Waste management challenges with wet filament winding

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Anders Holmberg. Engineering manager. Hitachi Energy, Composites..

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Outline

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- Hitachi Energy
- Wet filament winding process
- Waste generated
- Waste treatment challenges
- Conclusions

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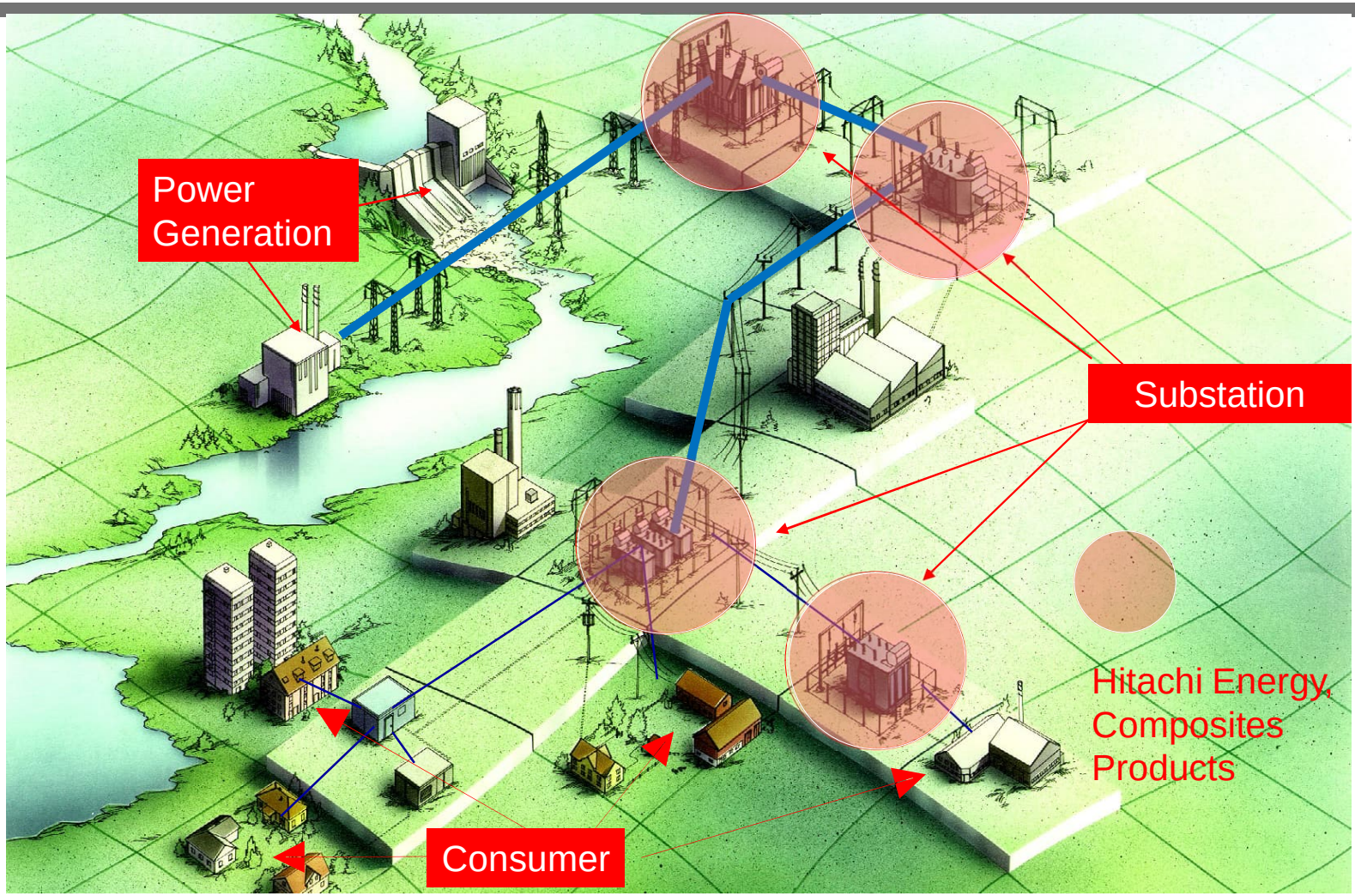
Power Transmission

Power Distribution



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420 kV substation

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Hitachi Energy, Composites main products

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Glass fiber / epoxy cylinders

Conductive glass fiber / epoxy prepreg tape

Composite Insulators

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Hitachi Energy company purpose:
Advancing a sustainable energy future for all

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Hitachi Energy sustainability targets 2030

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We have placed sustainability at the heart of our Purpose: focused on powering good for a sustainable energy future.

Claudio Facchin, CEO

OUR TARGETS

PLANET	Carbon-neutral in our own operations ↓ -50% CO_2e along the value chain ↓ -50% waste disposed ↓ -25% freshwater use ↓ -25% hazardous substances and chemicals
PEOPLE	Zero harm Top quartile health absence rates Life-long learning culture Increase female diversity from 19% to 25% by 2025
PEACE	Zero incidents of corruption and bribery
PARTNER-SHIPS	Increase involvement in multi-stakeholder partnerships

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Wet filament winding process

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Types of waste 1 (3)

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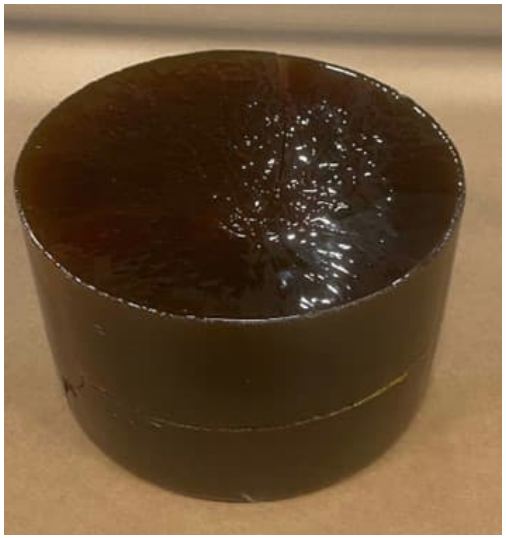
Used acetone

End of fleece and peel ply rolls

Waste resin



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Types of waste 2 (3)

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Glass fiber roving

Splicing minimize waste

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Types of waste 3 (3)

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Epoxy impregnated peel ply

Tube ends

Longer tubes

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Waste treatment

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Type		Waste amount	Classification	Present waste treatment	Preferred solution
Acetone / epoxy mix		Medium	Hazardous waste	Sent for destruction	Recovery by distillation
Non-woven		Small	Non-hazardous combustible waste	Incineration with energy recovery	Thermoplastic recycling
Peel ply		Small			
Cured epoxy		Medium			Pyrolysis
Cured epoxy + peel ply		Small			
Glass roving		Small	Non-hazardous incombustible waste	Land fill	Glass remelting?
Cured tube end pieces		Large	Non-hazardous (combustible) waste. • Heat of combustion: 20 MJ/kg • Ash content 70-80% (hazardous waste)	Land fill or incineration with energy recovery	Mechanical recycling Cement co-processing Pyrolysis Solvolysis
Cured tube cut off pieces		Large			
Non-conforming tubes		Medium			

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Product portfolio 72 – 1100 kV (0.5 - 12 m), Applications

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Circuit Breakers

Cable Terminations

Bushings

Instrument Transformers

Surge Arresters

Post insulators

Challenge: wide product portfolio with rather small quantities of each product

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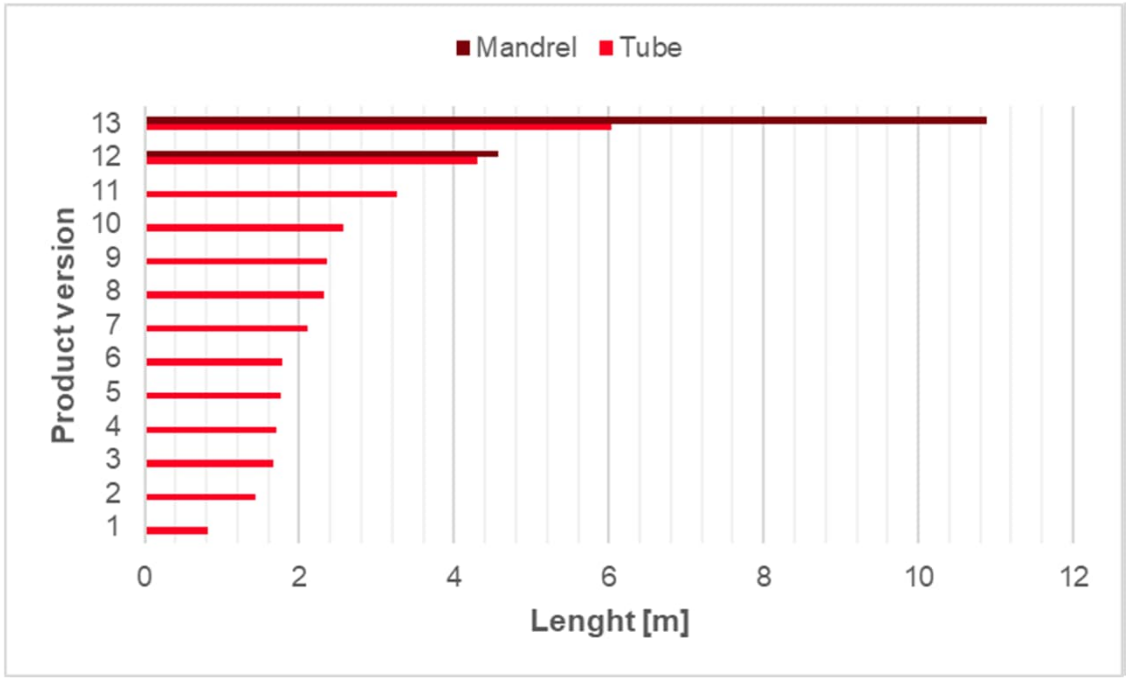
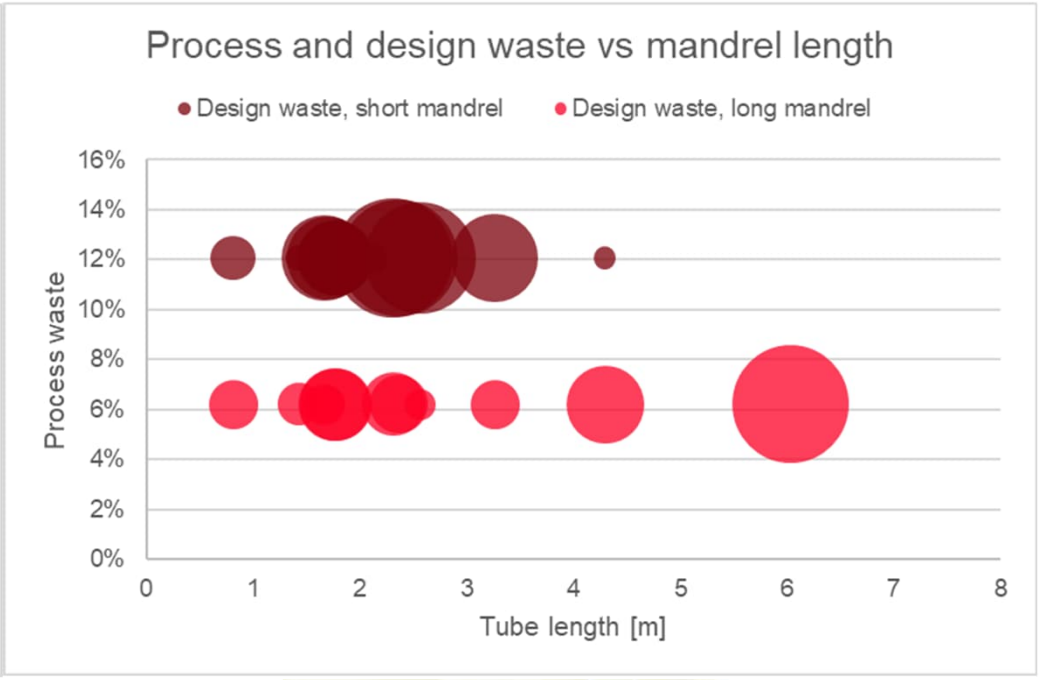
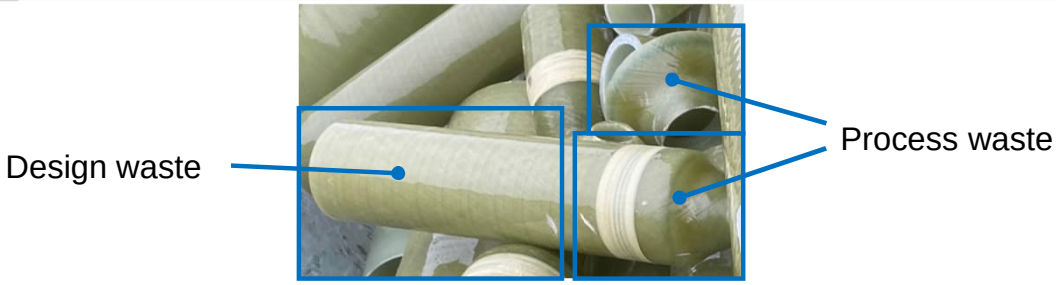
Illustration: 1 tube diameter, several product lengths







Conclusions

Most manufacturing methods for continuous fiber reinforced polymers, including wet filament winding, are not net shape processes.

- Significant amounts of production waste is generated.

Today most of the production waste is incinerated with energy recovery or discarded as land fill.

Higher level recycling is technically possible but logistic chains and economy of scale is still missing.

Hitachi Energy, Composites, have the in-house logistics (sorting) in place for higher level recycling and are searching for collaboration with partners that can use the waste material as resource.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