Inline Melt Characterization of rPellets – Adding value to recycling

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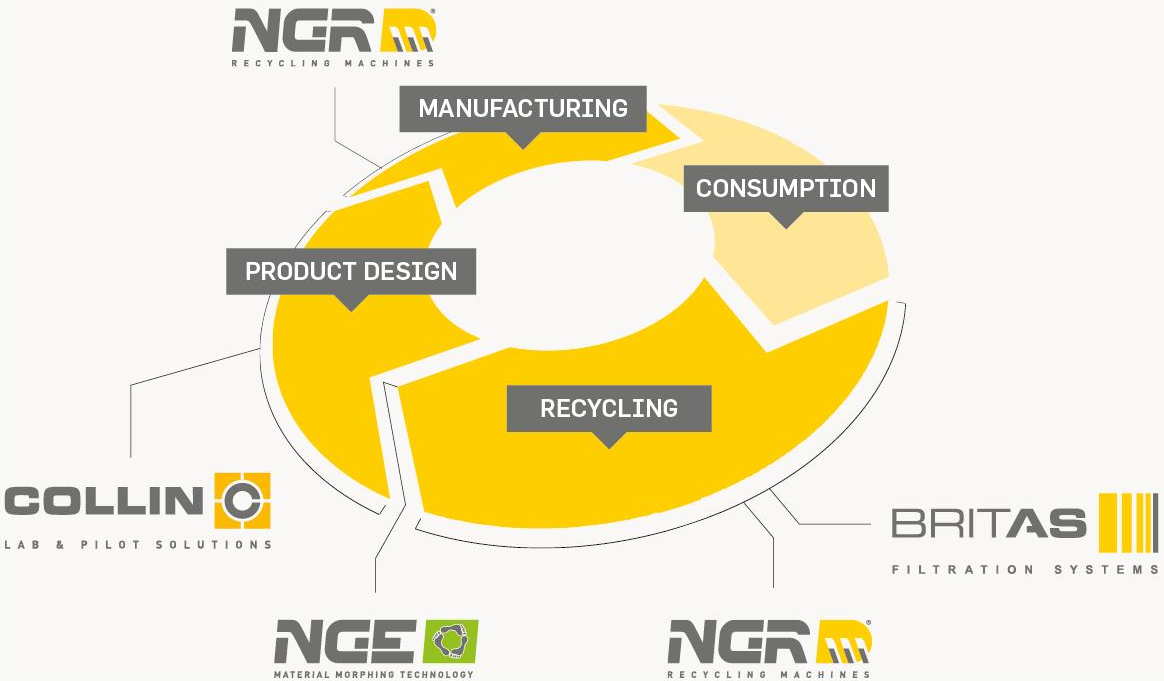
NEXT GENERATION GROUP



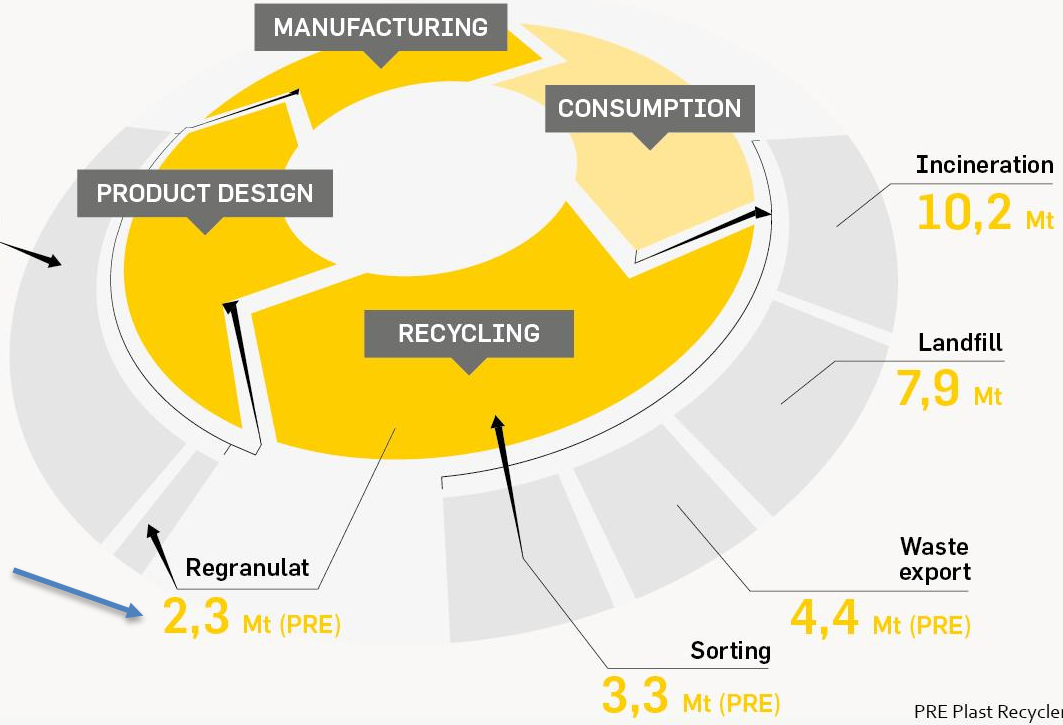
PRODUCTDESIGN
> Active support with analytical instruments
> Optimizing of material + material-converting
> Development of eco-efficient products

MANUFACTURING
> Seamless integration of recycling in material-logistics
> High-grade pellets out of production scrap
> **„Zero Scrap“** in plastic-converting

CONSUMPTION
> Creating eco-awareness
> Adaption of consumer-habits
> Promotion of eco-efficient products

RECYCLING
> Innovative recycling-solutions for end-of-life plastics
> Quality-Management of rPellets + high performance filtration
> Efficient waste-management

PLASTIC STREAM EU28+N/CH

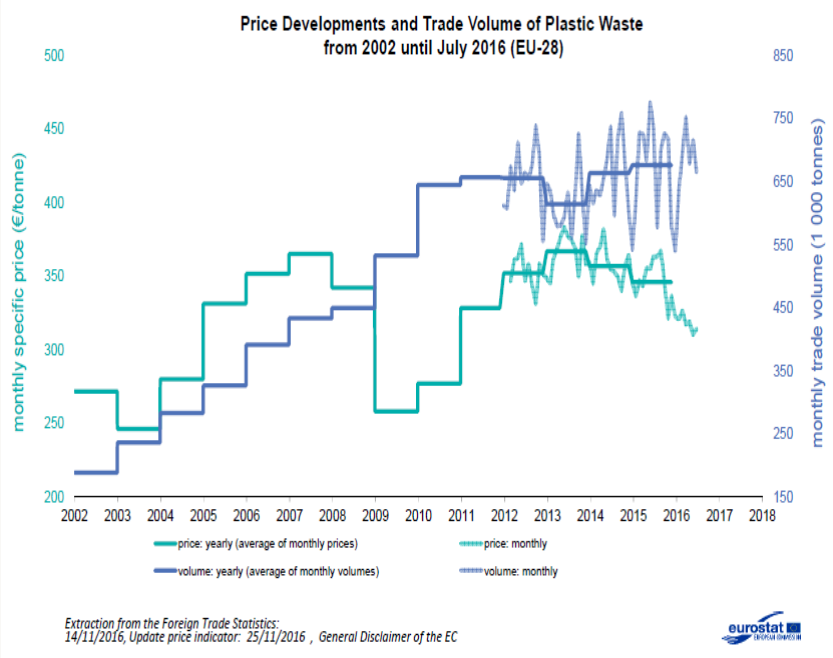


Taget 2025
up to 55% recycling

PRE Plast Recyclers Europe, 2015 and Plastics Europe, 2015

FORECAST 2025

> EU circular economy – new targets 2025
> Quote plastic packaging increases from 22,5% to 55%
> Awaiting significant higher trade volume per month – actual approx. 650 000 to per month in EU
> Dramatic increase of rPellet production
> The big question – quality
> The bigger question – price development



WHY QUALITY CONTROL?

> Recycling becomes more difficult because of more complex use (multilayer film)
> Automotive industry asks for definition of quality and specifications, traceability
> Industry is asking for recycling material with specifications close to virgin material

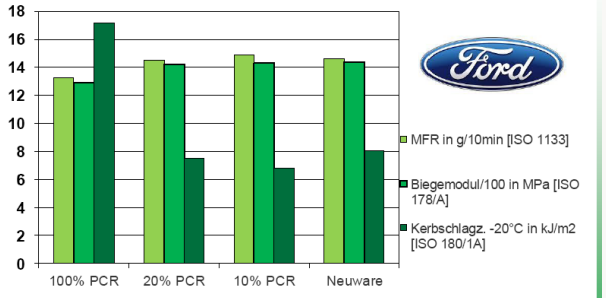
1. WIPAG Gruppe – Carbon-Compoundierung

Material	Norm	DIM	WIC PP 10	WIC PP 15	WIC PP20	WIC PP30	WIC PP40
Dichte / density	ISO 1183	[g/cm³]	0,95	0,97	1,01	1,05	1,11
Schlagzähigkeit (23°C)/ Impact 1eU 4J	ISO 179	[kJ/m²]	30	35	40	48	37
Kerbschlagzähigkeit (23°C)/ notched impact 1eA 0,5J/2J	ISO 179	[kJ/m²]	4	6	7	8	7
Zug-E-Modul/ Tensil-E-Modulus (ET) 1mm/min 1A	ISO 527/2	[MPa]	5.600	8.000	9.700	13.000	15.500
Zugfestigkeit (RM)/ tensile strenghth 5mm/min 1A	ISO 527/2	[MPa]	55	73	79	90	90
Reißdehnung/ elongation at break (AB)	ISO 527/2	[%]	1,8	1,8	1,6	1,3	1
Schrumpfung/ shrinkage		[%]	L:0,18; B:1,44	L:0,15; B:1,25	L:0,08; B:1,15	L:0,05; B:0,91	L:0,0; B:0,80

WIPAG We close the loop!

5. Stoßfänger-Recycling - Materialeigenschaften

PP/EPDM Recompound aus Altstoßfängern



WIPAG We close the loop!

PCR = Post Consumer Recyclate (Alter der Teile ca. 10 Jahre)

Source: Speech at 19th Internationaler Altkunststofftag, 21.-22.6.2016 in Bad Neuenahr/BRD

Online Quality Control. Motivation

- **Conditions**
  - Recycling machines with increasing throughputs
  - need of higher ratio of recycled plastic in products requires preciser property specifications
  - pressure on the market because of prices

- **Needs**
  - minimization of off-spec waste
  - quick and extensive monitoring of material properties
  - intervention in the converting process by off-spec

- **Weakness of laboratory control**
  - too much time flies during material testing in laboratories

Online Quality Control. Requirements

Measuring methods with following performances:

- quick response (near to the converting machine)
- adequate sensitivity to identify deviations from specification
- robust test assembly
- constant environment (Temp., moisture, …)
- statistical significance
- correlation with laboratory test methods
- comparability
- time dependent monitoring
- customizable

Online Quality Control. Approach

A new approach in quality control at the recycling process

Comprehensive Characterisation

- melt and solid state properties
- customizable due to modularity

Interaction

- possibility to influence the converting process by communication to the production line
- specified action limits

Permanent Monitoring

- display chronological sequences
- trace of drifts and deviations
- constancy of measured data precede laboratory values

Marketable

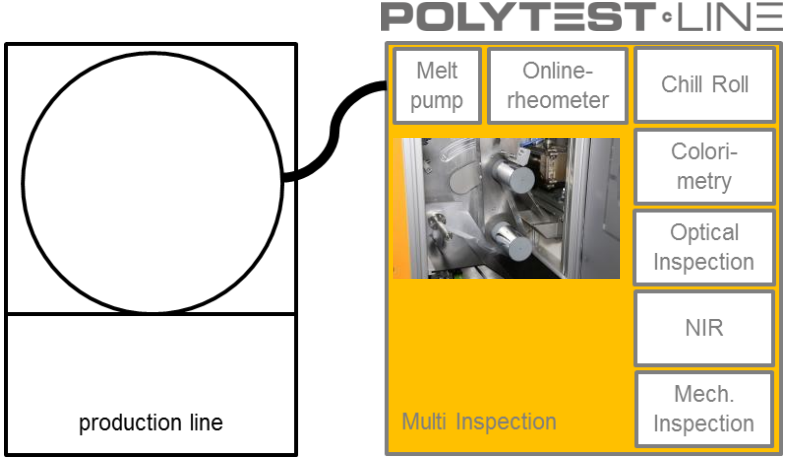
- compact size
- economically priced components

Online Quality Control. Approach

Taking out a side stream of the melt from the production line and cast a film - then various inspection methods can be combined

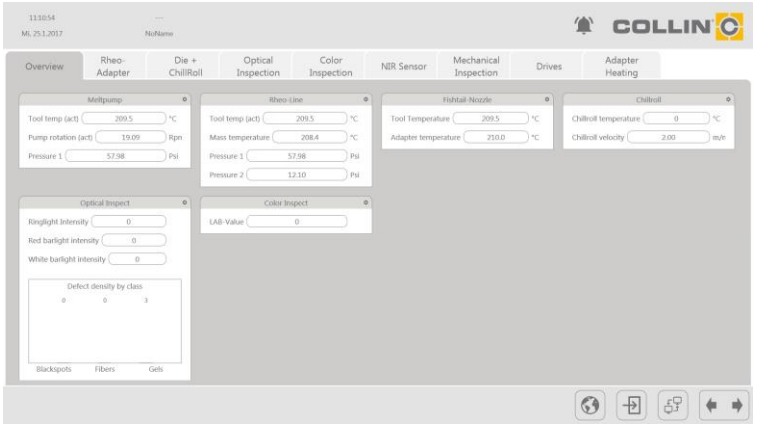
- melt viscosity (before casting a film)
- optical inspection (gel counting)
- colorimetry
- infrared detection of inpurities
- tensile test
- …

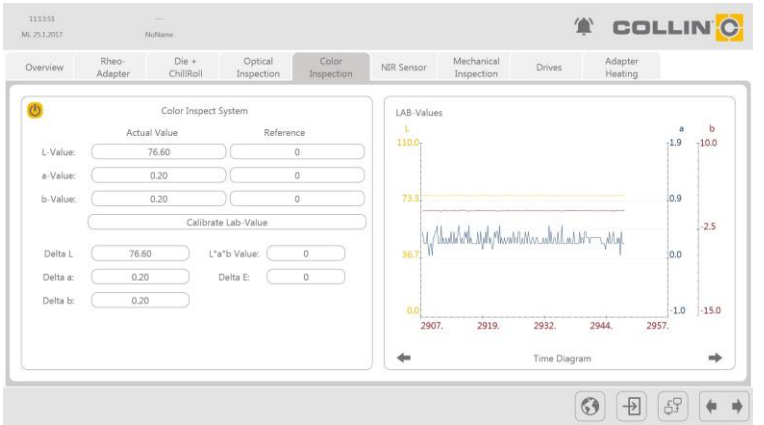
The modularity of the system allows a customized configuration with different measuring systems.



Online Quality Control. Realisation

- modular and compact measuring device
- collecting all data in one system
- clearly represented data overview
- detailed information for each setting parameter
- chronological sequence of each measured value
- upper and lower control limits
- data storage
- data transfer to the production l





Online Quality Control. Technical Data

- The system is construed for a **mass flow** rate up to approx. **2.5 kg/h**.
- The **flat film die** has a cross section of **0.5 x 100mm²**.
- **Line Speed** up to **5m/min**.
- Best Performance with film thickness of approx. 50µm and line speed of 2-3m/min.
- calculated apparent viscosity at a rheological slit die
- optical inspection with a **resolution** of approx. **30µm**
- colorimetry at **CIE L*a*b*** color space
- NIR with a multispectral sensor (sensitivity 5-10%)
- measured stress-strain relationship at constant elongation
- **Dimensions**: 1200x580x1690mm
- Data exchange via PROFINET protocol with the production line

Online Quality Control. Conclusion

Comprehensive inspection device for testing film quality

- **Comfortable**. Quick melt and film inspection at the production line.
- **Compact**. Low space requirements due to the compact design.
- **Output-raising**. Reduction of the quantity of waste in the production process.
- **Modular**. Cost-efficient components.

Contact

For more information regarding COLLIN Polytest Line

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Thank you!