



Guideline on the Manual Dismantling of Refrigerators and Air Conditioners

Dr. Jonathan Heubes

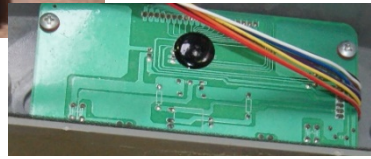
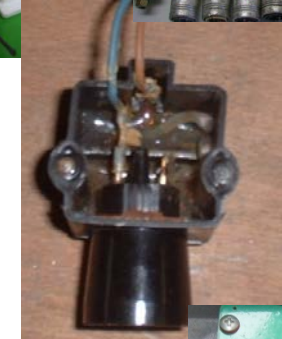
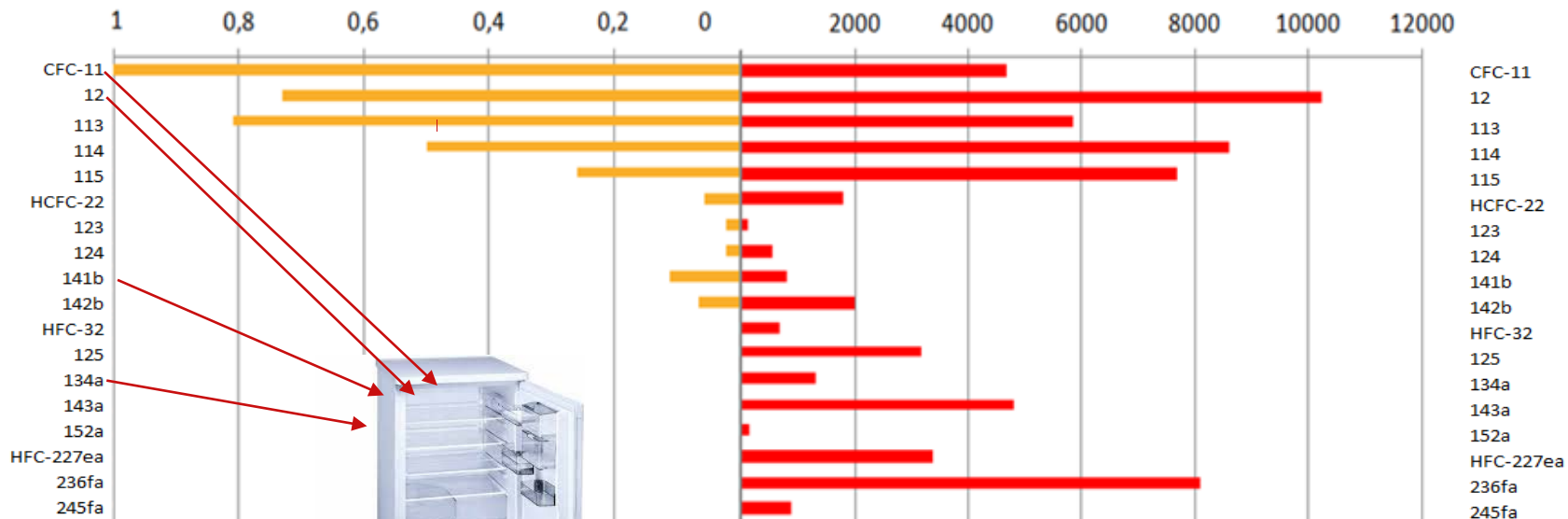
October 24th, Geneva, Switzerland



Without proper EOL management: Negative impacts on the environment and health!

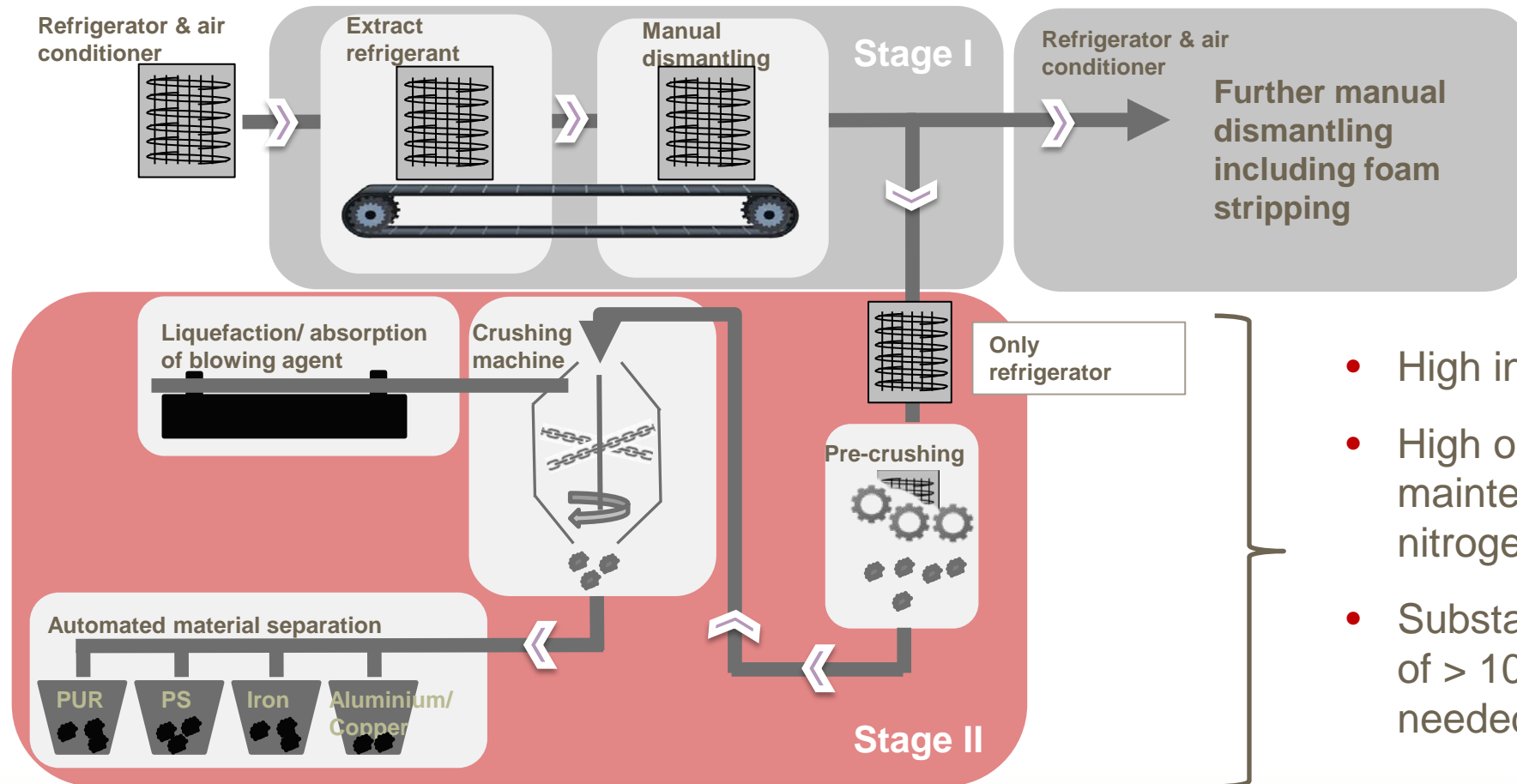
Damage to ozone layer (ODP values)

Climate change (GWP)





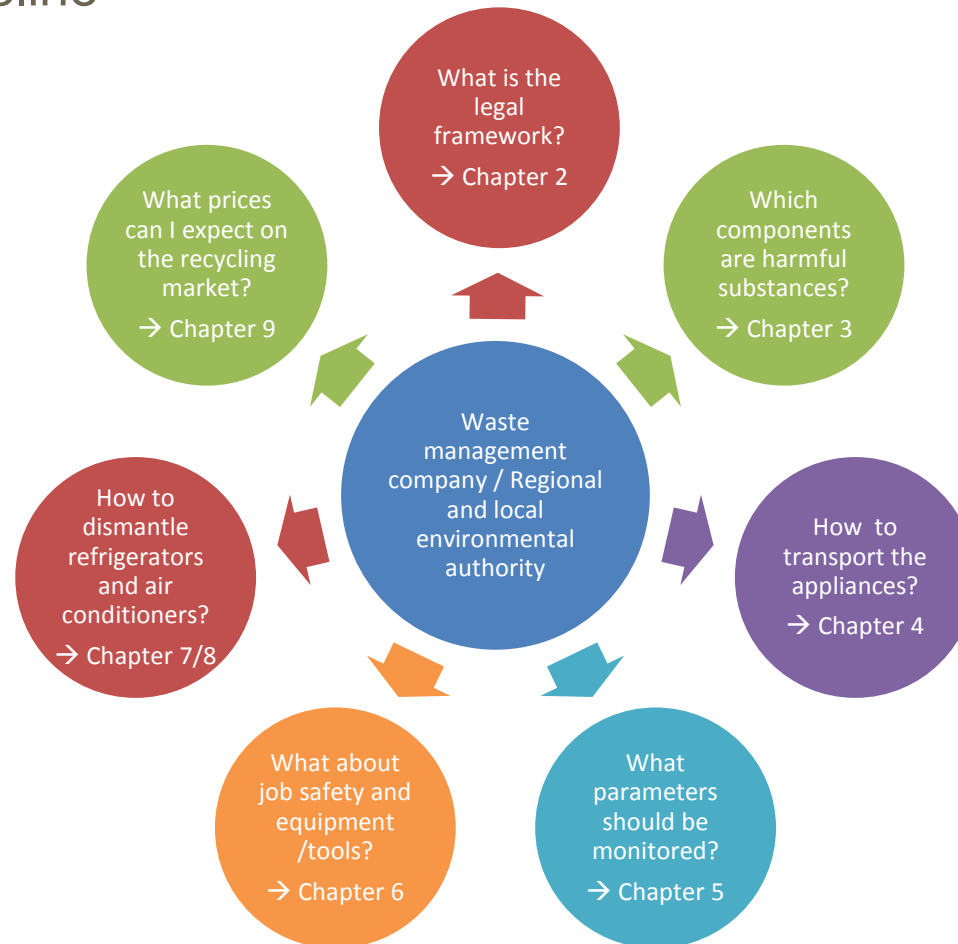
Overview of stage I and stage II processing



- High investment cost: 2-4 Mio €
- High operational cost: maintenance, electricity and nitrogen (explosion suppression)
- Substantial waste stream of > 100.000 refrigerators/year is needed



The chapters of this guideline



GIZ 2014, Green Cooling Technologies

Download: www.giz.de/expertise/downloads/giz2017-en-weee.pdf



The dismantling steps and necessary equipment



Industrial degassing machine with disassembly line



Piercing pliers to extract the refrigerant

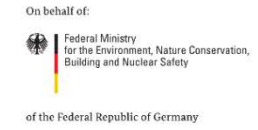
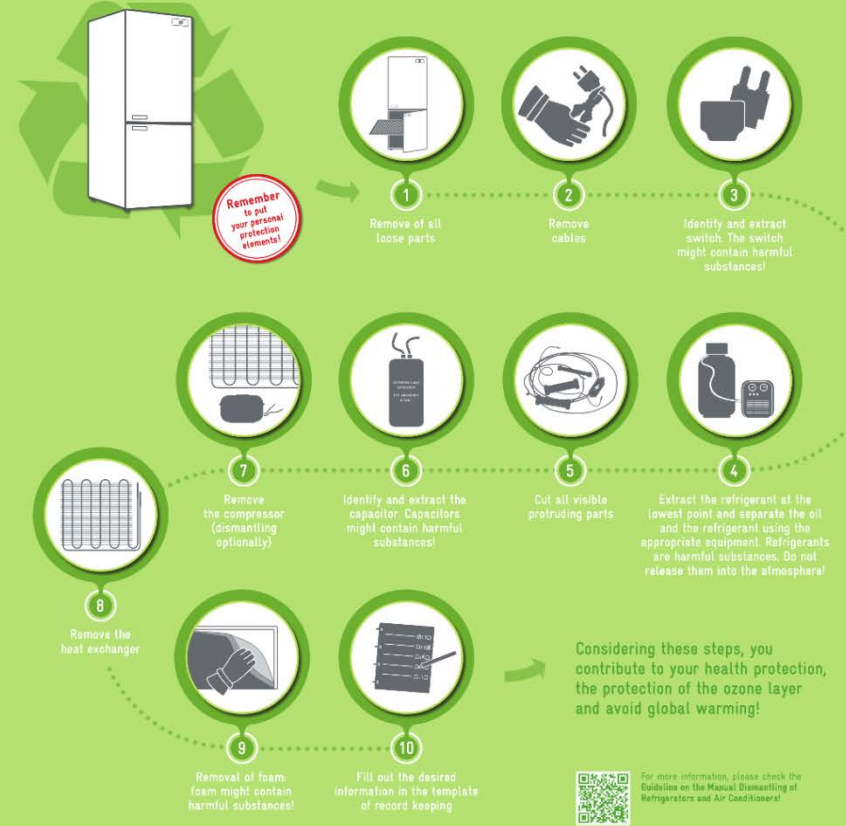


Mobile recovery unit for refrigerant recovery with integrated oil separation

Appropriate Dismantling of Refrigerators

10 steps to consider for technicians and operators of WEEE* management companies

*WEEE: Waste of electrical and electronic equipment





Towards encapsulated stage II systems

- Conduct stage I as described before
- For crushing the foam, we recommend to use a chain impactor (*Querstromzerspaner*)
- Attention: ensure inert atmosphere to avoid the creation of explosive atmospheres
- Recovery of the blowing agent
 - Cryocondensation
 - Activated carbon - incineration

Further technical upgrades towards stage II

- Airflow separator (filter, cyclones)
- Overbelt magnet
- Conveyor belt



(Photo: J. Gloel)



Thank you for your kind attention!

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