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# Novel polymeric materials for cost-efficient solar-thermal systems

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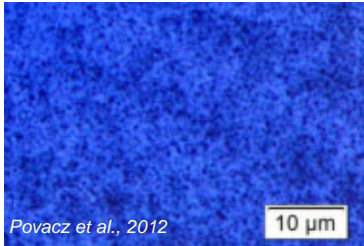
**TASK 54**

International Sustainable Energy  
Conference (ISEC)

Graz, Austria  
3-5 October 2018

# New Materials – Tailor-made Absorber Materials

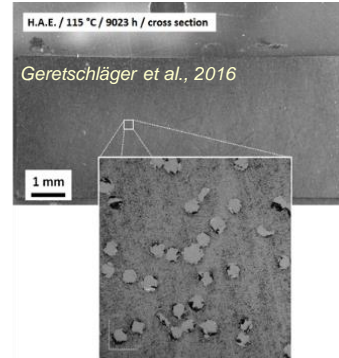
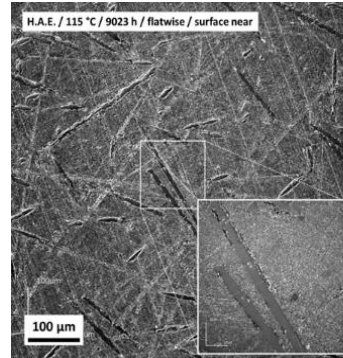
## POLYPROPYLENE (PP)



Blockcopolymer +  
Carbon black + AO + HALS



## POLYAMIDE+GLASS FIBER (PA-GF)



various suppliers: e.g., Radici, Schulman, BASF

## POLYPHENYLENESULFIDE (PPS)



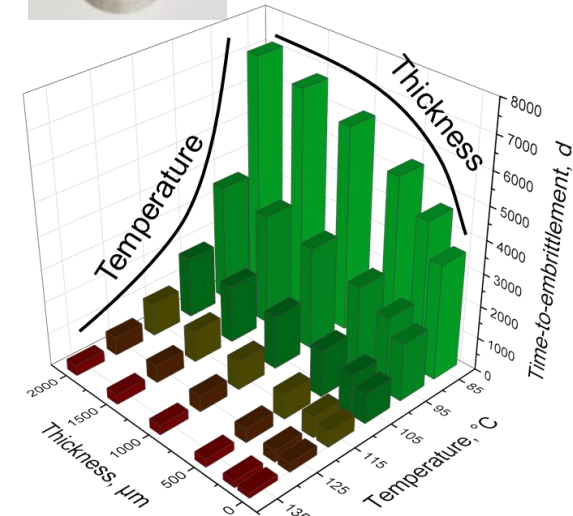
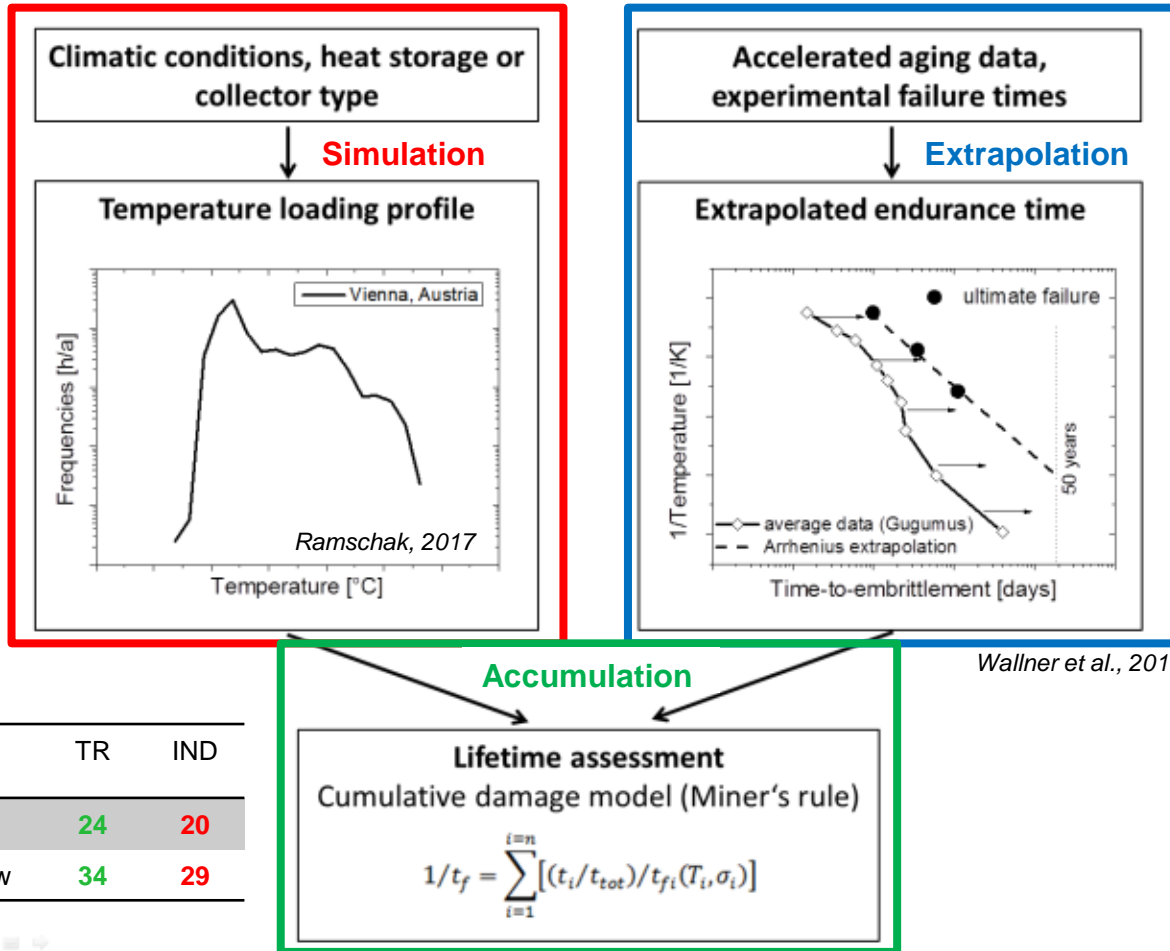
PPS + PO impact modifier



Material	T <sub>Glass</sub> , °C	T <sub>Melt</sub> , °C	Modulus, MPa RT / 125°C	Strength @RT, MPa	Solar thermal system
PP	-10	165	1200 / 200	25	Low-pressure systems, T <sub>max</sub> ~100°C
PA-GF	-40 to 60	260	5000 / 2000	100	Pressurized systems (< 6bar), T <sub>max</sub> ~100°C
PPS	100	280	1400 / 200	50	Low-pressure systems, T <sub>max</sub> ~150°C

# New Materials – Testing and qualification methods

## CUMULATIVE DAMAGE APPROACH (LOW MECHANICAL STRESS)



years	TR	IND
PP old	24	20
PP new	34	29

Based on: Diss Povacz (2014); Diss Grabmann (2018)

# Process Technologies – Continuous manufacturing

## EXTRUSION OF SHEETS AND PIPES

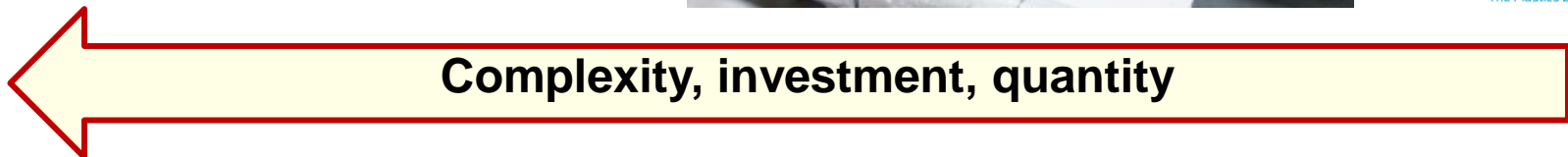
Hollow sheets



Pipes



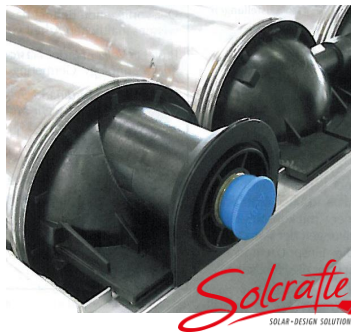
Sheets / liners



# Process Technologies – Discontinuous manufacturing

## INJECTION OR COMPRESSION MOULDING

### Injection moulding



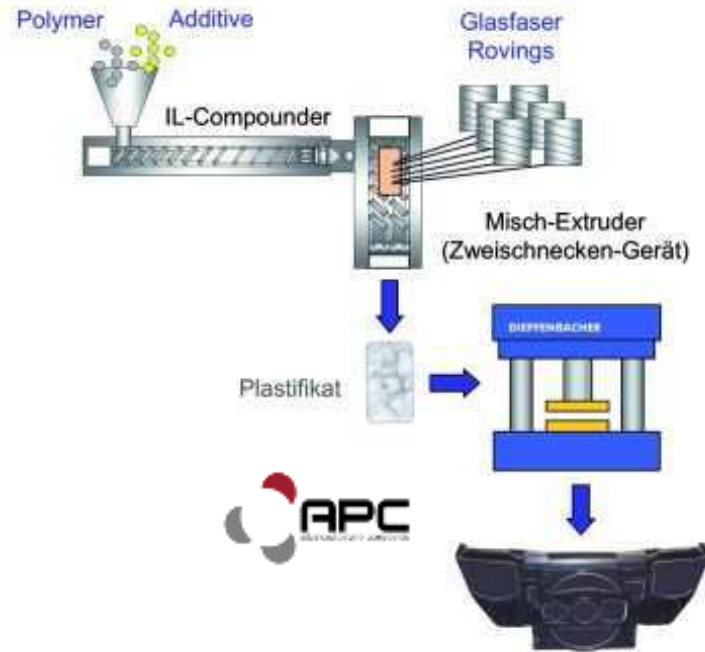
aventasolar



MAGEN  
BCO-ENERGY



### Compression moulding

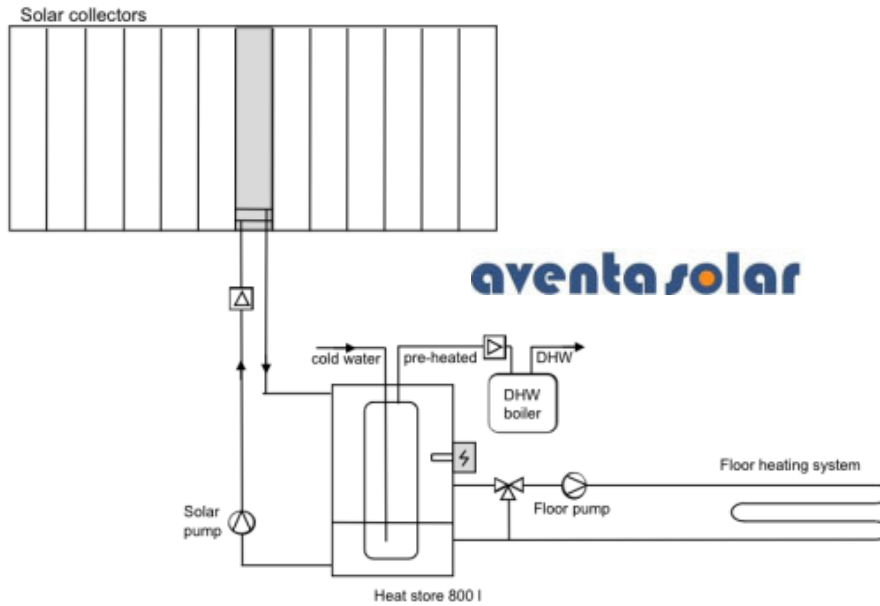


Complexity, investment, costs

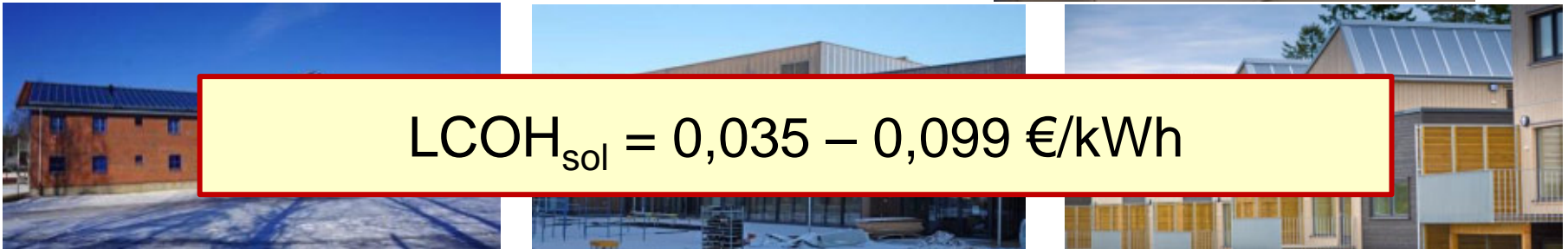
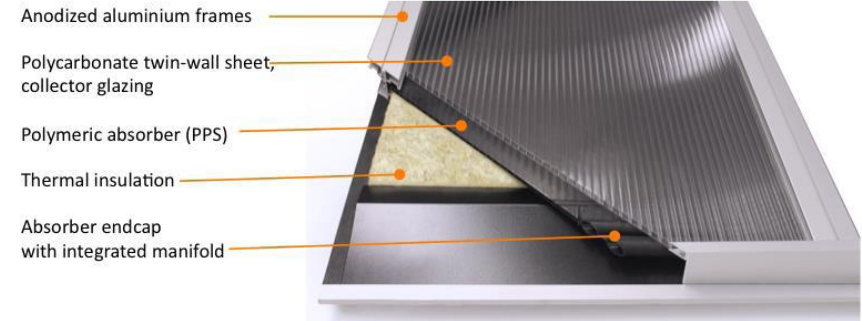
Complexity, investment, quantity

# Solar-thermal systems – Hot Water & Space Heating

## AVENTA SOLAR – PUMPED DRAINBACK SYSTEM



Rekstad, 2015 (AventaSolar collector system, Task39 Info sheet B16)



# Solar-thermal systems – Domestic Hot Water

## SUNLUMO – PUMPED “LOW PRESSURE” SYSTEM

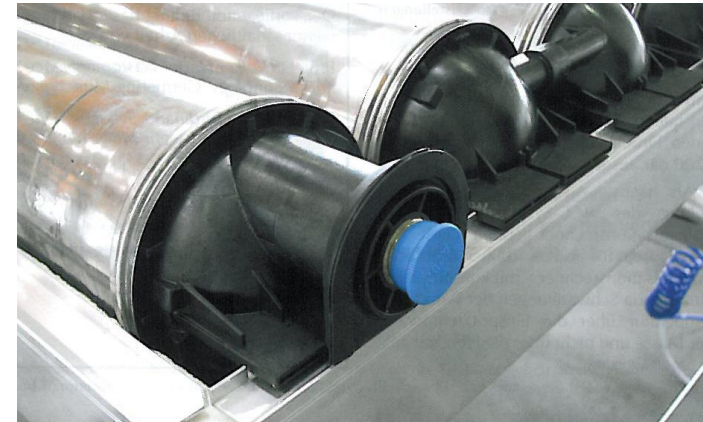
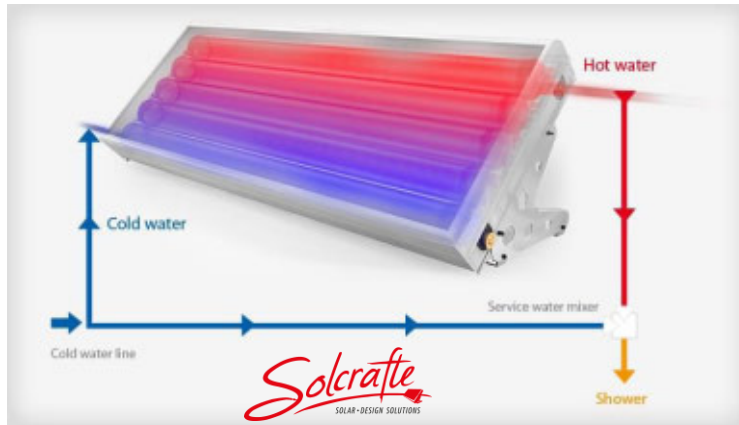


from 20 parts brass ....  
to 10 parts plastic

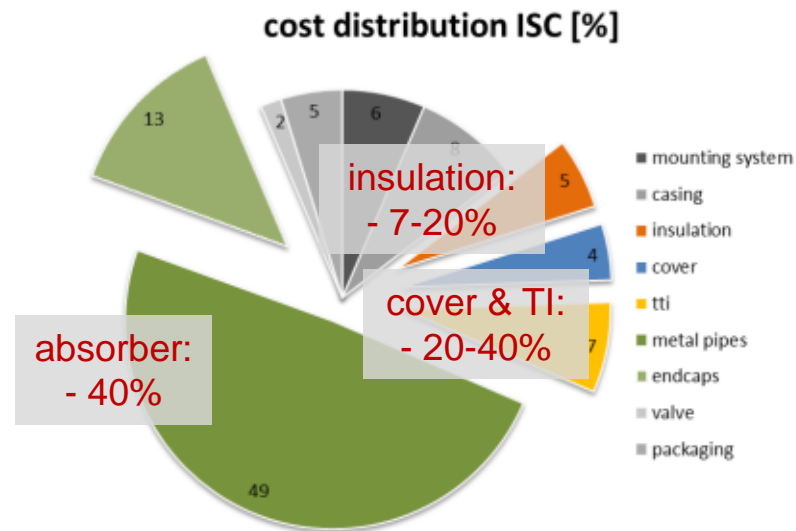
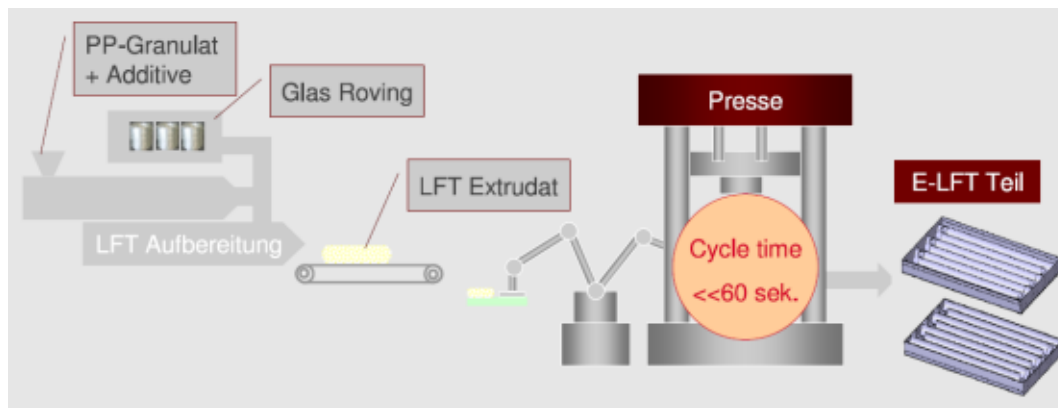
$LCOH_{sol} = 0,01 - 0,03 \text{ €/kWh, if } > 100.000 \text{ systems/year}$

# Solar-thermal systems – Domestic Hot Water

## GREENONE TEC – INTEGRATED STORAGE COLLECTOR



from > 100 parts/ .... to 7 parts/ISC



# Comparison of LCOH – Impact of new materials

