Sustainable technical materials. Innovative recycling concepts

XIV Edycja Konferencji Plastinvent 28/30.09.2022

Agenda

Sustainable technical materials. Innovative recycling concepts

TER GROUP TER Plastics POLYMER GROUP

1. **Background of Recycling**
2. **Availability of Recycling Feedstock**
3. **TER Plastics‘ Contribution to the Recycling Market**
4. **Recyclates by TER Plastics**
5. **TEREZ-Eco Grades approvals**
6. **Summary and Conclusion**

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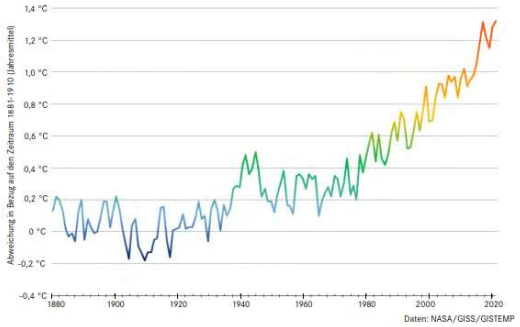
Background of Recycling

Thematic drivers

1. Shortage of resources
   - „Rohstoffe der Zukunft werden knapp“ (SZ 13.0.7.21)
     - „Das Angebot werde voraussichtlich nicht schnell genug wachsen, um die Nachfrage zu befriedigen„; Beratungsunternehmen BCG.
     - „Im Jahr 2030 dürften Batteriehersteller dreimal soviel Lithium oder Nickel, Kobalt oder Mangan benötigen, wie von diesen Ressourcen derzeit verfügbar sei“; Forscher der US-Firma Cairn Energy Research
   - Although the (known) oil reserves will last for > 50 years, oil production and consumption lead to CO_2 pollution

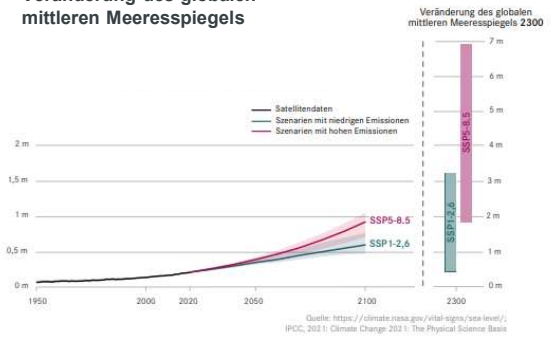
2. Climate

Globale Mitteltemperatur1880 - 2020



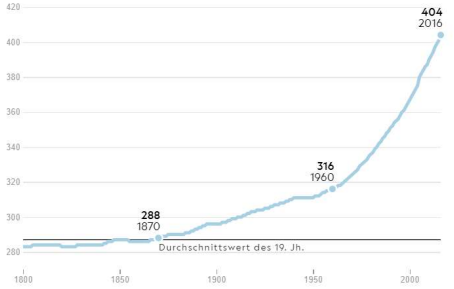
https://www.deutsches-klima-konsortium.de/fileadmin/user_upload/pdfs/Publikationen_DKK/basisfakten-klimawandel.pdf

Veränderung des globalen mittleren Meeresspiegels



https://www.deutsches-klima-konsortium.de/fileadmin/user_upload/pdfs/Publikationen_DKK/Deutsche_Klimaforschung_informiert_zum_Klimawandel.pdf

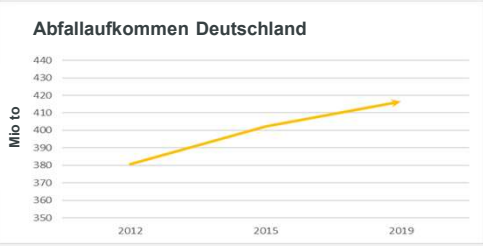
CO2-Konzentration in der Atmosphäre 1800 - 2016



https://www.nationalgeographic.de/7-fakten-zum-klimawandel

3. Waste
   - EU produces > 2500 million tons of waste per year
   - The amount of waste tends to increase and must be reduced (example D →)
   - Landfill bans force higher recycling rates
   - Today's waste becomes the raw material of the future

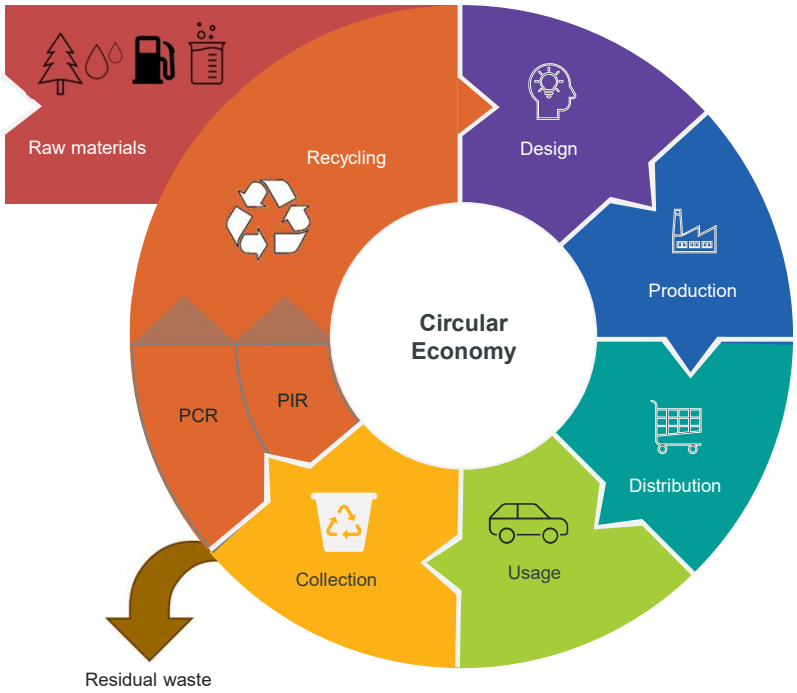
Abfallaufkommen Deutschland



Background of Recycling

Circular Economy and Recycling Categories

Circular Economy



PCR = Post Consumer Recycling, PIR = Post Industrial Recycling

Recycling Categories

Methode	Definition	Description / Procedure
Material Recycling	Separating, sorting, reprocessing, regranulating without dissolving the plastic compound itself	Mechanical Recycling
Polymer Recycling	Dissolving the plastic compound, the polymers chains remain intact	Solvent Recycling Solvolysis
Monomer Recycling	Decomposition of the plastic into its monomers and new synthesis starting from there	“chemical” Recycling Chemolysis Pyrolysis Hydrolysis
Thermal Recycling	Energy utilization of the plastic	Waste incineration

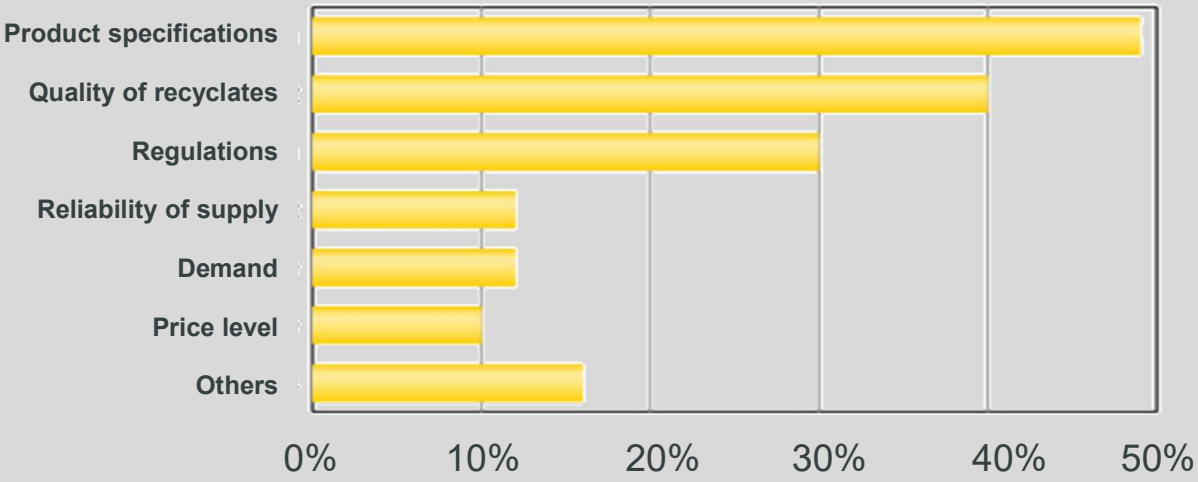
Background of Recycling

Challenges

EuPC Customer survey on recycling, published in KI, January 2019:

- 376 companies from 21 countries
- 47% of participants did not use recycled materials

Reasons to not use recycled materials



Quelle: EuPC

1. High-quality requirements
2. Standards, norms
3. Quality
   Homogeneity, contamination, fillers
4. Raw material access, reliable supply
5. Price

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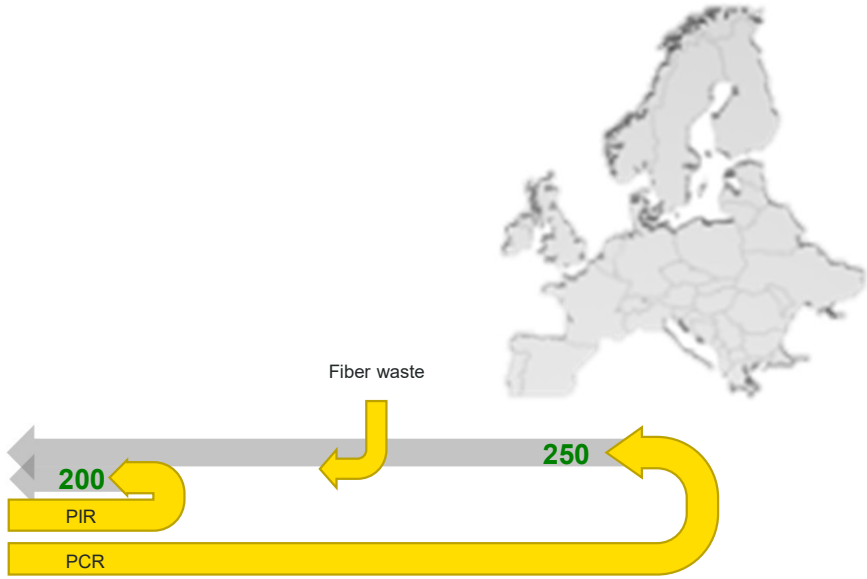
Availability of Recycling Feedstock

Sources of Recycling for engineering plastics

Plastics conversion volume 2020 EU + 3 incl. recycling* **

	Unit	volume
Total	kto/a	54.000
PE	kto/a	18.000
PP	kto/a	11.000
PVC, PET, PUR, …	kto/a	21.000
Engineering Thermoplastics	kto/a	4.000
Demand engineering plastics	kto/a	4.000
Industrial waste	kto/a	300
Processing into products	kto/a	3.700



- From waste < 500 kto (<15% of the total demand) of engineering plastics are available for reuse.
- Fiber and textile waste from PIR und PCR increasingly complement the recycling volumes.
- Recyclates cannot cover the total demand of engineering plastics.
- Additional volumes to cover the increasing demand for recyclates must come from PCR.

** Total volumes: „The Circular Economy for Plastics", PlasticsEurope 2022; Polymertypen: „Plastics-the Facts 2021", PlasticsEurope 2021, AMI 2021, hochgerechnet mit Recyclingmengen*

*** without fibre quantities PET, PA, etc.*

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TER Plastics' Contribution to the Recycling Market

Development, Production and Marketing of recycling-based materials

- 4 decades experience in recycling of plastics
- Large portfolio of recycling-based materials
- Development and production of customized compounds
- Acknowledged development partner
- Pan-European organization

TER Group

TER Plastics

7500 Materials

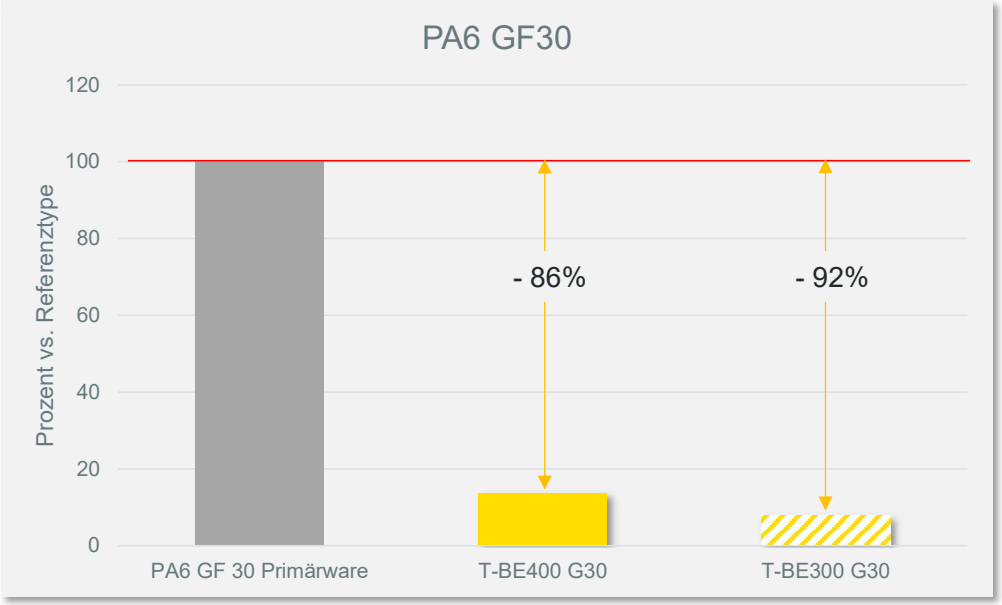
4800 Customers

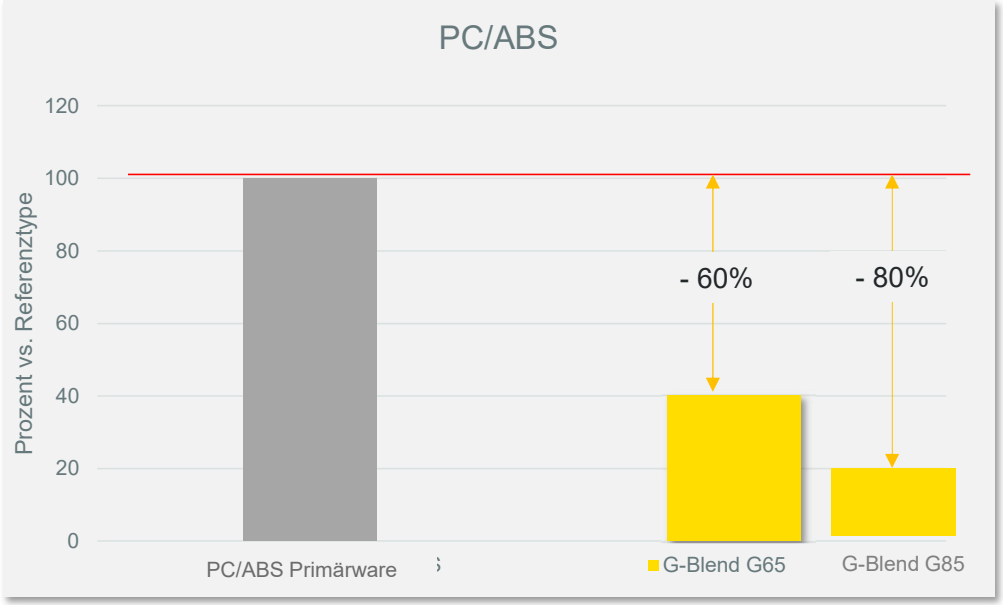
9 locations in Europe with 18 Sales offices

TER Plastics' Contribution to the Recycling Market

Significant reduction in CO_2 emissions caused by high-quality recycling grades

Relative change in CO_2 emission factor [$kgCO_{2eq}/kg$] compared with reference grade





- The grades TEREZ BE 400 G30 and TEREZ BE 300 G30 offer a CO_2-advantage over virgin products of > 80%
- TEREZ BE 400 G30 offers the best combination of techninal performance and CO_2-footprint

- G-Blend G65 and G85 offer a significant advantage over virgin products

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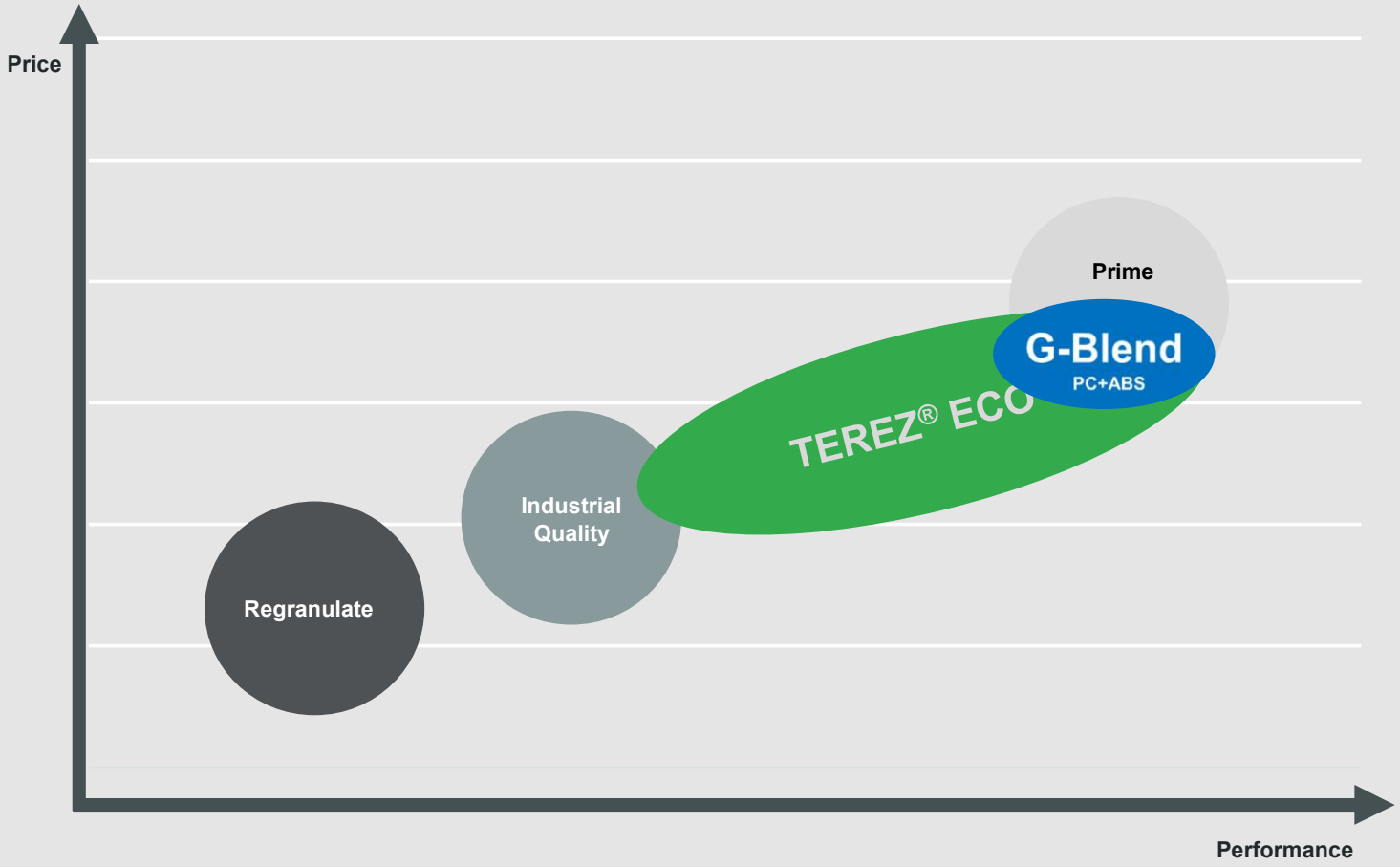
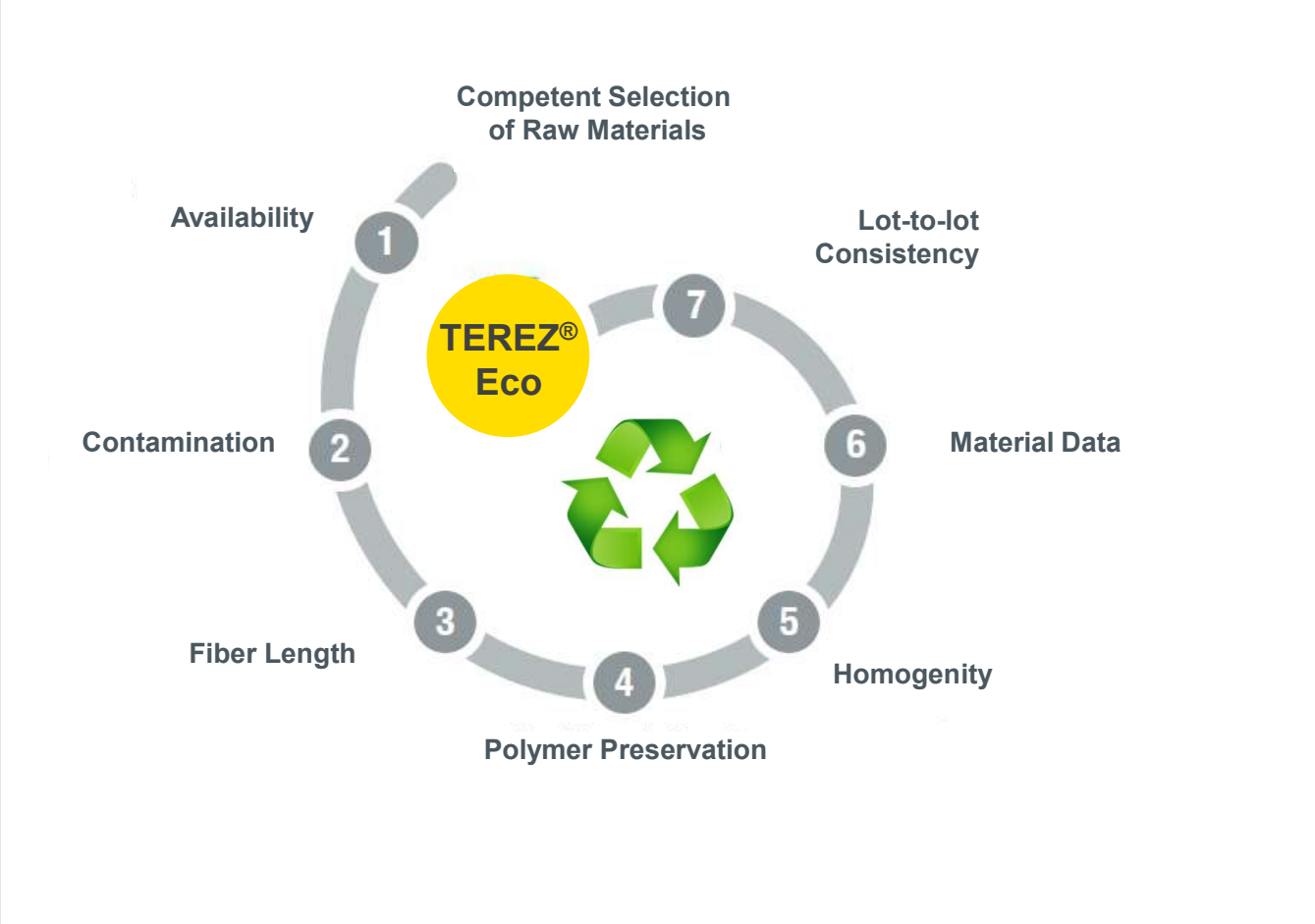
Recyclates by TER Plastics

Positioning

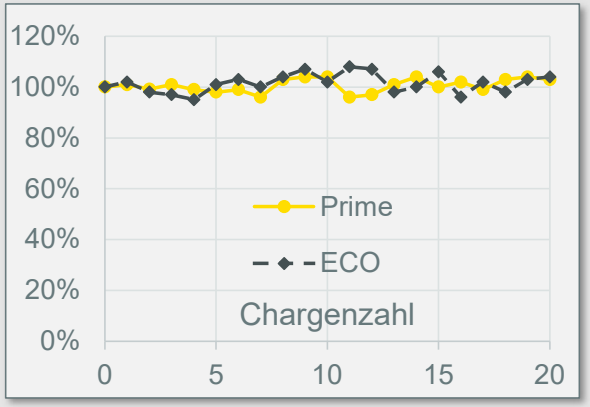


Recyclates by TER Plastics

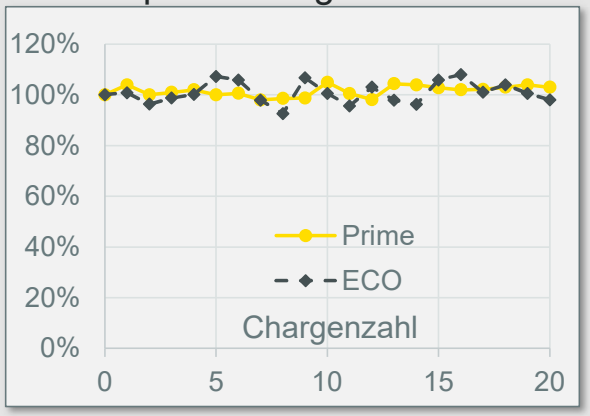
High quality through multi-stage manufacturing process



Notched Impact Strength



Impact Strength



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Summary and Conclusion

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1. Today's waste must be tomorrow's raw material.

2. The production of high-quality ECO materials that are capable of meeting automotive standards, with high batch-to-batch consistency, a guarantee of continuous supply and an adequate price, will increase the rate of use of recycled materials. An increase in the volume of PCR is necessary to maintain the growth of available recycled materials.

3. Today, commercial grades already exist that can meet automotive standards.

4. Ter Hell Plastics has a wide range of materials capable of meeting these standards.

5. It is imperative that we all play our part in making the 2030 agenda for sustainable development a reality.

Thanks for your attention