PLASTO®

Closing the loop

-

fishing gear recycling for plastic injection molding

Innovations since 1955

-3rd generation family owned

-Injection molding of thermoplastics

-Research-based innovation

-Localized in Åndalsnes

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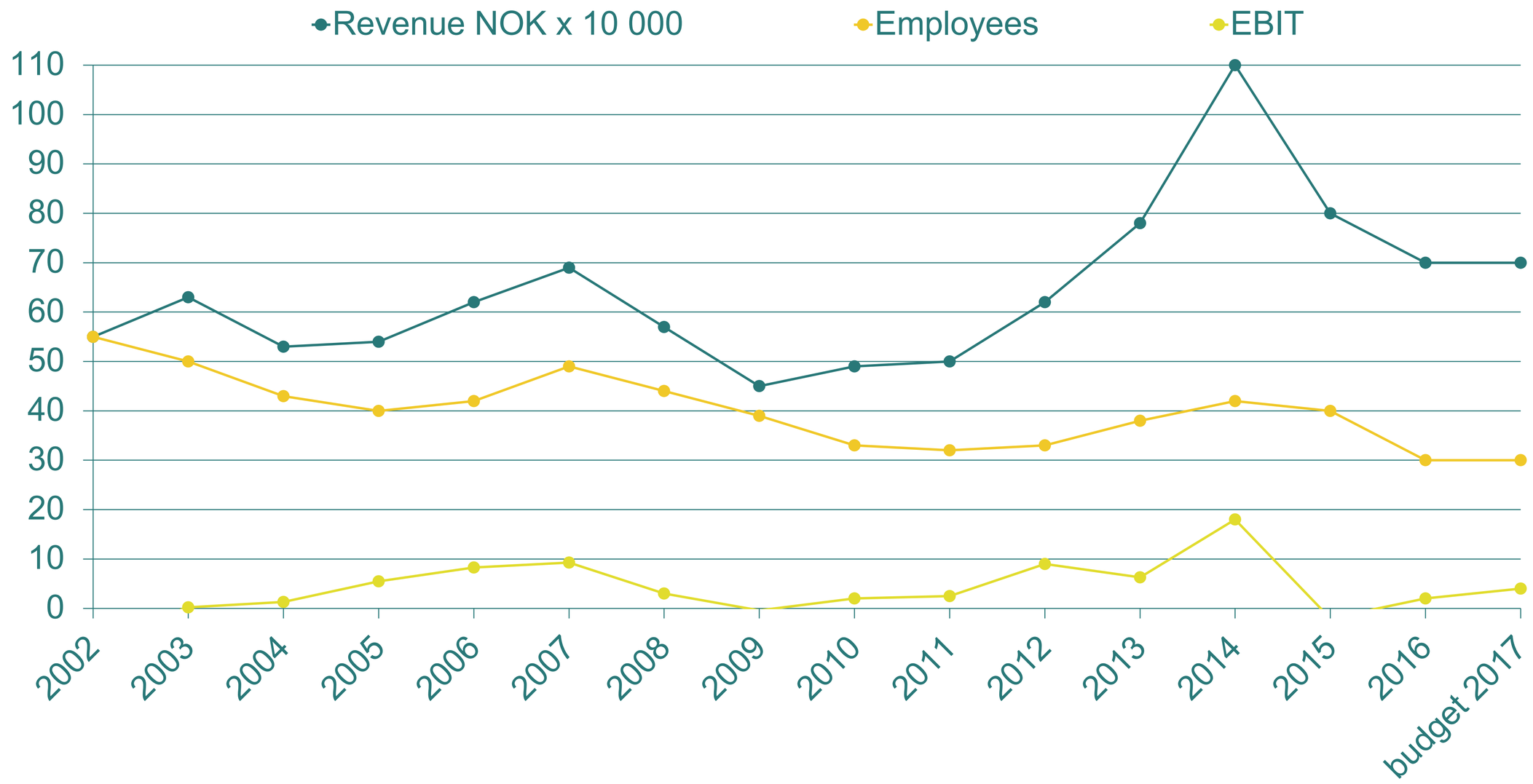
Siden 1955

PLASTO®

2002 - 2017



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

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Opportunities from recycled plastic waste

Re-use of material from discarded cages

Brackets and walk-ways from Plasto
Pipes from Helgeland Plast (AKVA group)
- same material (HDPE)

Material

BOREALIS

Producer

PLASTO®

Assembly/sales

AKVA GROUP™

Egersund Group
Fishing - Aquaculture - Trade

Fish-farmer

Landfill

Re-cycling

Nofir
Bringing value to marine waste

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

Producer — PLASTO®

Assembly/sales — AKVA GROUP — Egersund Group, Fishing - Aquaculture - Trade

Fish-farmer

Re-cycling — Nofir, Bringing value to marine waste

~~**Landfill**~~

Closed loop

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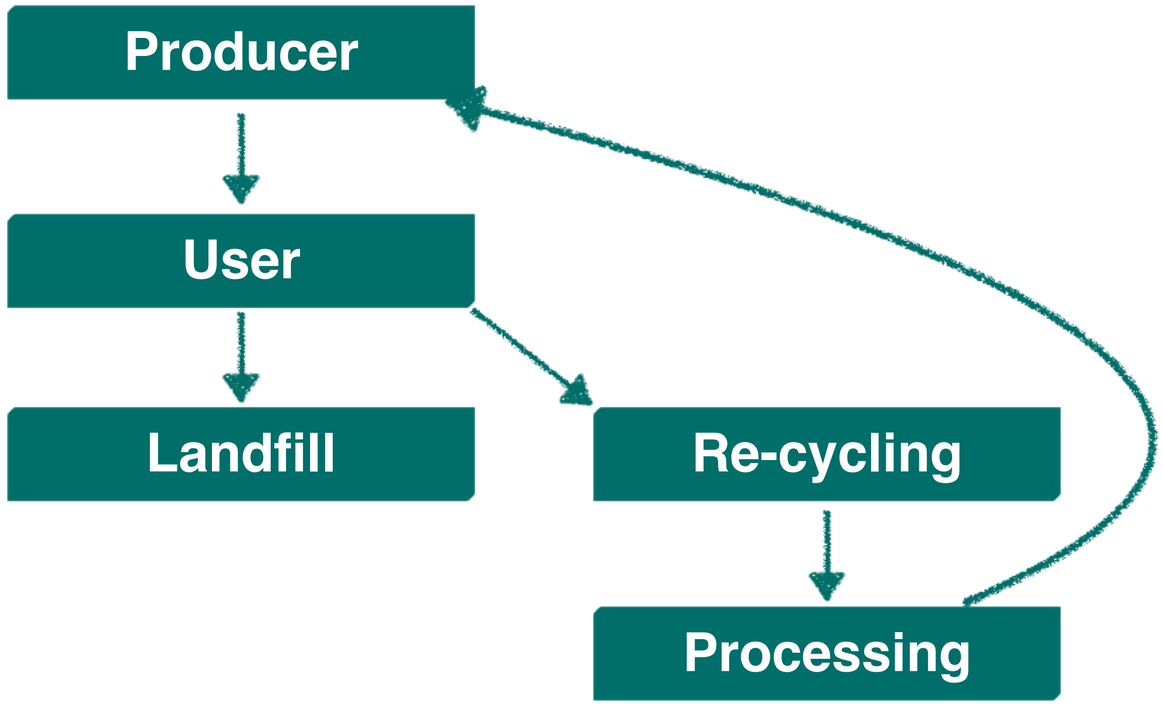
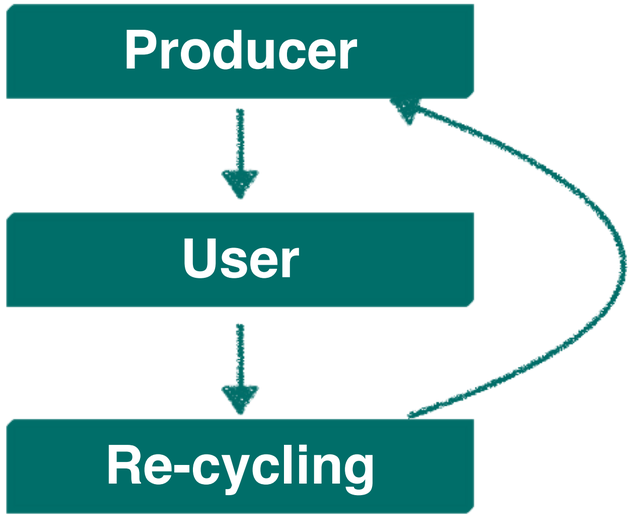
Present



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

Vision



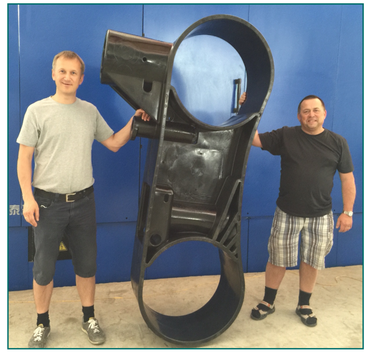
+ Lower economical and ecological cost
+ 1 x melting of material
- No documentation of material performance
- New production technology needed for IM

Our approach to a solution

Supply chain/business models
- 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)

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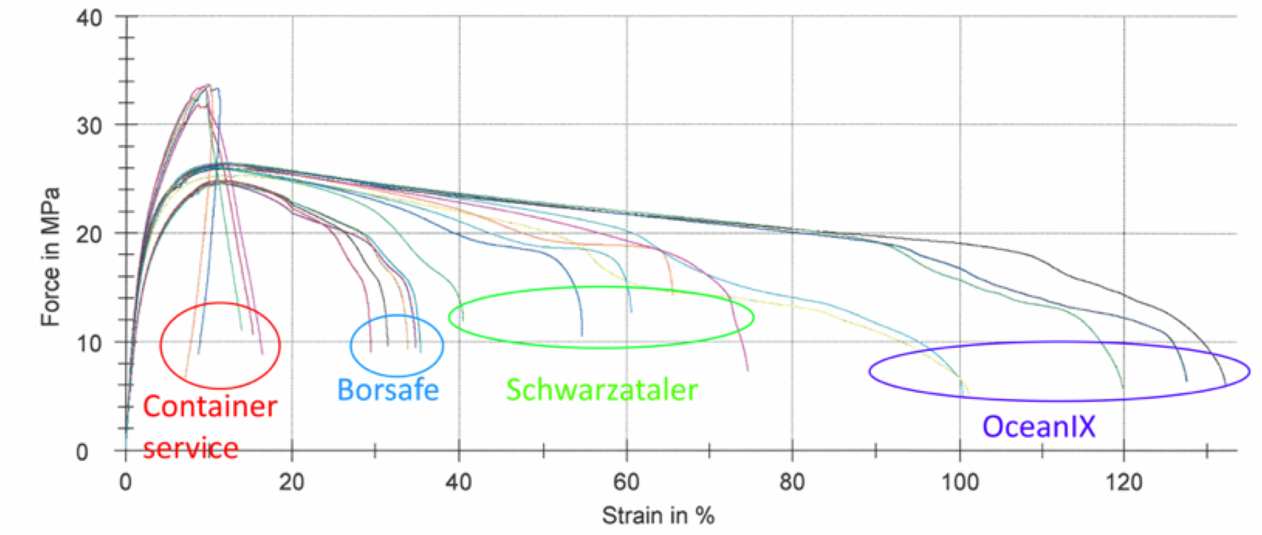
Material

	Standard	Enhet	Borsafe ME3440	Containerservice	Plastiix OceanIX	Schwartzataler 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]	W (Absorbed impact energy) [J]	W(%) (absorbed impact energy) [%]	Charpy Impact strength [kJ/mm2]	Min/Max impact strength from test series [kJ/mm2]
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

Data

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

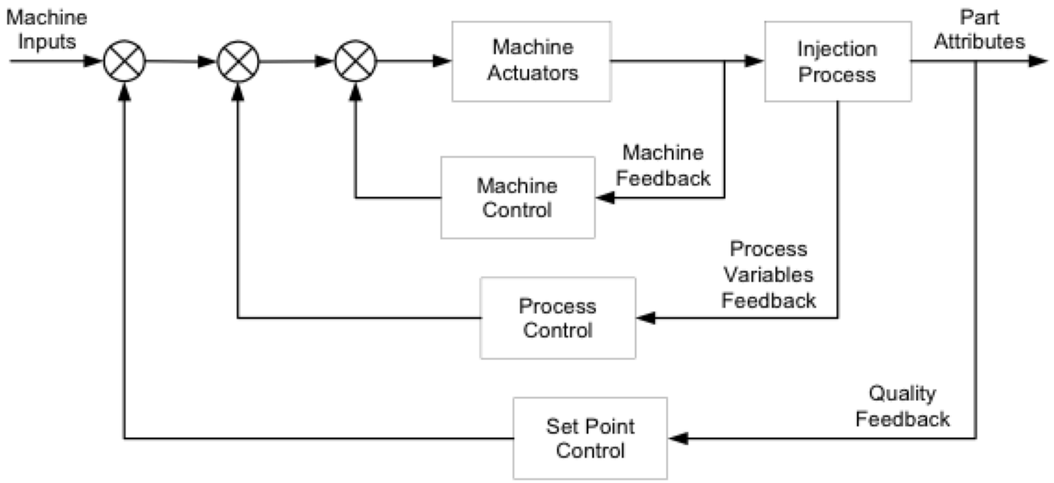


Figure 1. Three injection moulding control loops (4)

Hardware

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

- Ettlinger 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

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

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