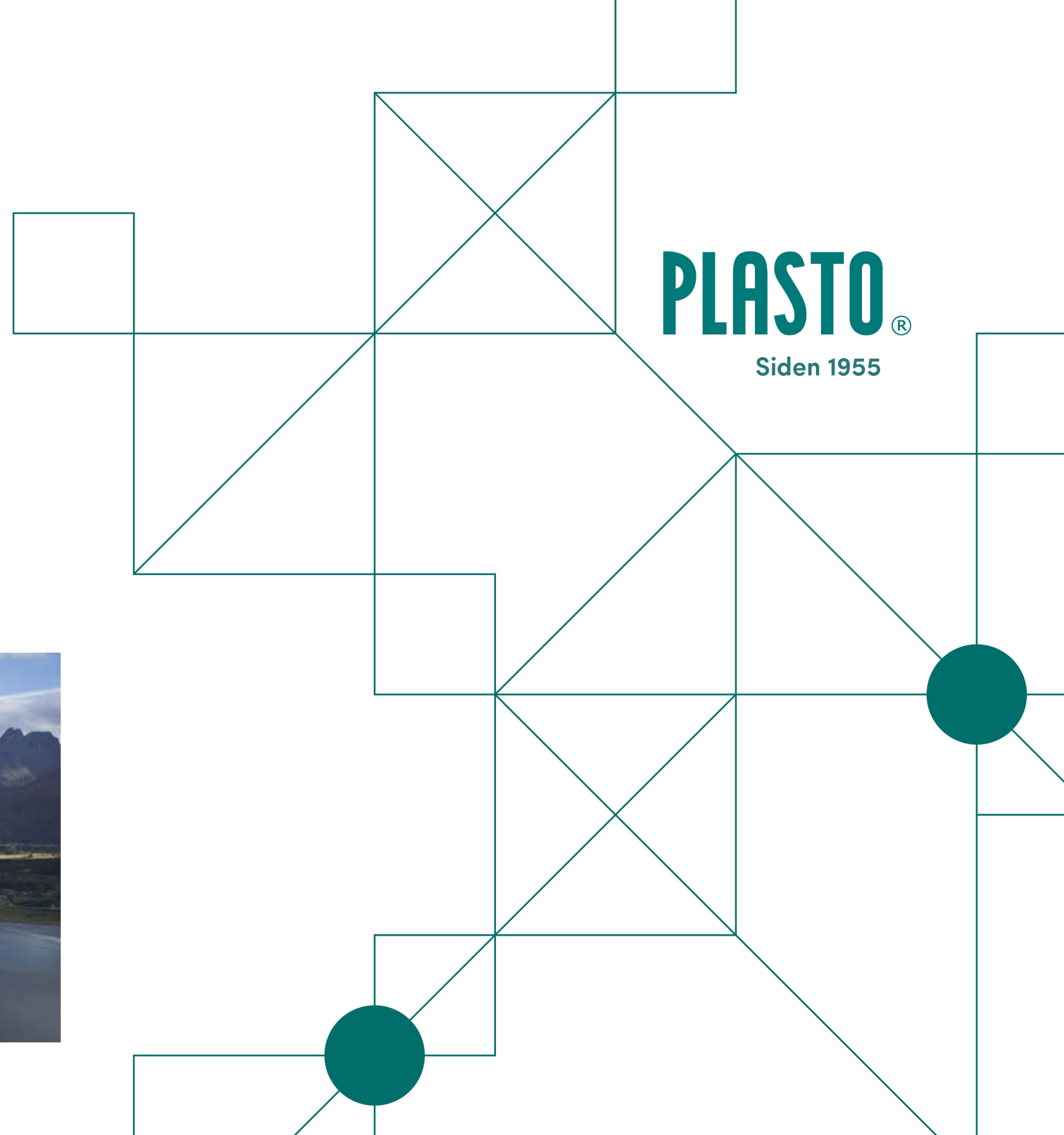


PLASTO®

New circular business models through research and innovation

Innovations since 1955

- 3rd generation family owned
- Injection molding of thermoplastics
- Research-based innovation
- Localized in Åndalsnes

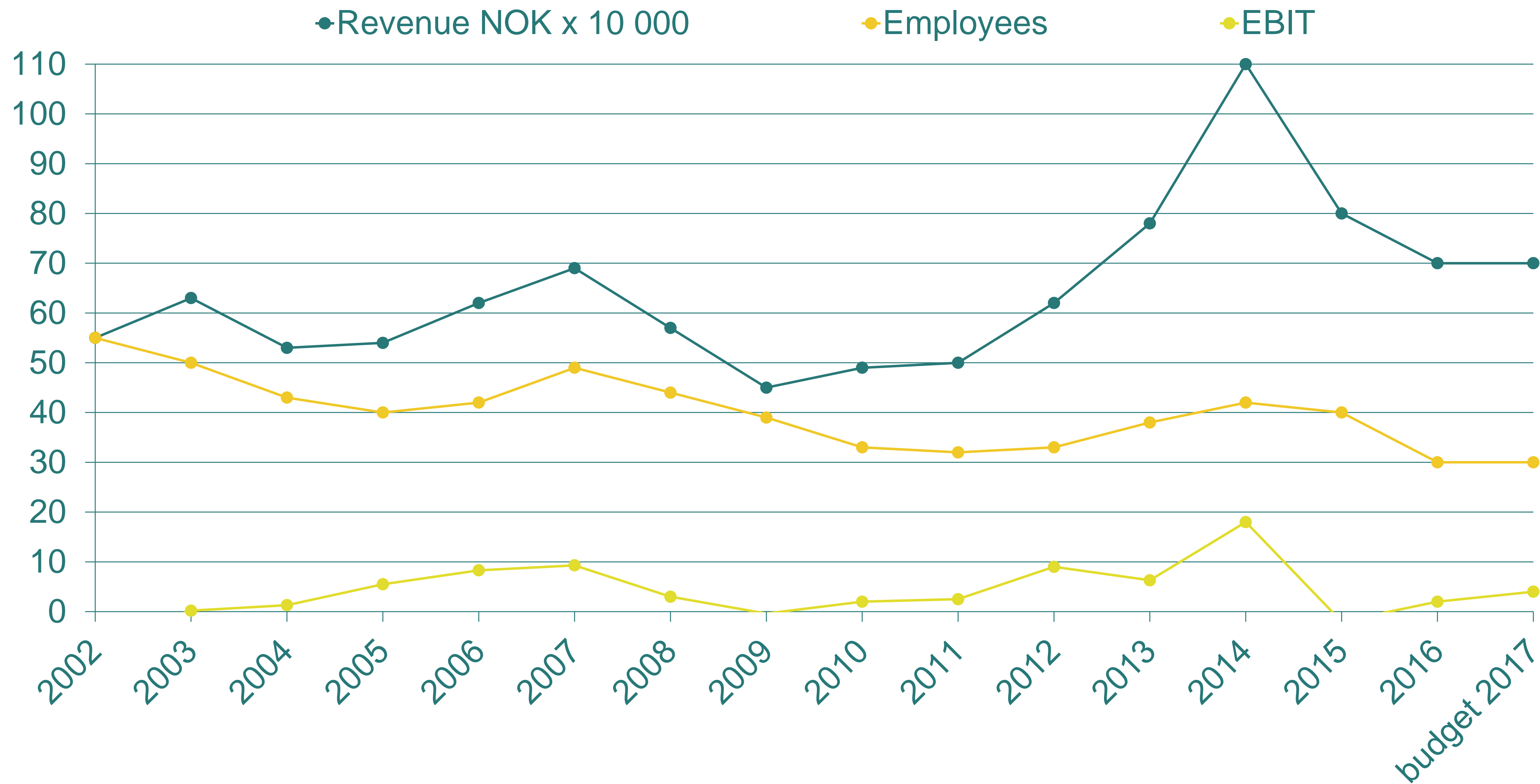


Facilities

- 26 robots
- 20 Injection Molding machines
 - 25 to 1500 ton clamp force
 - Products range from under 1 gram to over 100 kg.
- Fully automated 24/7 production
- R&D, engineering, construction, product development
- In-house mold shop and automation department

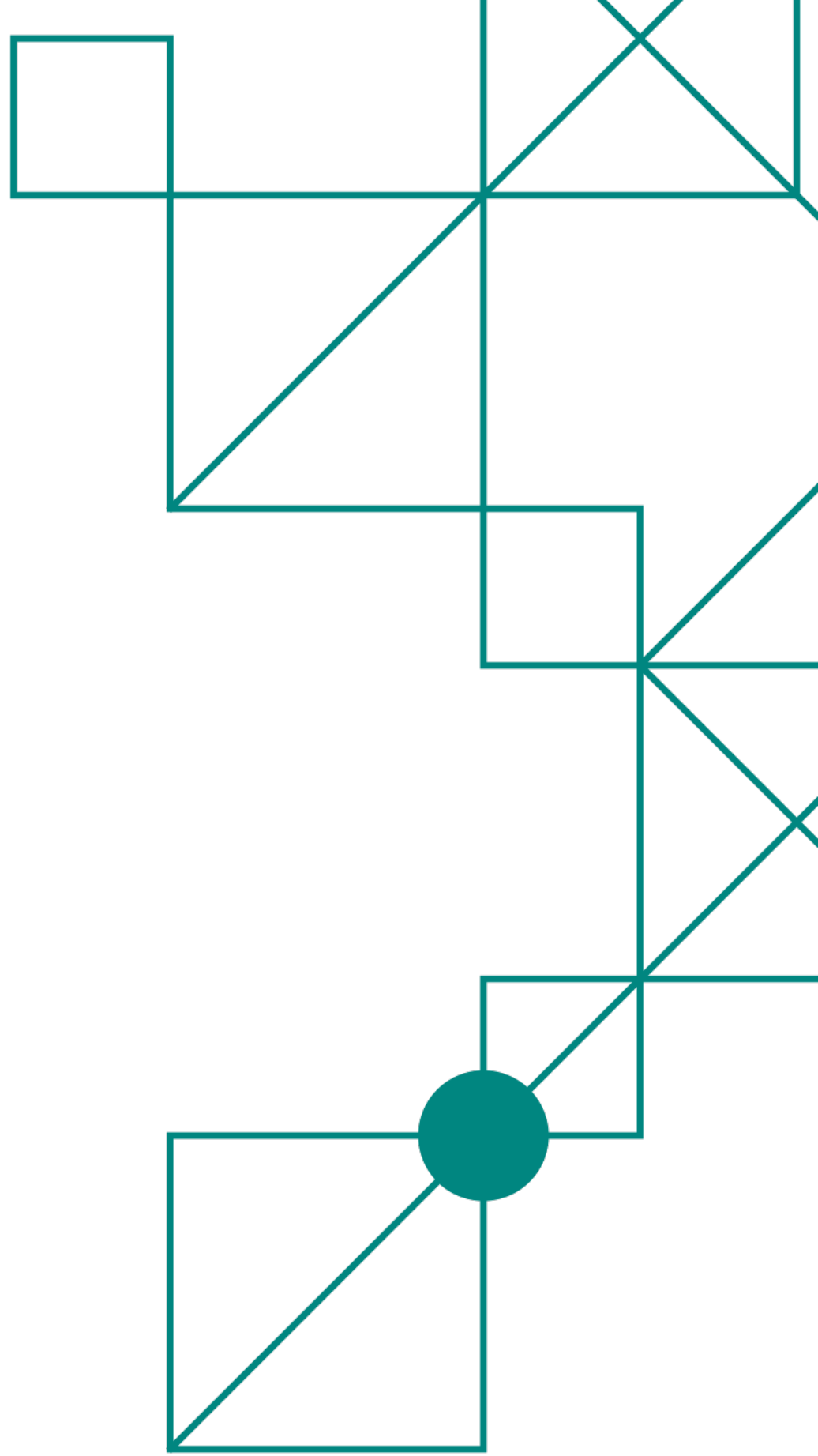
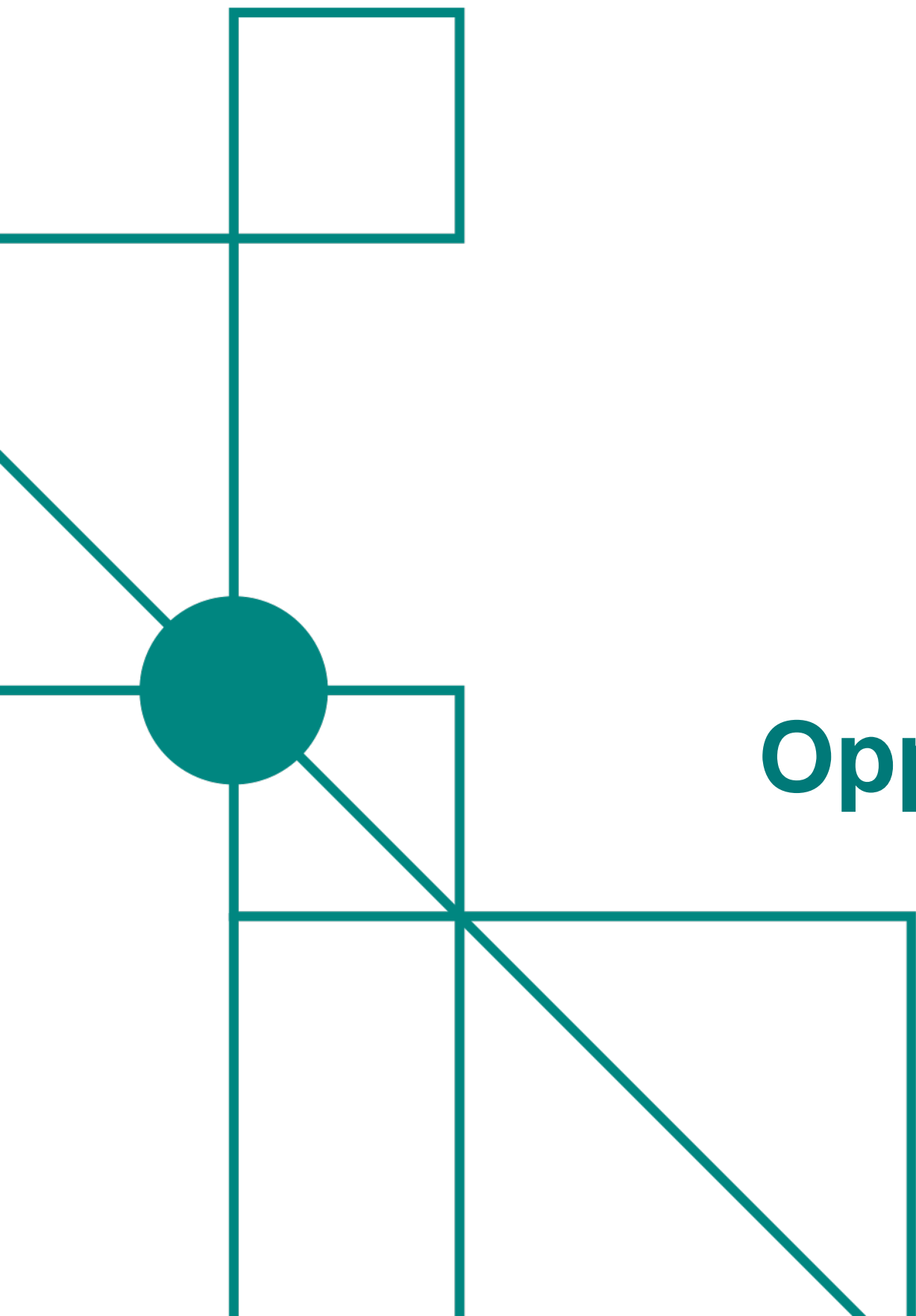
NS-EN ISO 9001:2015 & NS-EN ISO 14001:2015

2002 - 2017





Opportunities from discarded fish farming cages



Re-use of material from discarded cages

Brackets and walk-ways from Plasto

Pipes from Helgeland Plast (AKVA group)

- same material quality (HDPE)



Material



Producer



Assembly/sales




Fish-farmer




Landfill

Re-cycling



Material  **50 - 70 % reduction of virgin-material**

Producer 

Assembly/sales  
Fishing - Aquaculture - Trade

Fish-farmer

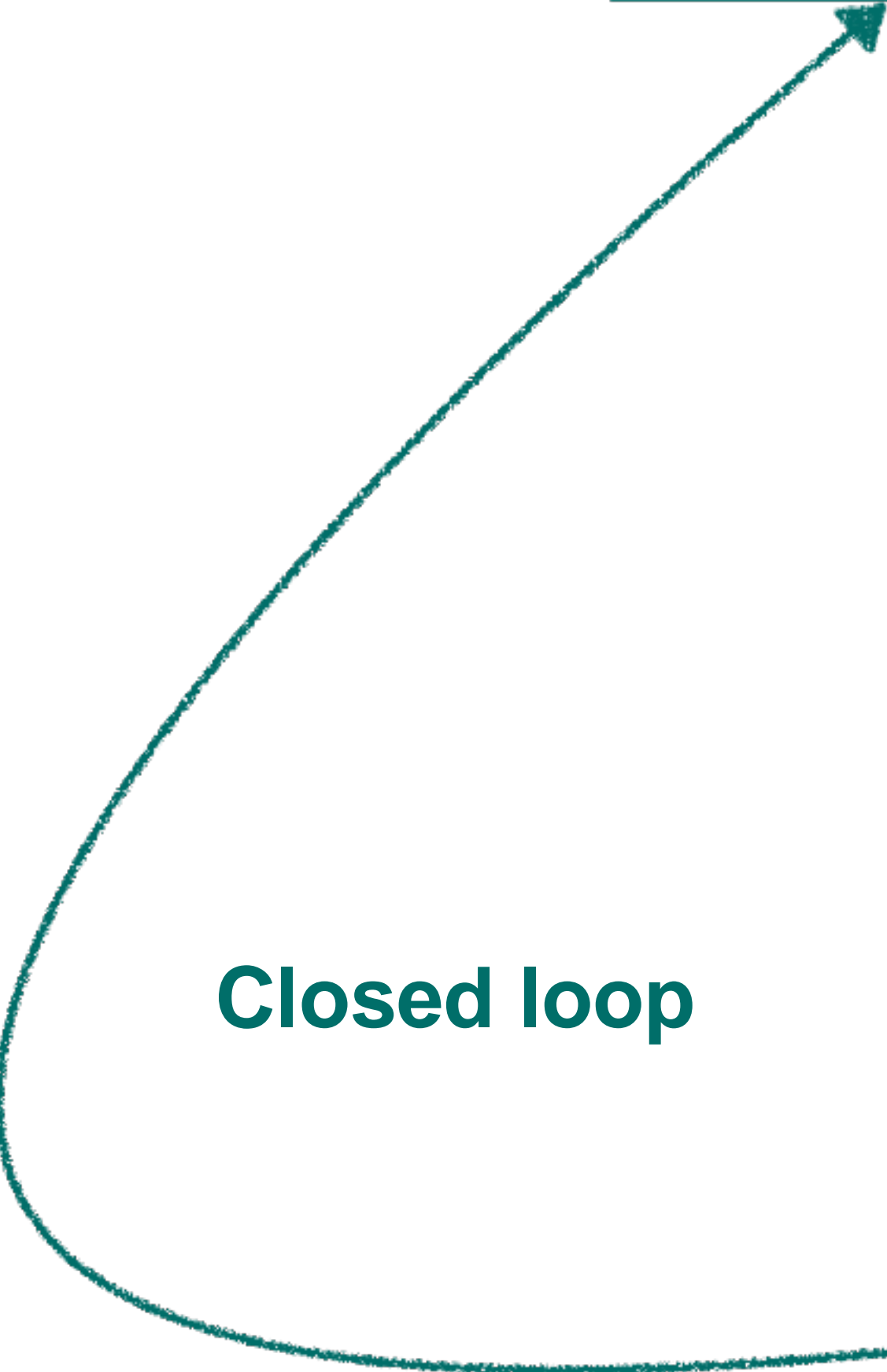
.....


Bringing value to marine waste

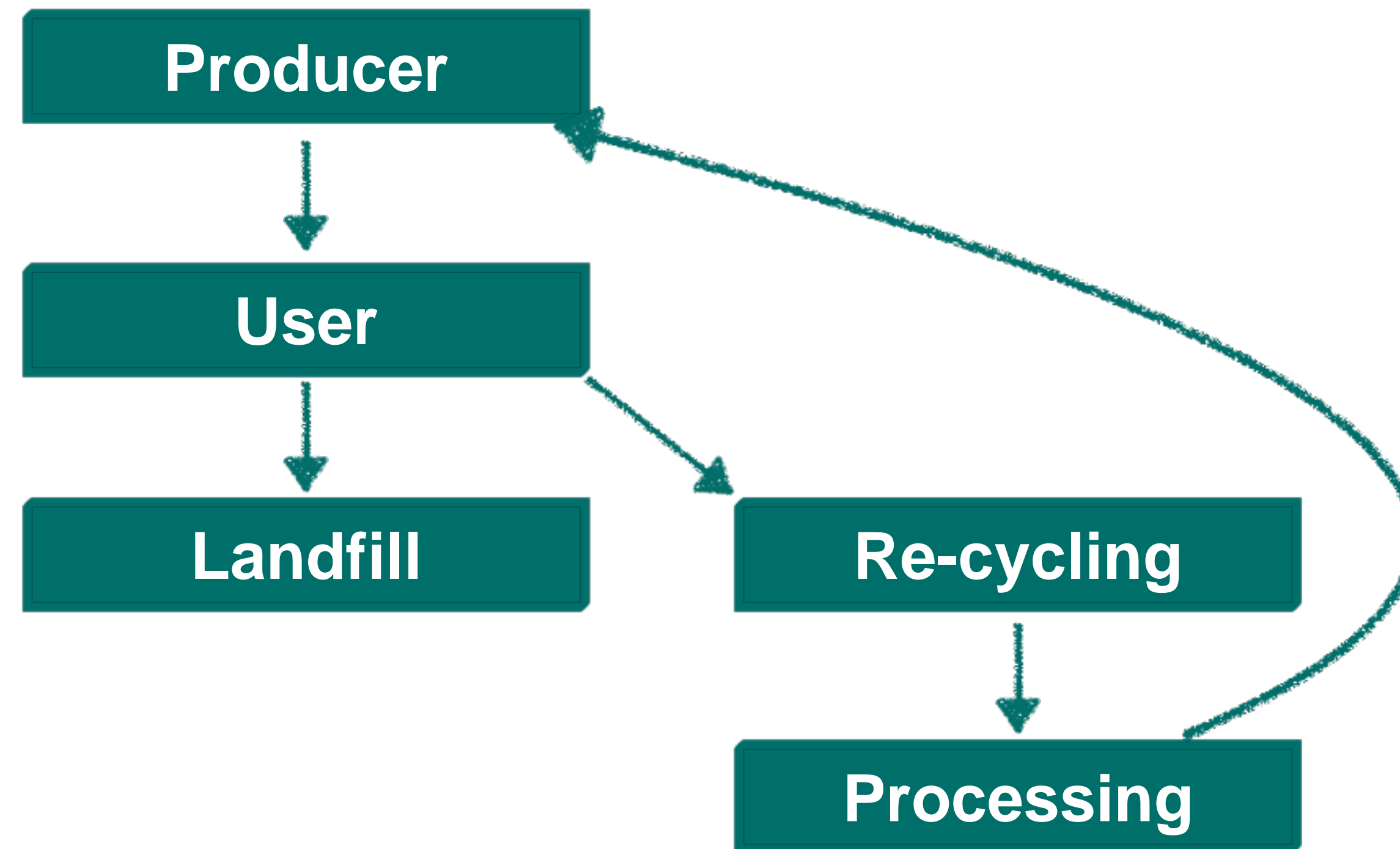
Closed loop

~~**Landfill**~~

Re-cycling

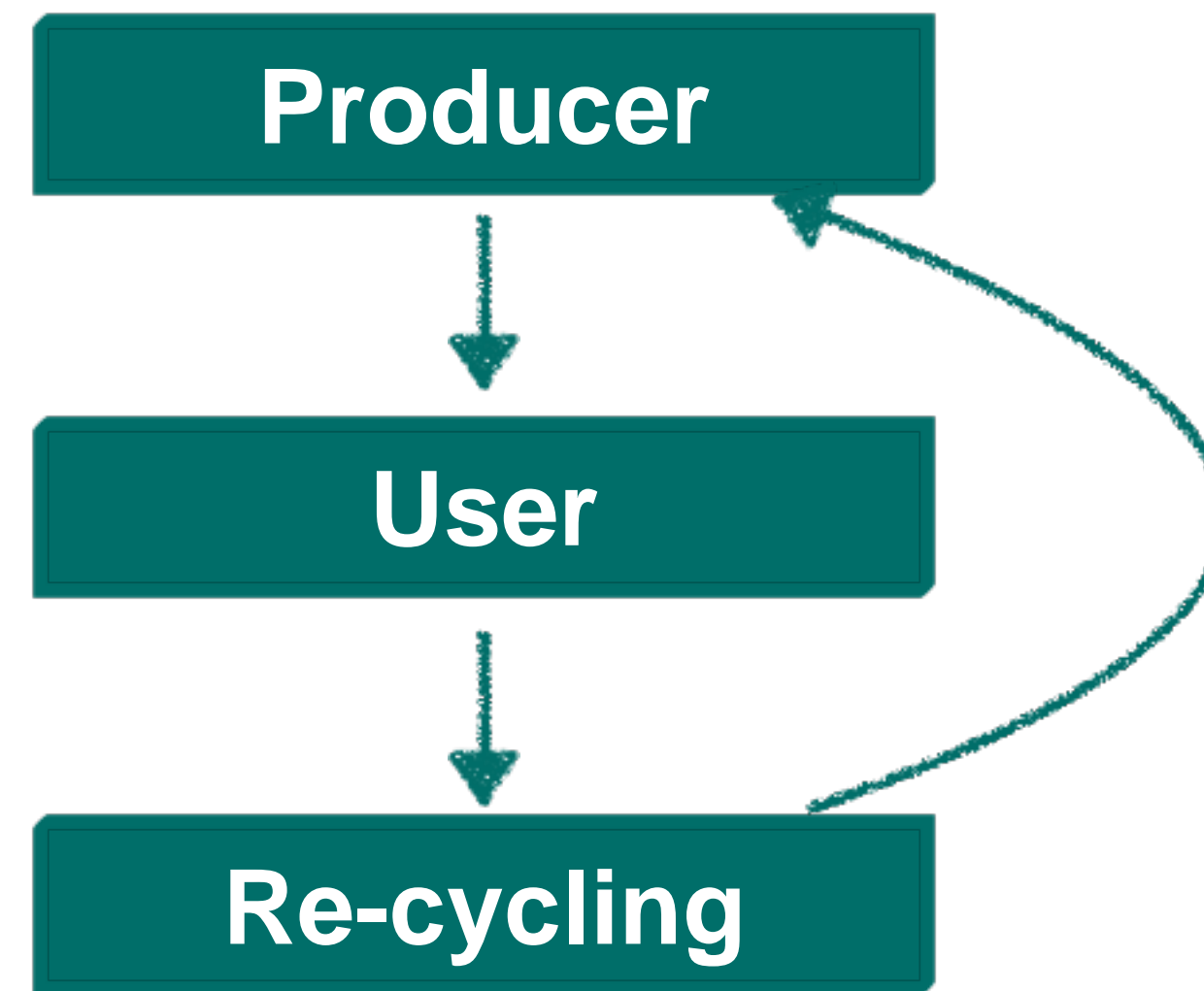


Present



- + Documented material performance
- Long transportation
- 2 x melting of material

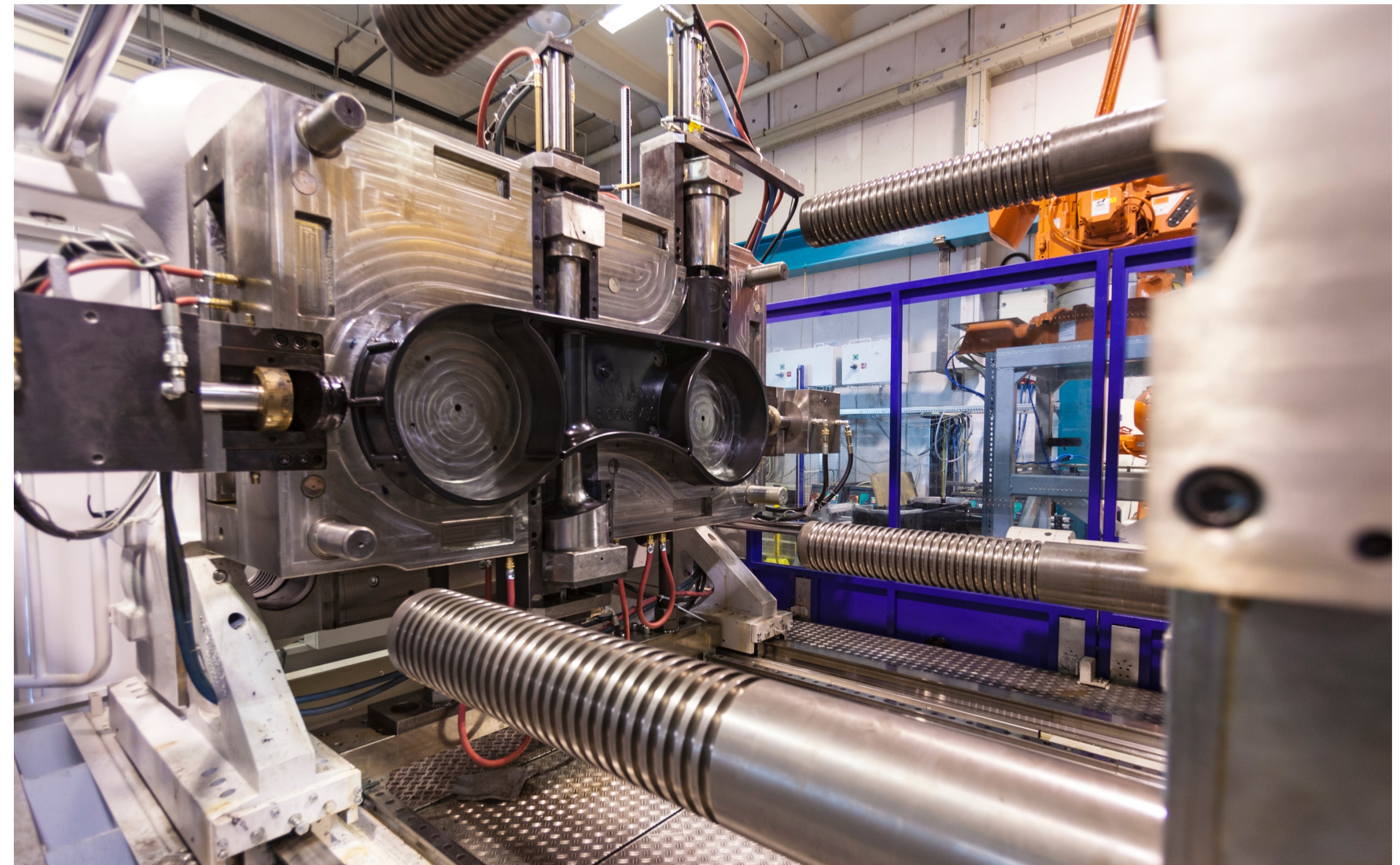
Vision



- + Lower economical and ecological cost
- + 1 x melting of material
- No documentation of material performance
- New production technology needed for IM

R&D needed to realize our vision

- Material
- Production technology:
 - Hardware
 - Software
- Business models / supply chain



Our approach to a solution

Supply chain/business model - SISVI



Production technology - MEGA-mold

Plasto, AKVA Group, Pipelife



-Develop process for documenting material properties in each batch

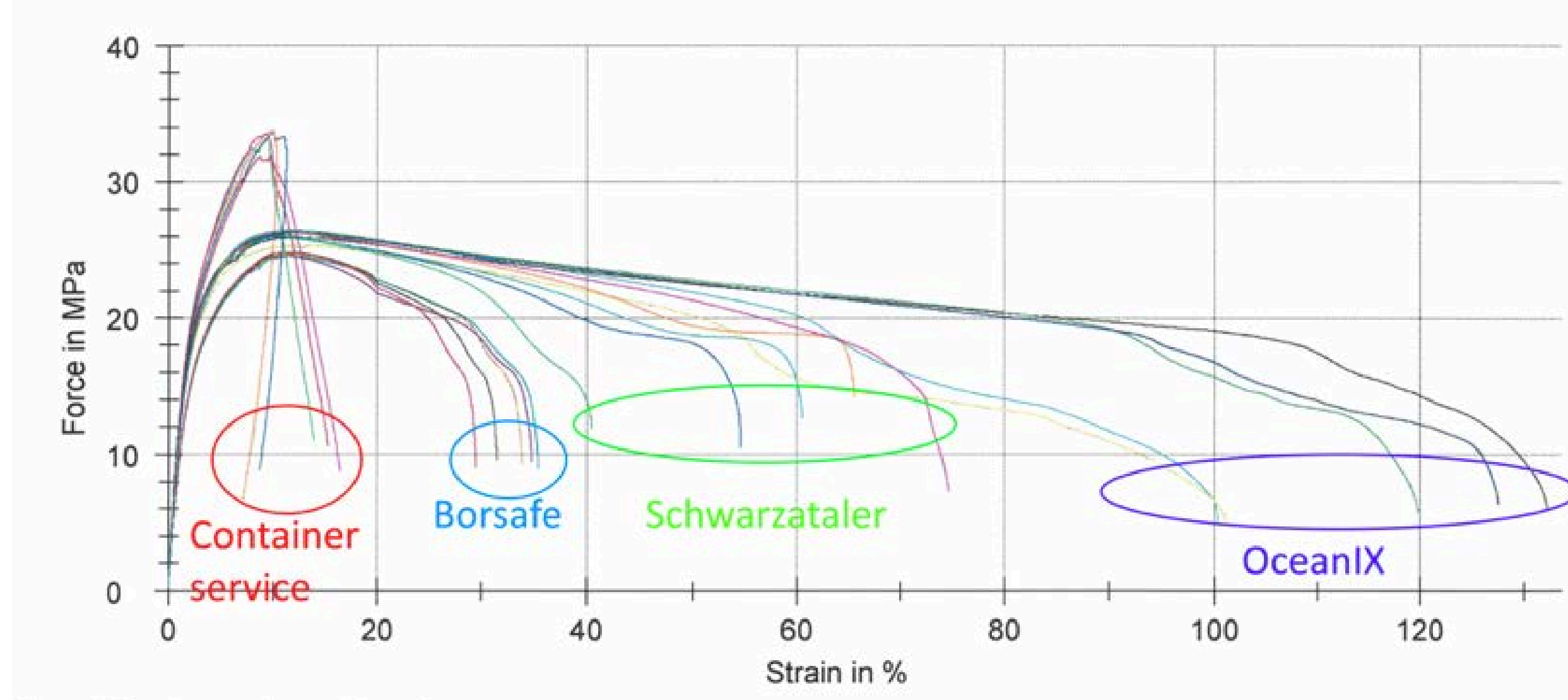
and/or

-Develop self-optimizing production process (PhD in project)

Material

	Standard	Enhet	Borsafe ME3440	Containerservice	Plastiix OceanIX	Schwarzataler HDPE 3101
OIT	ISO 11357 (210°C)	min	25,1	32,3	1,2	7,0

ID	Temperature [°C]	SM (Deflection at F max) [mm]	$\frac{W}{}$ (Absorbed impact energy) [J]	$\frac{W}{}$ (%) (absorbed impact energy) [%]	Charpy Impact strength [kJ/mm ²]	Min/Max impact strength from test series [kJ/mm ²]
Container/5	23	1,04	2,6675	5,35	84,2	79,9/88,7
Ocean/6	23	1,11	2,828	5,68	89,3	84,6/92,2
Borsafe/6	23	1,198	2,722	5,44	85,9	84,3/88,4
Schwarzataler/6	23	1,338	2,914	5,84	92,0	84,6/96,9
Container/6	-20	0,944	2,16	4,32	68,2	61,6/72,3
Ocean/6	-20	0,862	2,716	5,42	85,8	73,6/95,0
Borsafe/6	-20	0,72	2,604	5,22	82,2	72,9/88,7
Schwarzataler/6	-20	1,158	2,396	4,78	75,7	69,8/79,3



Figur 3 Test kurver fra strekktesting

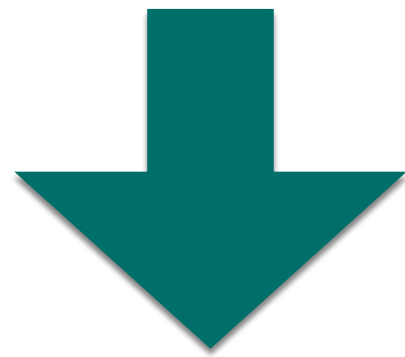
Hardware

Existing technology for extrusion with contaminated material is already on the market:

- Ettlenger Kunststoffmaschinen

Combined with modified IM-equipment

- «Continous molding» technology by Plasto / WittmanBattenfeld
- Further development of needed technology through MEGA-mold



Plasto receives large «chumps» <15 kg

- Perform fine grinding in-house
- Production with contaminated material

Software

Mold test rods, perform tests according to ISO-standards for each batch:

- low entry cost
- time consuming
- manually adjust production parameters according to material properties from batch to batch

or

Self-optimizing process, a given range within the production parameters = approved quality of product

- high entry cost
- efficient and robust process

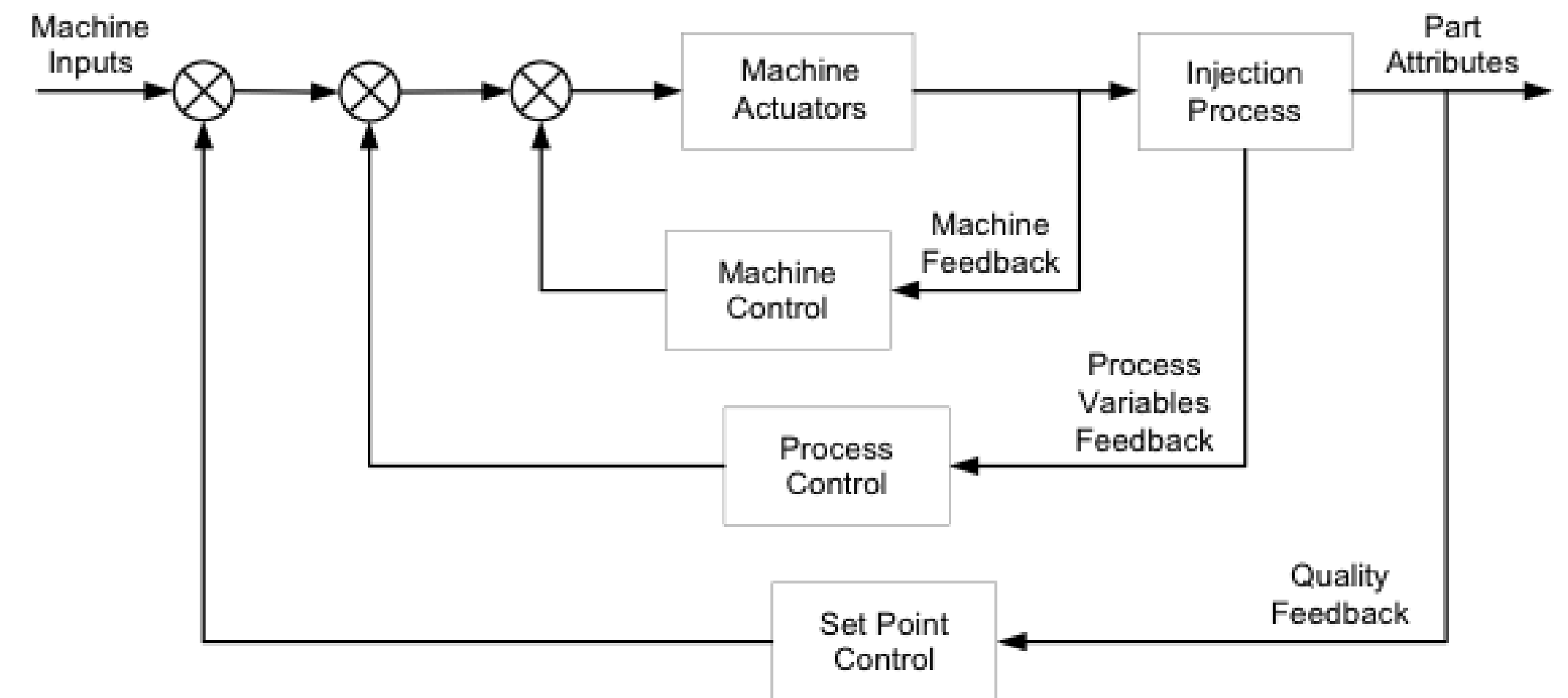


Figure 1. Three injection moulding control loops (4)

Business model / supply chain

Possibilities:

- 1) Containerservice Ottersøy or other supplier is being integrated in existing supply chain
- 2) Plasto, on its own or through partnership, becomes a part of the market for disposal of cages
- 3) Product owner transforms their business model to product as a service

Next steps:

- 1) Products with "lower" demand for performance, i.e pallets, walk-ways
- 2) Sandwich (w/virgin material) or specific re-inforcement - products with higher performance
- 3) Documented performance and qualified process - 500 / 1000 tonnes per year (Plasto)
< 70% reduction of virgin material

PLASTO®