



Zero Waste

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RWTH Aachen University

9th CEWEP Waste-to-Energy Congress
20-21st September 2018
in Bilbao



Zero Waste – Hysteria in the internet

Internet: > 10 Mio Google hits for "zero waste"



Zero Waste – political advertising

India

THE HINDU

[f](#)[t](#)[in](#)[ig](#)[en](#)

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JUST IN

7 3hrs Bopanna-Cuevas win Monte Carlo Masters

8 3hrs BJP slams DMK for calling AIADMK govt as benami of Centre

9 4hrs Saudi King Salman names Prince Khaled as US envoy

10 4hrs Bribery case: Dhinakaran questioned for second day

MENU

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NEWS

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SCI-TECH

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STATES

ANDHRA PRADESH

KARNATAKA

KERALA

TAMIL NADU

TELANGANA

OTHER STATES

NEWS > STATES > KERALA

KERALA

Minister launches zero-waste scheme



M.K. Muneer, Minister for Panchayats and Social Welfare.

Plan will be implemented in Pathanamthitta for three years

Active people's participation and a close monitoring by local self-government institutions was the basic pre-requisite for a waste-free Kerala, said M.K. Muneer, Minister for Panchayats and Social Welfare.

The Minister was launching the 'Zero-waste Pathanamthitta' project sponsored by the Pathanamthitta district panchayat at a function at Ranni on Friday.

Zero Waste – political advertising

Croatia

WATCH THE NEWS 

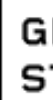
EBLnews

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EBL News have closed daily news service on March 31st, 2017



ERLEBE TOP FUSSBALL
LIVE UND AUF ABRUF



Croatia

Environment protection minister advocates zero waste policy

The new Environment Protection Minister, Slaven Dobrovic of the Bridge party, said on Monday that he would wait for findings of an analysis to decide whether the ministry would remain in the ZagrebTower building or leave those premises.

I have heard that the relocation of ministry personnel (into ZagrebTower) has stirred up great public interest and that there are some questions difficult to answer, and I will definitely analyse this matter and <x<after that I will take my position, Dorbovic said after the handover ceremony.

Watch now

Xinhua, Monday, April 10, 2017 - 09:59 CET

"Eye in the sky" to help with environmental protection in China

Berlin

RECYCLING magazin

Trends, Analysen, Meinungen und
Fakten zur Kreislaufwirtschaft

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POLITIK & RECHT

Zero Waste für Berlin

Im Koalitionsvertrag der Rot-Rot-Grünen Regierung wird das Leitbild "Zero Waste" als Ziel einer modernen Kreislaufwirtschaft ausgegeben, das "insbesondere von allen öffentlichen und öffentlich geförderten Einrichtungen ist das Leitbild vorbildlich umzusetzen"

23.11.2016



RECYCLING
magazin
08 / 2017

Zum Inhalt

Zero Waste – what does it mean?



Zero Waste – What does it mean?

One glass fits them all:

The ultimate desire to reduce residual waste to the size of a pickle jar



<https://news.nationalgeographic.com/2018/05/zero-waste-families-plastic-culture/>

Zero Waste – What does it mean?

Approach of Simon Fraser University Canada



Zero Waste – What does it mean?

The definition!



- Zero Waste is a goal that is ethical, economical, efficient and visionary, to guide people in changing their lifestyles and practices to emulate sustainable natural cycles, where **all discarded materials are designed to become resources for others to use.**
- Zero Waste means designing and managing products and processes to systematically avoid and eliminate the volume and toxicity of waste and materials, **conserve and recover all resources**, and **not burn or bury them.**

<http://zwia.org/standards/zw-definition/>

Zero Waste – What does it mean?

Indispensable Requirement:

- **No incineration and landfill!**

Postulated approaches :

- Option 1: Total avoidance of residual waste
 - No residual waste accrues in the households
 - All the waste can be completely recycled
- Option 2: New approaches to utilize the residual waste
 - Mechanical-Biological Treatment MBT
 - Alternative Thermal Treatment ATT

Option 1

Reality check



Zero Waste – What does it mean?

Indispensable Requirement:

- No more Incineration and landfill!

Postulated approaches :

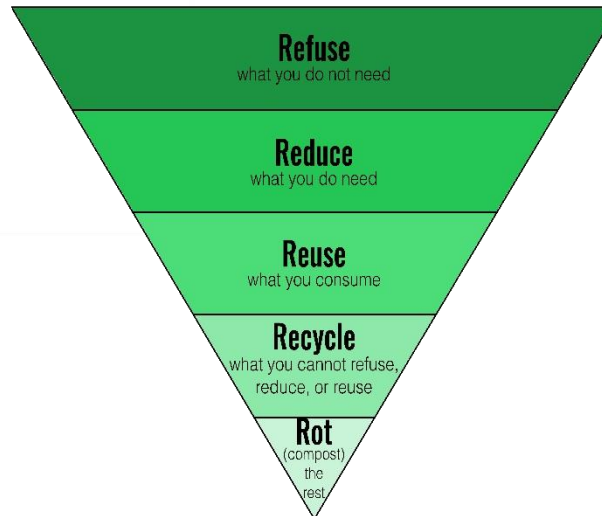
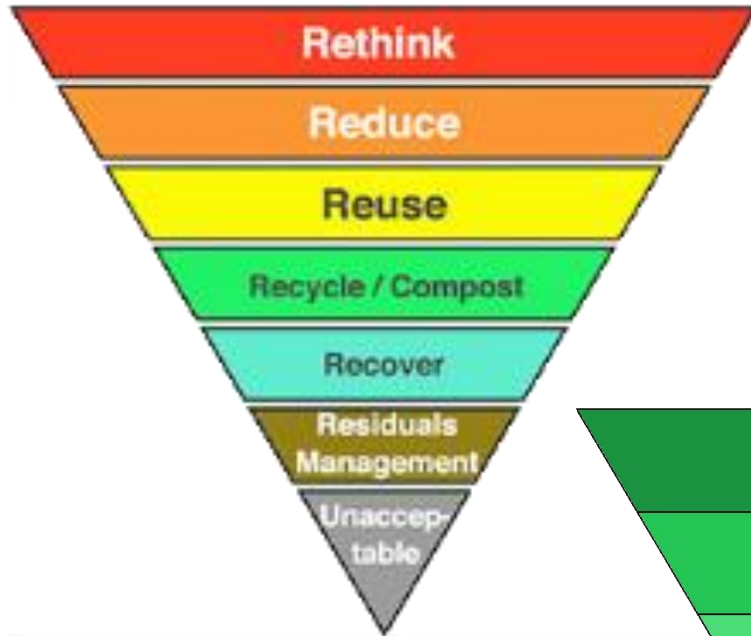
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Residual waste from households

Zero waste approaches



A lot of R's to consider...



<http://zerowaste.world> | <https://www.addisoncountyrecycles.org/articles/zero-waste/> | <https://www.pinterest.com/pin/403212972882423484/>

Zero Waste – Approaches for daily live

Recommendations



Quelle: www.zerowastefamilie.de

1. Buy without packaging if possible
2. Take your own packaging with you
3. Go shopping only once a week if possible, you will save travel costs, money and time and will be less tempted to shop
4. Buy consciously and only what you really need
5. Inspect your garbage again and again so that you know where there is still savings potential
6. Use reusable or washable products
7. Separate your garbage and recycle it
8. Do it yourself: Check what you can easily produce yourself
9. Invest in stock keeping
10. Compost
11. If you cannot reduce something currently, focus on something else at the moment and return to it later.
12. Buy things in large packaging
13. Learn new skills such as repairing
14. Get to know your eating habits and the quantities
15. Create a food and a shopping list and buy accordingly
16. Spare convenience foods, but cook as freshly as possible
17. If you eat away from home, avoid garbage such as packaging beforehand
18. Many things can be bought second hand, e.g. toys
19. Exchange (visit clothes exchange events or book exchange shelves)
20. Rent (books, sports equipment or tools etc.)

Zero Waste – Approaches for daily live

Buy unwrapped



Quelle: <https://marinedebris.noaa.gov/sites/default/files/styles/taxonomy-images/public/taxonomy-images/learn-1.JPG?itok=aVeVBvIA>

Zero Waste – Approaches for daily live

Buy unwrapped



Quelle: <http://wastelandrebel.com/de>

Zero Waste – Approaches for daily live

Buy unwrapped



Quelle: <http://wastelandrebel.com/de>

Zero Waste – Approaches for daily live

Do it yourself



Detergents from chestnuts

Quelle: <http://wastelandrebel.com/de>

Zero Waste – Approaches for daily live

Utilize!

- Examples



Shoe polish with banana peel



Shampoo from avocado seeds



Bokashi
Kitchen composting

- Hair bands from old tights for children
- Shopping bag from old undershirt
- Dishwasher rinse aid
- ...

Zero Waste – Approaches for daily live

Substitute – Toys



Quelle: <http://wastelandrebel.com/de>

Zero Waste – Approaches for daily live

Substitute – Body Hygiene



Quelle: <https://zerowasteladen.de/Furoshiki-Tuch-Sterne>

Result: Remaining residual waste



TER | **RWTH**AACHEN
UNIVERSITY

Residual waste from households

And the reality?

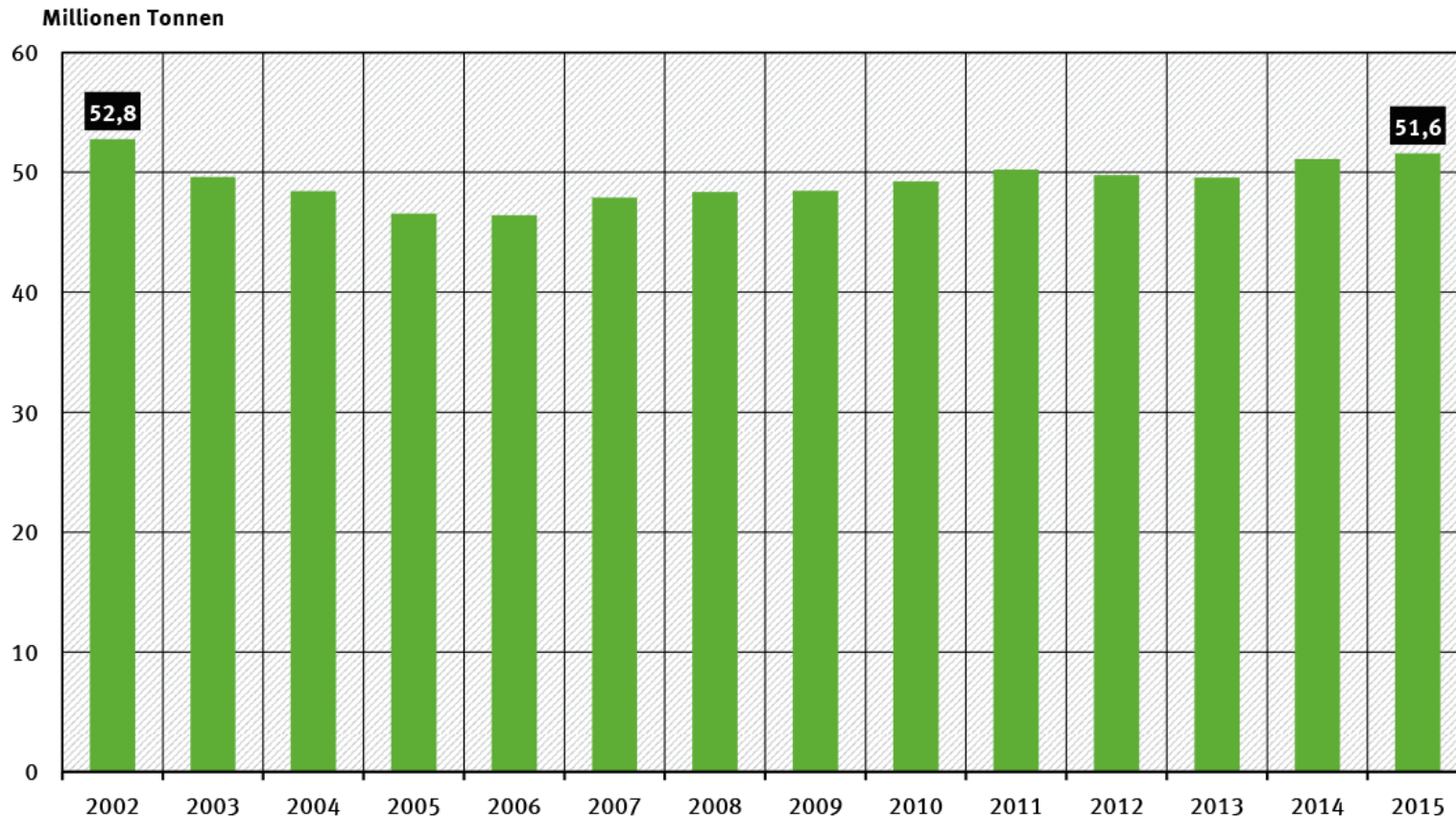


Zero household waste – the reality...



Zero household waste – the reality...

Example Germany: Development of municipal solid waste



Option 1

Reality check



Zero Waste – What does it mean?

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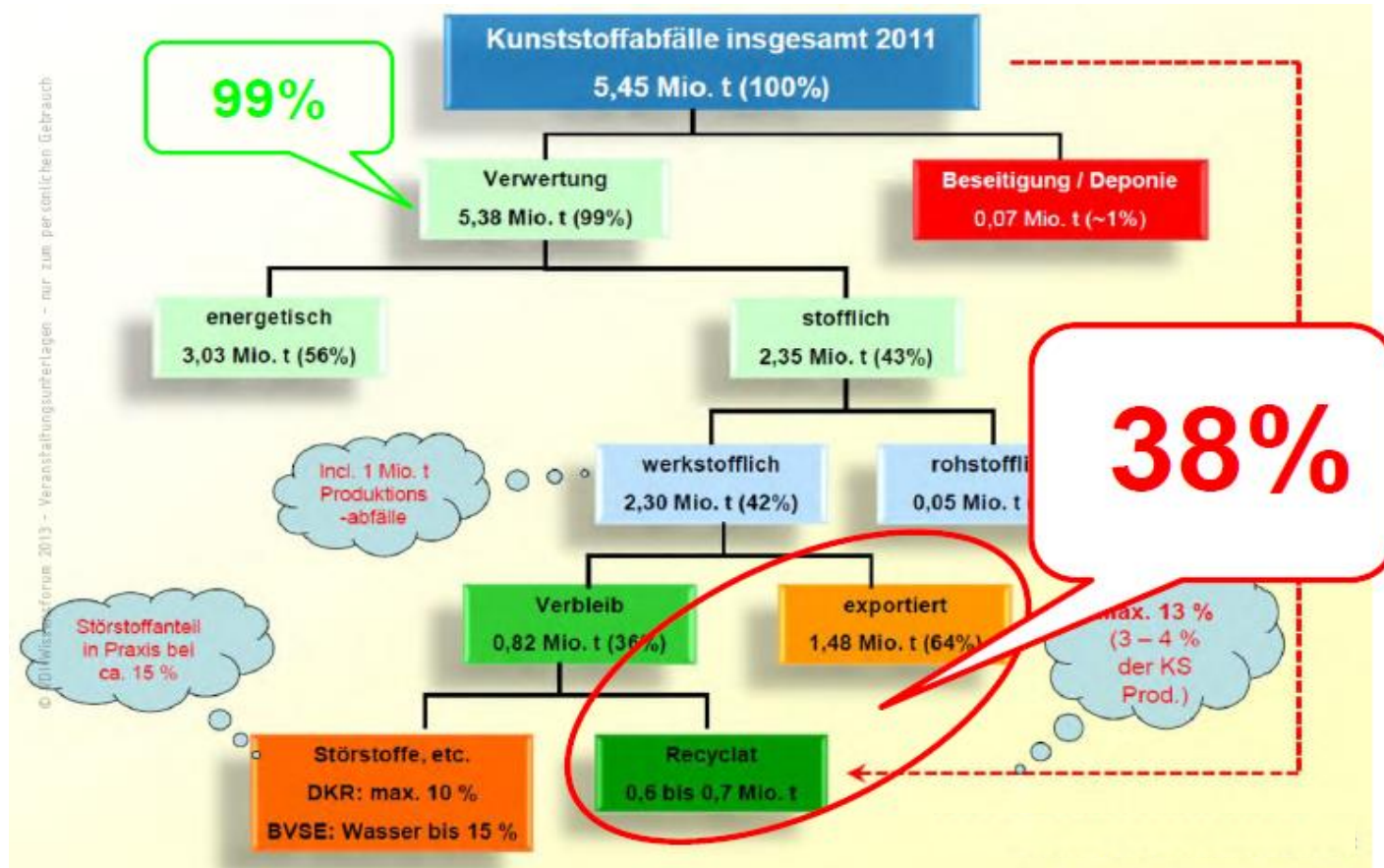
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Plastics



Plastics

About 1/3 rd material recycling



Kleppmann Fachtagung VDI-ITAD 2014

Plastics recycling in China



Quelle: <http://www.presseportal.de/pm/7840/2561568>

End-of-life vehicles



End-of-life vehicles

Export

- Germany: Fate of 1,2 to 1,4 Mio. vehicles unknown!



Quelle: <https://diepresse.com> | <http://blog.icbdubai.com>

End-of-life vehicles

Shredder light fraction



Wastepaper



Wastepaper

Recycling



www.reichelt.de | <http://www.ahe.de/privat/muellrichtigentsorgen> | www.nemetz-ag.at

Wastepaper

Balance

- Number of cycles

- European Union:

3,5 x

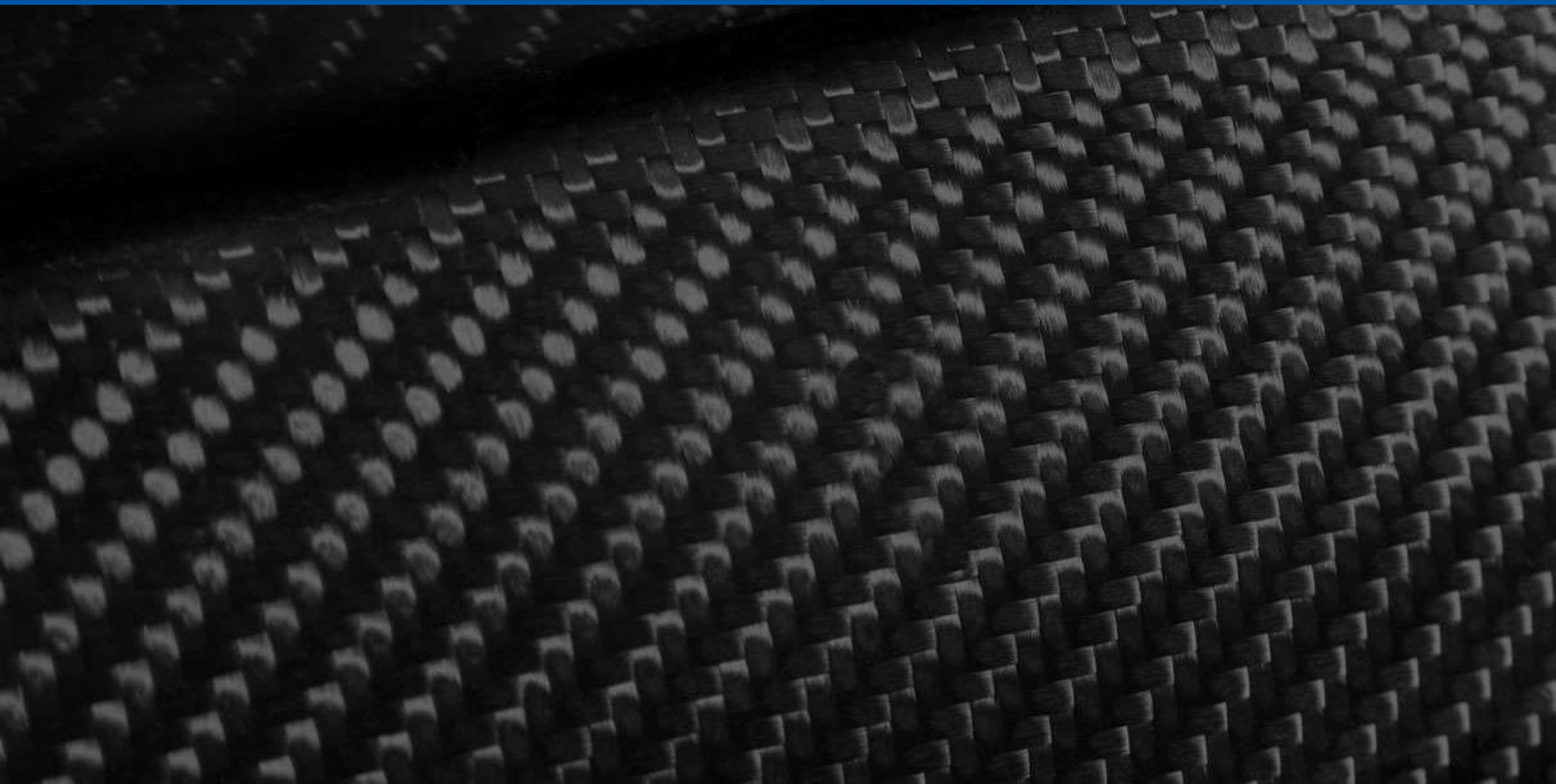
- Worldwide:

2,4 x



www.reichelt.de | <http://www.ahe.de/p> | en |

Composite materials and products



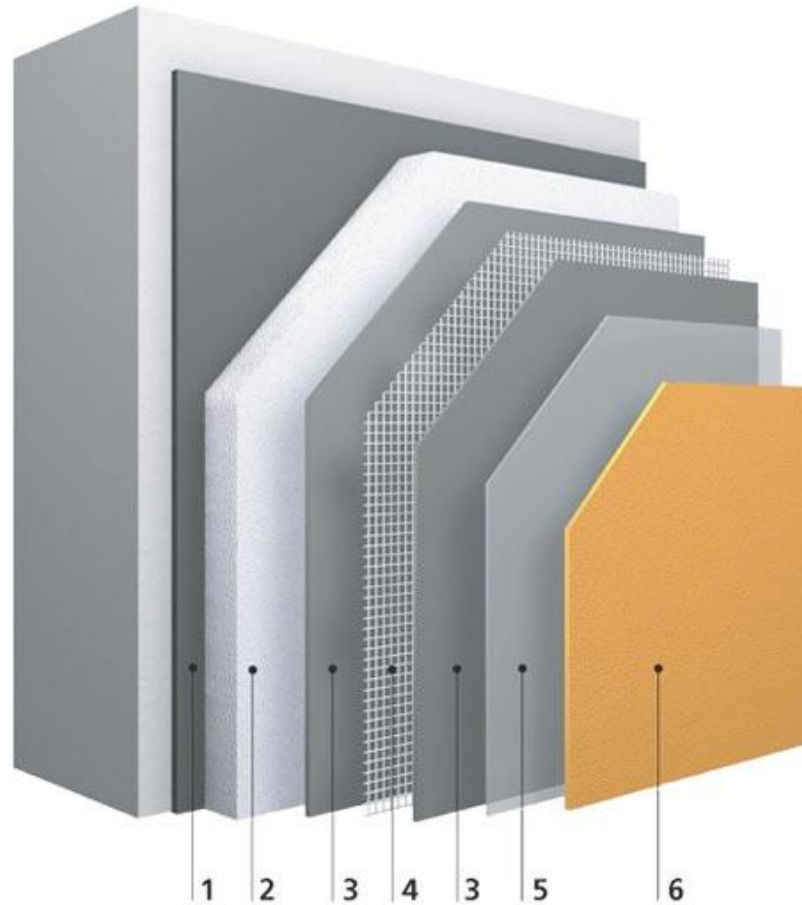
Composite materials

Example carbon fibre reinforced plastics CFRP



Quelle: carbonNext

Example thermal insulation systems [Polystyrene]



- 1 Bonding**
- 2 Insulation**
- 3 Reinforcing mass**
- 4 Reinforcing fabric**
- 5 Primer**
- 6 Final coating**

<http://www.baulinks.de/webplugin/2011/1815.php4>

Composites

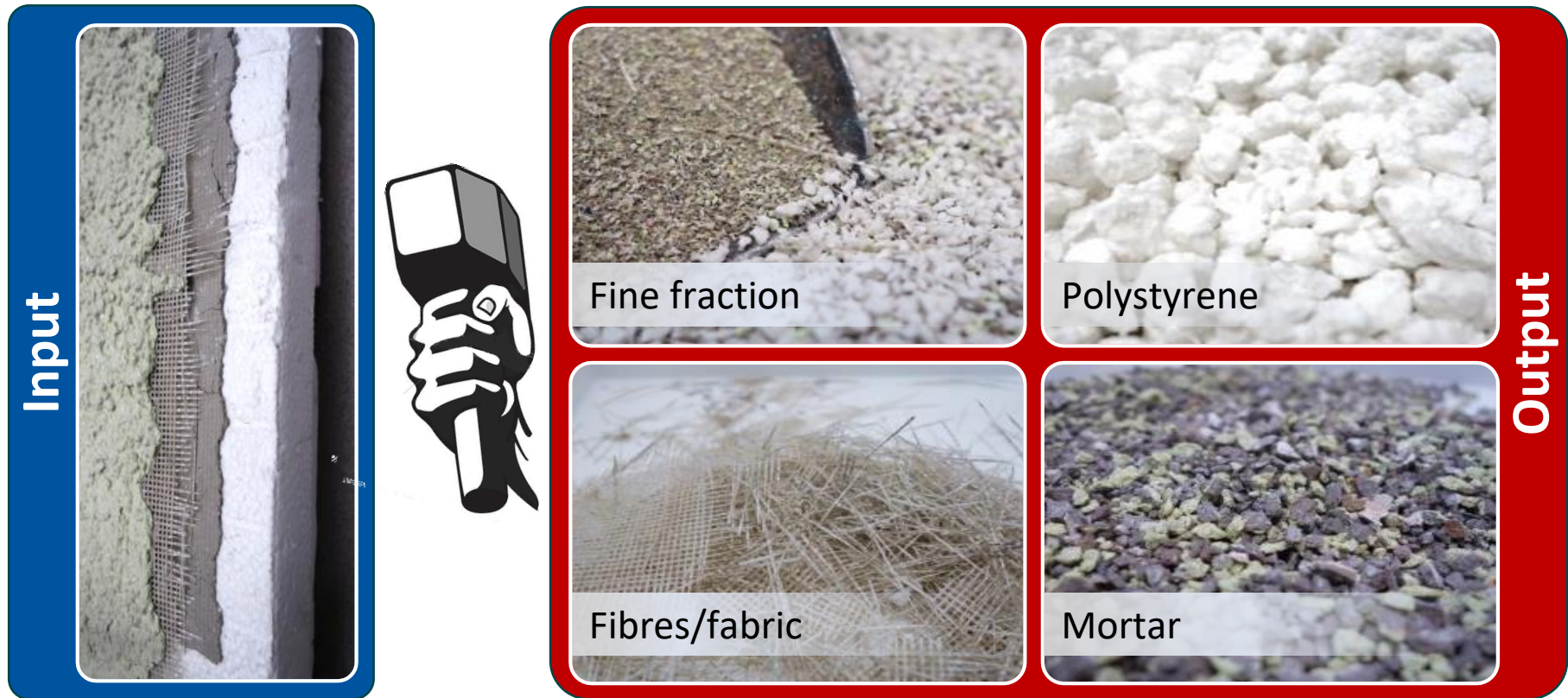
Example thermal insulation systems – disassembly



Savine Flamme, FH Münster

Composites

Example thermal insulation systems – attempt for recycling



Sabine Flamme, FH Münster

Option 2

Reality check



Zero Waste – What does it mean?

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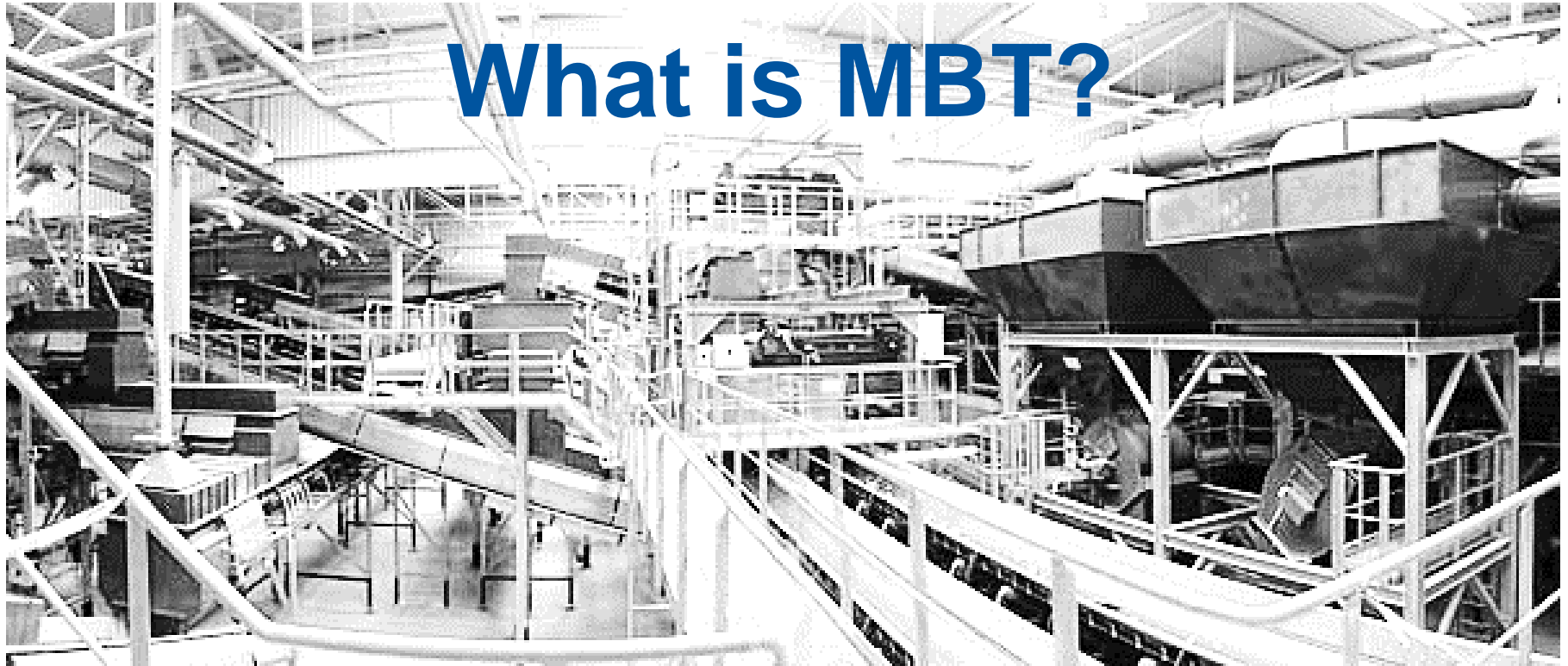
Zero Waste by MBT?



Zero waste by MBT?



What is MBT?



What ist MBT?



MBT is
processing this...

What ist MBT?

**... to get a
high calorific
fraction
for incineration...**



What ist MBT?

**... and a
low calorific
fraction
for incineration...**



What ist MBT?

**... and a
residue
for landfilling.**



Conclusion

**A society with zero waste,
[= no landfills and no waste incineration]
is possible
by employing MBT
which
means incineration & landfilling**

?



Zero Waste by Alternative Thermal Treatment?



Zero Waste – What does it mean?

Indispensable Requirement:

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Postulated approaches :

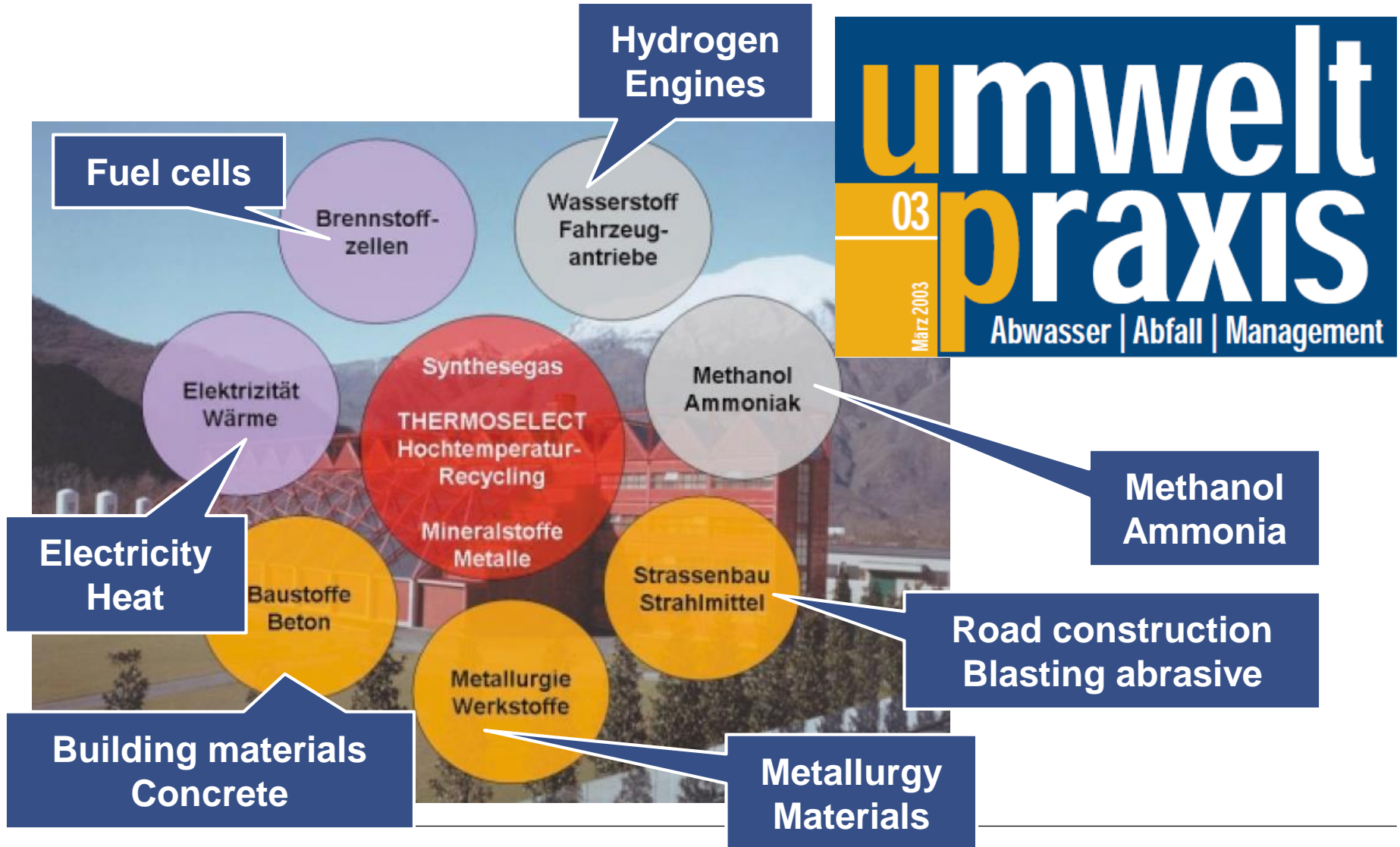
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 - **Alternative Thermal Treatment ATT**

Alternative Thermal Treatment

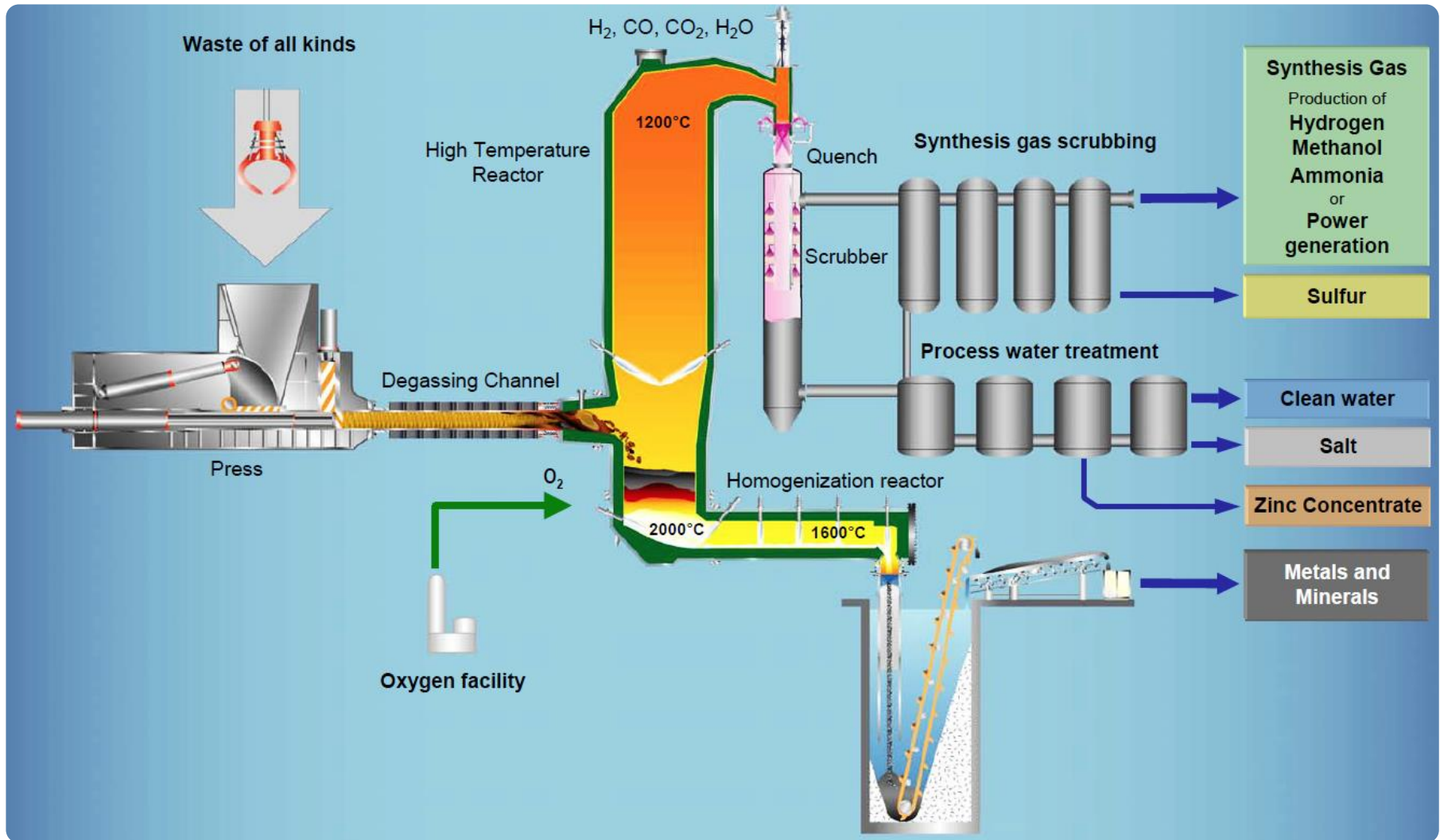
Thermoselect



Alternative Thermal Treatment



Alternative Thermal Treatment – Thermoselect



Alternative Thermal Treatment – Thermoselect

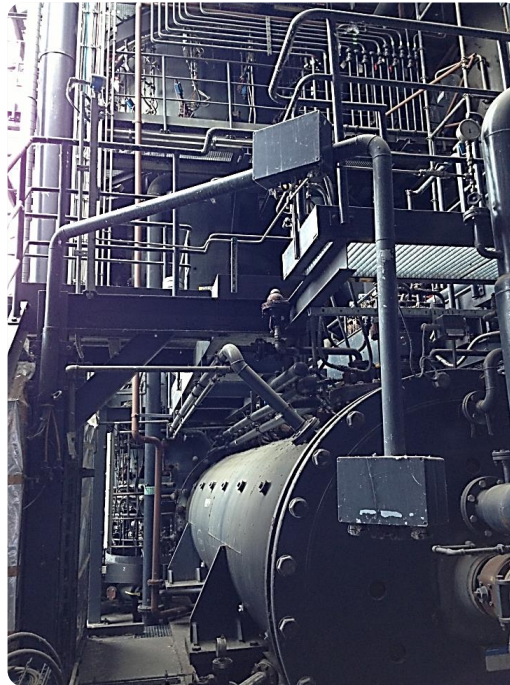
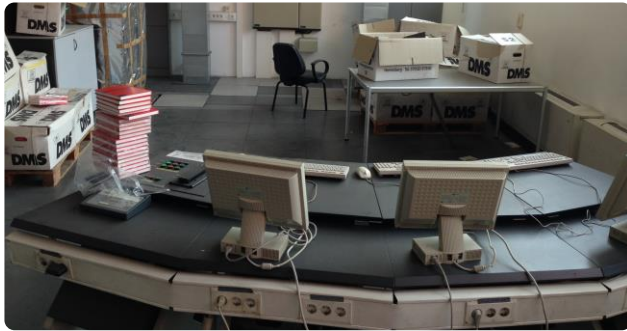
Plant in Yorii, Japan

- Availability 82-87 %
(after 11 years operation)
- ca. 5 % C-content
of bottom ash
- Consumptions:
 - 300-400 m³ H₂O per day
 - 400 m³ O₂ per ton of waste
 - 40 m³ natural gas per ton of waste
 - **10 Mio € deficit per year**



Alternative Thermal Treatment – Thermoselect

Leftovers in Karlsruhe



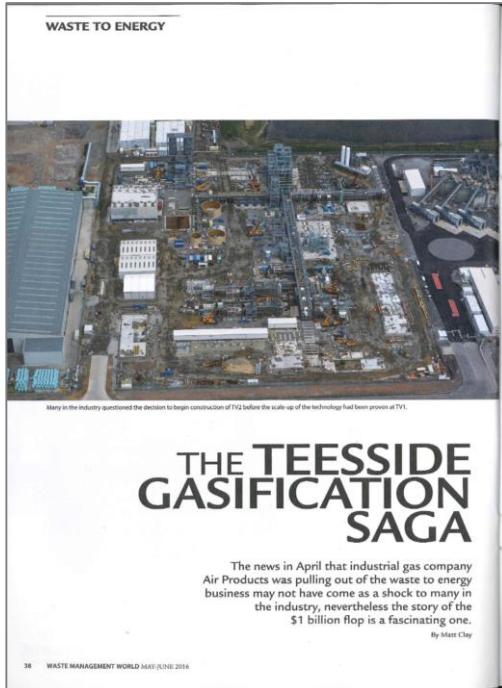
Alternative Thermal Treatment – AlterNRG

The Air products desaster



Alternative Thermal Treatment – AlterNRG

The Air products desaster



Hopefully lessons can be learned from the experience and the UK should not lose hope on eventually scaling up gasification to treat waste on a large scale. —



Alternative Thermal Treatment – Enerkem

The newest one from Canada....



GESAMT [Mg/a]	365.000
MSW	280,000
Commercial waste	30,000
Sewage sludge	40,000
Other feedstock	15,000

Enerkem



Alternative Thermal Treatment – The Reality

Pipes for pyrolysis gas



Conclusion

Conclusion

What is the problem with zero waste?

- First of all:
 - Minimizing waste in everyday life is absolutely to be welcomed and should occupy each of us!
- But:
 - Politically the story of the „Zero-waste society“ leads to irrational and even counterproductive demands/strategies:
 - Higher recycling rates without a quality and recycling concept
 - Closure of landfills
 - Closure of waste incineration plants
 - Promotion of fantasy processes...

Conclusion

- **Zero Waste is an Utopia**
- Zero waste is not reachable because of
 - Product design, composites, ...
 - Consumer behaviour
 - Unavoidable downcycling, entropy...
- But that's fine: **We need pollutant sinks!**
- The elimination, concentration and destruction [or safe immobilization] of pollutants must be the first priority of waste management
- **Incineration plants** but also (inert material) landfills **are indispensable for this!**



Thank you!

Prof. Dr.-Ing. Peter Quicker

www.teer.rwth-aachen.de