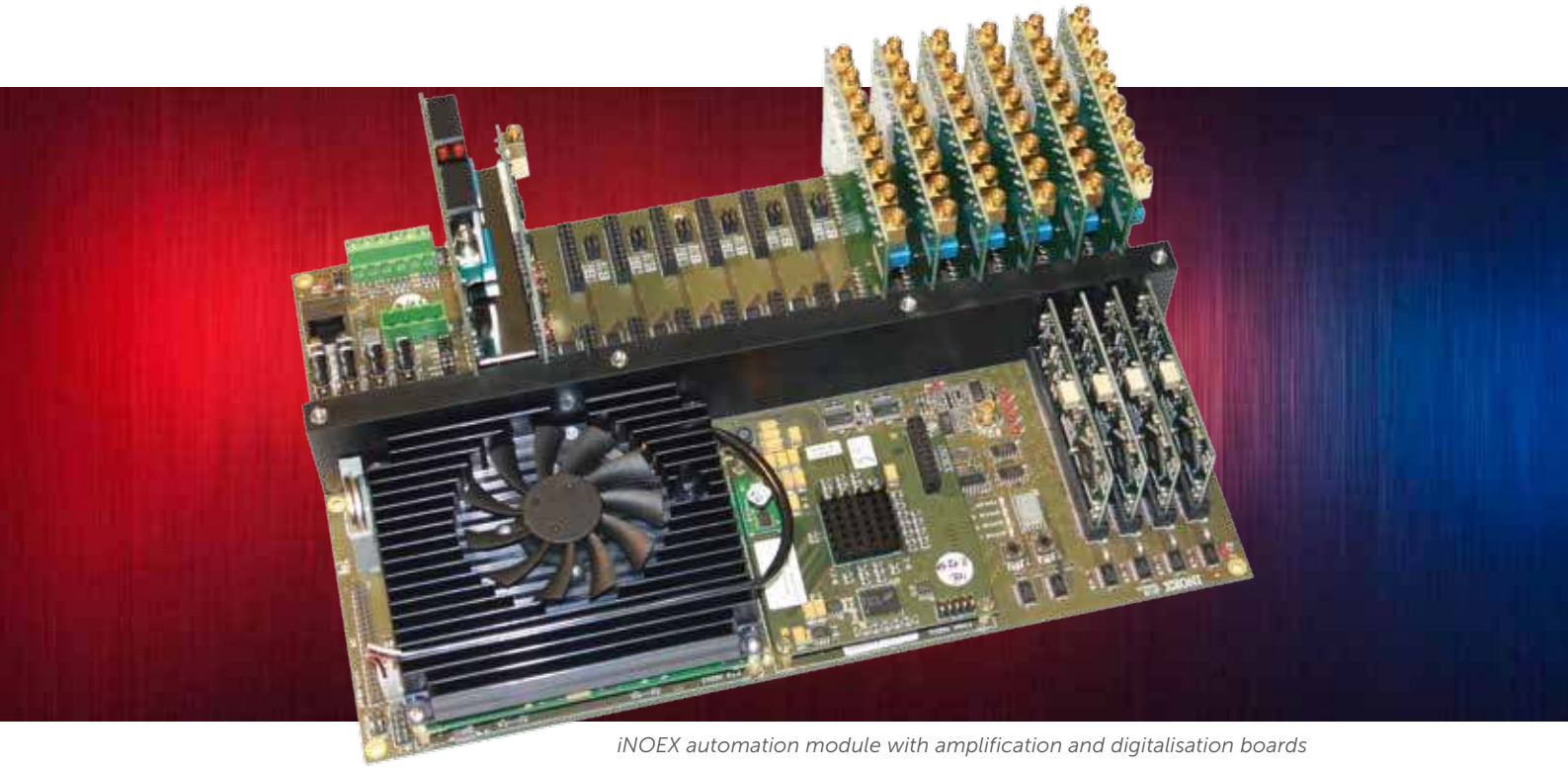
Perfect measuring technique, full documentation included!



AUREX M-LINE / X-LINE

AUREX m-line and **x-line** use very little water during operation. Sensors are pneumatically adjusted to the pipe. In turn, the equipment does not need to be converted when produced pipe dimensions need to be changed**. AUREX x-line** reliably measures the wall thickness of large pipes and increases efficiency.

Reliable and maintenance-free, also for large diameters!



iNOEX automation module with amplification and digitalisation boards

HIGH-PRECISION MEASUREMENT!

SELF-OPTIMIZING.

Only an evenly running, continuous and thoroughly stable extrusion process ensures that the production process is cost-efficient and competitive in the plastics market. This requires a technology which is able to master the interplay of "Measurement & Control", to provide full production data and to convert this data into automated processes. Modular components, flexibility and self-optimization are needed to be able to automate also existing extrusion lines or to respond to new market demands.

An important task is the consistent leveling off of all components involved in the extrusion process. AUREX technology is based on "Measurement & Control", which means that the system recognizes variations from set values without delay and compensates them through control loops in the classic extrusion process. This offers the manufacturer an option for full automation, including the analysis of the extrusion process, its continued performance and finally the documentation of all process data.

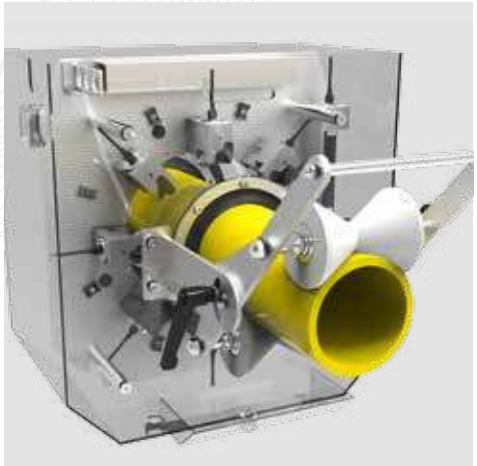
Measuring accuracy and reproducibility are at the base of all further functionalities. In order to be able to regulate the process, measuring values must be recorded continuously and directly during the extrusion process. Consequently, calibration of the measuring devices must be operational also during process changes. Extensive automatic functions such as the self-optimizing measuring value recording, the automatic ultrasonic calibration, integrated compensation of shrinkage and temperatures as well as the reciprocal sensor control ensure a maximum measuring accuracy.

PROVEN IN THOUSANDS OF APPLICATIONS.

INNOVATIVE MEASURING MECHANICS.

AUREX MK guarantees with its process-adapted measuring chambers highly precise measuring values, minimum conversion times and a cost-effective complete solution for the measurement of geometries from **0.5 to 400 mm.**

The required measuring accuracy and functioning are provided by a proven measuring mechanics. Water is supplied through the existing cooling system. An integrated water filter keeps the system clean. For the best possible performance, measuring chambers for diameters up to
125 mm are designed with guide shells (for each dimension) which guide the pipe through the chamber. The ability of these two-part shells to self trigger is needed for a continuous production process in order to prevent any product tear-off. Measuring chamber of more than Ø125 mm are centered by an easily adjustable double cone guidance.



Measuring chamber MK 160 with pipe guidance

Measuring chamber MK 32, hinged

Measuring chamber MK 400

PERFECT MEASURING MECHANICS, FULL DOCUMENTATION!

AUREX AFM sensor adjustment

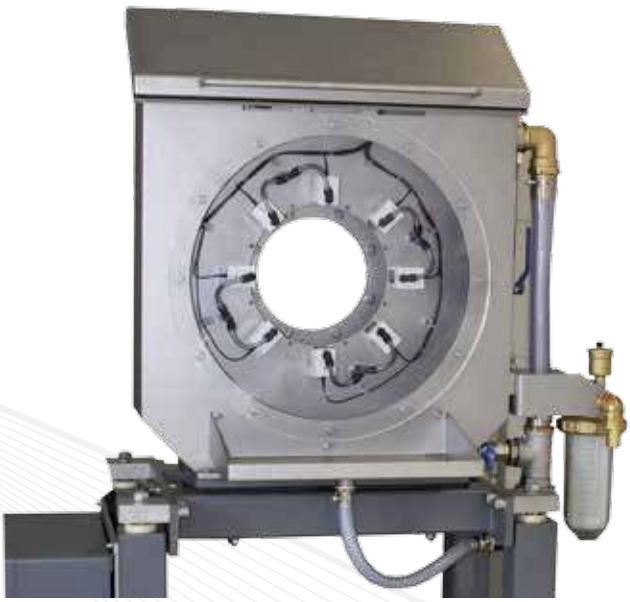
32:630 MM (1.26 - 24.80")– MEASUREMENT WITHOUT LIMITS.

AFM measuring chambers are flanged directly to the outlet of the vacuum tank. Its sensors perform a dependable ultrasonic measurement and equally guide and center the pipe.

For the diameter range of 32:630 mm (1.259 – 24.803") AUREX AFM measures on 8 – 96 spots around the pipe circumference. Wall thickness sizes and diameters are simultaneously measured. Minimum wall thickness tolerances are obtained through subsequent control loops for weight per length and thin points and the thermal die centering unit. All measurements can be automatically documented and evaluated. Product settings are managed and stored under recipe or product numbers to make parameters available fast and reliably when pipe dimensions have to be changed.

This measuring and control system was designed to fulfill the specific tasks of standard pipe extrusion:

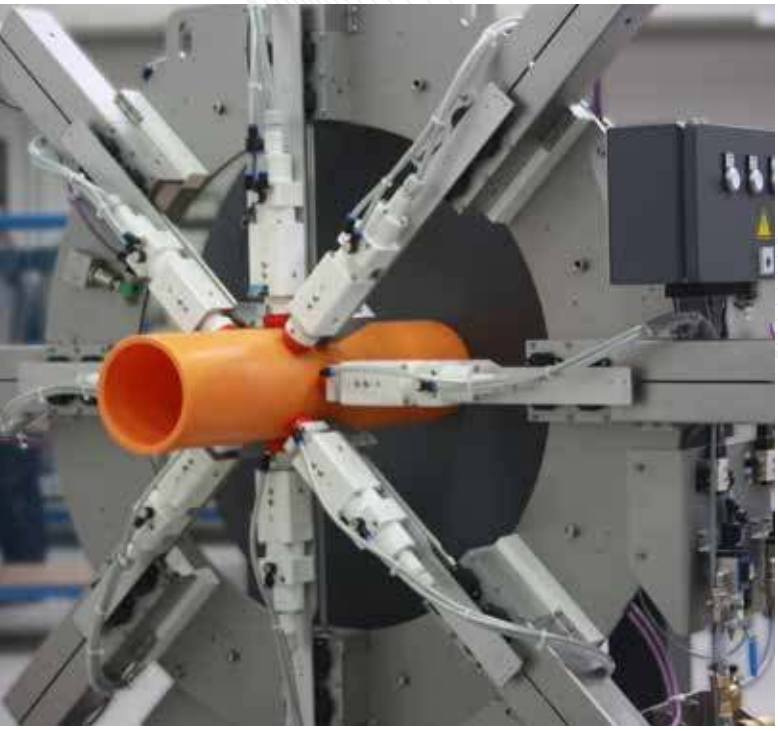
- Maximum increase in output, maximum material savings
- Modular product for gradual retrofitting
- Simple handling and operation
- Process protocols

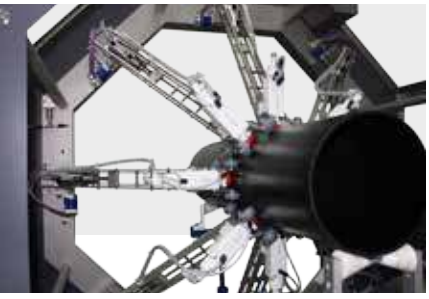


AUREX AFM 400

AUREX AFM 400

EASY, SAFE AND MAINTENANCE-FREE!





RELIABLE AND MAINTENANCE-FREE.

AUREX m-line sets a high standard. The ultrasonic measuring mechanics is maintenance-free and needs only small water quantities for ultrasonic coupling. This is due to the flexible and interlocking connection between the sensor holder and the measured pipe. The correct pipe/sensor coupling is supported by spring tension. The specific combination of the sensor/sensor holder results in a unique flexibility of both. Thanks to a collar piece and spring loaded pressure elements which provide a maximum flexibility, the sensor holder can independently fold up or down when thicker pipe sections pass through.

THE SOLUTION FOR LARGE PIPES.

AUREX x-line reliably measures large pipes with a diameter of up to 2500 mm (98.425”). Its ultrasonic sensors are mounted on pneumatically operated carrier arms which are attached to a support frame. When dimensional changes are required, the sensors can be pneumatically adjusted to the required pipe diameter.

WALL THICKNESS MEASUREMENT, OPTIONALLY DIAMETER MEASUREMENT.

AUREX x-line and AUREX m-line measure the wall thickness and optionally the diameter of a pipe. Subsequent control loops for weight per length and thin points reduce wall thickness tolerances to a minimum and optimize the production process. The improved centering of the pipe results in substantial material savings, especially when large pipes are produced. Measuring accuracy is ± 0.1 mm (0.004”).

100 % HIGH-QUALITY PRODUCTION WITH AUREX ERS!

AUREX ERS measuring mechanics

ELECTRONIC ROTATION FOR A 100 % HIGH-QUALITY PRODUCTION.

AUREX ERS guarantees a 100 % high-quality production and thus the additional plus to achieve excellent results in the market and for the company. Process variations which normally occur during the production process are identified and compensated so that it becomes possible to run a controlled flow production which will in turn generate a plus in quality and efficiency. This exactly where iNOEX comes into the picture!

ERS MEASURING TECHNOLOGY.

This iNOEX measuring technology uses the principle of the **Electronically Rotating Scanner (ERS)** for touch-free measurement and a full scann of the pipe. The technology is based on active/passive measurement. The patented measurement of electronically rotating ultrasonic signals does not leave a single spot of the pipe unchecked. Full measurement in lengthwise direction and around the circumference identifies hidden product defects.

THE OPERATING PRINCIPLE.

Sensor B (active) transmits and receives ultrasonic signals whereas sensors A and C are in passive mode and only receive ultrasonic signals. This is followed by a rotation to the next measuring cycle.
In this measuring cycle sensor C is switched to active mode. It transmits and receives ultrasonic signals. Sensors B and D are now passive and only receive signals. The rotation then continues to the next measuring cycle.

Measuring cycles rotate electronically around the measuring object ...for a 100 % scan.

Type	No. of sensors	OD [mm]	OD *[inch]*	Measuring range extension [mm]	Measuring range extension *[inch]*
ERS 32	18	1 - 32	*0.039 - 1.259*	-	-
ERS 63	24	10 - 63	*0.393 - 2.480*	-	-
ERS 125	36	10 - 125	*0.393 - 4.921*	-	-
ERS 160	30	32 - 160	*1.259 - 6.299*	-	-
ERS 250	36	40 - 250	*1.574 - 9.842*	-	-
ERS 400	36	225 - 400	*8.858 - 15.748*	90 - 225	*3.543 - 8.858*
ERS 630	76	400 - 630	*15.748 - 24.803*	160 - 400	*6.299 - 15.748*

360° SURFACE INSPECTION WITH AUREX OBF COMPLETES AUREX ERS FLAW MANAGEMENT!

OPTICAL INSPECTION OF PIPE SURFACES.

With AUREX OBF, iNOEX offers a simple optical 360° surface inspection system for pipes. AUREX OBF is based on IOS (Intelligent Optical Sensor), features a PowerPC (CPU with 400 MHz) and an intelligent line scan camera which are both mounted in a housing. 3 IOS systems are optionally linked to an AUREX OBF terminal or to an AUREX ERS system. Very small surface flaws can be detected

- 0.27 mm^2 (0.0004 sq inches) for pipes with OD range 10 - 32 mm (0.39 - 1.26")
- 0.40 mm^2 (0.0006 sq inches) for pipes with OD range 32 - 63 mm (1.26 - 2.52")

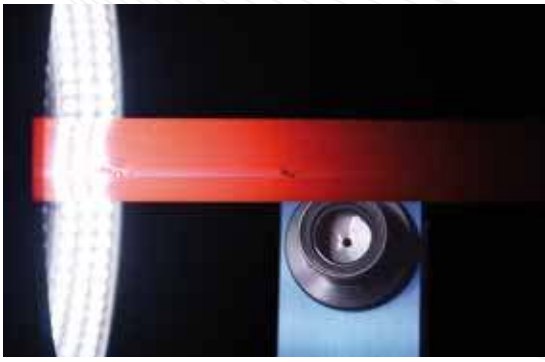
Flaws are automatically recognized by the IOS and the corresponding flaw image is transmitted to the master terminal. 360° surface inspection is guaranteed for line speeds of max. 48 m/min (157 ft/min) for outer diameters up to 32 mm (1.26") and 30 m/min (98 ft/min) for outer diameters up to 63 mm (2.52"). Activation of the alarm lamp, the saw or other downstream equipment is carried out by the IOS.

PERFECT COMBINATION WITH AUREX ERS.

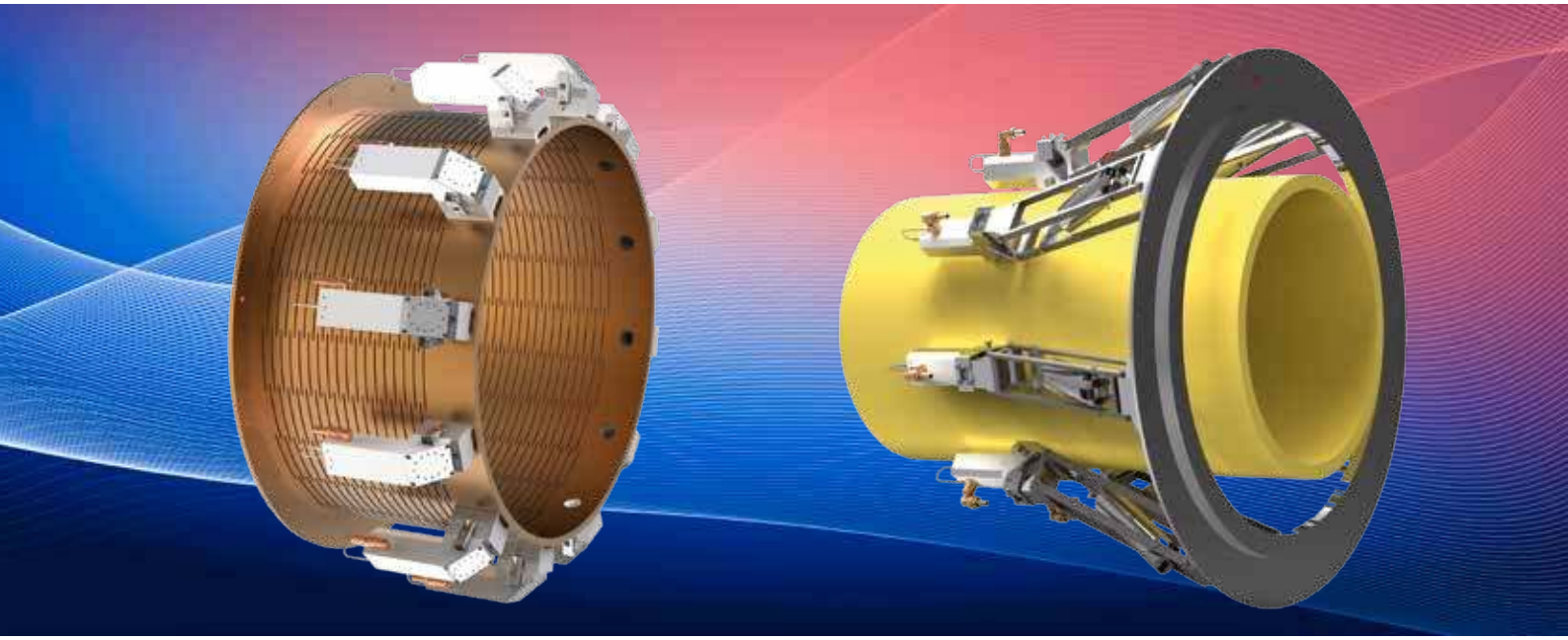
AUREX OBF combined with AUREX ERS perform the optical detection of smallest surface flaws and the ultrasonic detection of inclusions such as structural flaws in the pipe wall. Both systems combined represent the currently most comprehensive system available for flaw detection in the pipe extrusion industry. Various options for visualization assist the operator in documenting detected flaws faster and more clearly. In favour of a more easy handling, the control units of both AUREX ERS and AUREX OBF are encased in a single operation terminal.

Detectable surface flaws:

- dots
- dents
- scratches
- foreign bodies
- streaks in surface gloss



AUREX OBF IOS



ECCO m-line ultrasonic measurement on the calibration sleeve *ECCO i-line ultrasonic measurement with pneumatic sensor adjustment*

FAST CENTERING OF LARGE PIPES!

FAST PIPE CENTERING FOR AN ECONOMIC PRODUCTION OF LARGE PIPES.

The start-up process of thick-walled large pipes is difficult and requires time. The centering of the pipe is a special challenge as different temperatures in the extrusion die have an influence on the melt flow which leads to an irregular wall thickness distribution around the pipe circumference.

As line speed is at a low rate and mass throughput is high, it takes a lot of time and raw material until the pipe can be measured and the centering of the extrusion die can be carried out. A centering aid used at a very early stage is worth hard cash as it supplies immediate information on the wall thickness distribution which in turn is required for the fast centering of the extrusion die.

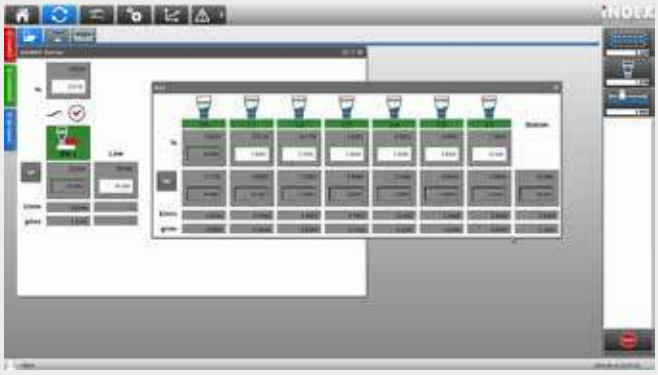
THE WINNING FORMULA: EARLY MEASURING VALUES – RECORDED DIRECTLY ON OR SHORTLY AFTER THE PIPE CALIBRATION UNIT.

ECCO by iNOEX represents an efficient solution for a fast centering of the pipe. For the first time the wall thickness distribution can be measured during or shortly after the pipe calibration. The ultrasonic sensors of ECCO i-line are mounted on a pneumatically operated carrier arm attached to a frame ring which is located closely after the calibration sleeve. After the line start the ultrasonic sensors are pneumatically adjusted to the pipe. Then measurement

NEW VISUALIZATION CONCEPT.

The cross-platform concept headed for the future permits the visualization as a Website by way of an easy integration through a browser. This way the iNOEX user interface can be visualized on all systems, which are Internet enabled. The multi-touch surface permits an intuitive operation by gesture command (zoom, swipe).

Operation is carried out through installed Widgets, which can be freely configured by the user, independent of their size or information, they can be added or removed as required. This allows the user to have permanent access to the most important applications (favorites).



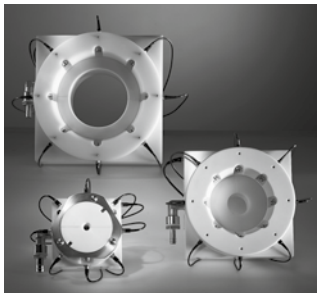
FAST CUSTOMER SUPPORT WITH TEAMVIEWER.

- Worldwide support via remote control
- Easy configuration, no VPN gateways
- In accordance with the highest safety standards

TeamViewer

SUCCESS IS MEASURABLE!

Ultrasonic systems by iNOEX provide you with the option to submit a measurable quality to your customers. Moreover, measurable cost savings are available to you. Your production process runs not only consistently and reproducibly due to constant wall thicknesses and good centering. With AUREX ultrasonic systems material savings of 5 % or more are possible through better centering and a systematic start up. Especially in combination with SAVEO-MAT gravimetric systems, payback periods are very short.



AUREX MK (Ø 63 mm PE-pipe)

Output	Production time	Savings	Material costs	Savings p.a.
250 kg/h	16 hrs/day x 350 days/year	2.0 % (Ultrasound)	1.30 €/kg	36,400 €
250 kg/h	16 hrs/day x 350 days/year	3.0 % (Gravimetry)	1.30 €/kg	54,600 €
		5.0 % total		91,000 €

AUREX x-line (Ø 800 mm PE-pipe)

Output	Production time	Savings	Material costs	Savings p.a.
1,400 kg/h	16 hrs/day x 350 days/year	2.0 % (Ultrasound)	1.30 €/kg	203,840 €
1,400 kg/h	16 hrs/day x 350 days/year	3.0 % (Gravimetry)	1.30 €/kg	305,760 €
		5.0 % total		509,600 €

AUREX AFM (Ø 630 mm PE-pipe)

Output	Production time	Savings	Material costs	Savings p.a.
1,200 kg/h	16 hrs/day x 350 days/year	2.0 % (Ultrasound)	1.30 €/kg	174,720 €
1,200 kg/h	16 hrs/day x 350 days/year	3.0 % (Gravimetry)	1.30 €/kg	262,080 €
		5.0 % total		436,800 €

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THE FUTURE OF EXTRUSION

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