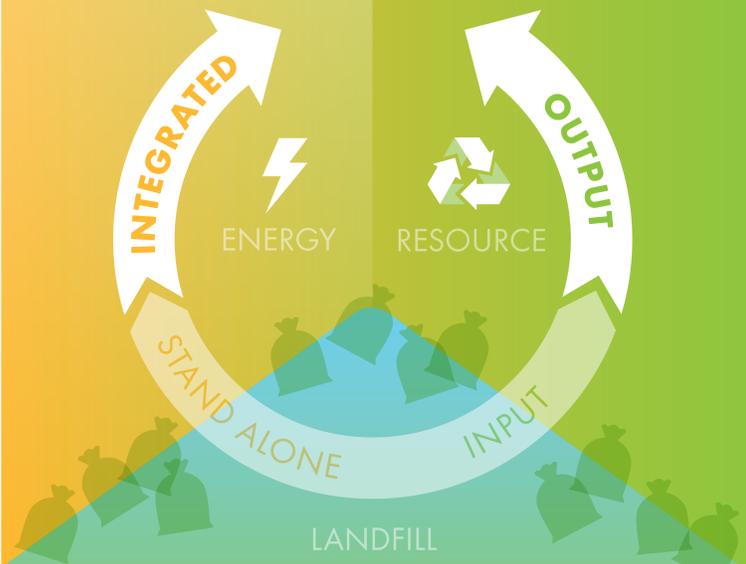


WASTE HIERARCHY

PREVENTION



A circular economy maximizes repeated recovery of materials from both the bio- and techno spheres. AVR has been realizing this ideal with a mono-stream dedicated thermal installation recovering both energy and upcycling resources. As a market leading Energy from Waste company, AVR is proud to present its TCI. This Thermal Conversion Installation realized strong integrated energy recovery with output focused resource upcycling from industrial biowaste.

PAPER CASCADE

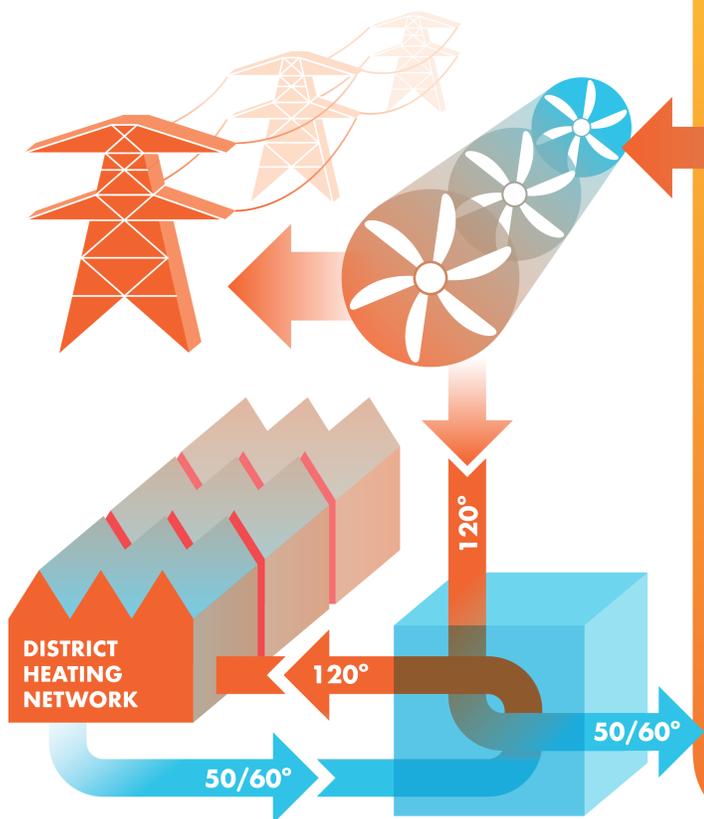
From RECYCLING to THERMAL CONVERSION



Paper can be recycled about 7 times. At the end of this paper cascade however, paper sludge from tissue paper production is a significant worldwide waste management challenge. The sludge consists of lignin-celluloses fibers, saturated with water, and mingled with mineral fillers, whiteners and inks from the former lives of the paper: corrugated board, magazines, office paper and newspapers.

ENERGY RECOVERY

The self maintaining exothermic reaction allows for a 25 tons per hour steam boiler to produce high pressure steam. This energy is delivered to thousands of households by means of a 5MW turbine and Arnhem Area's district heating network.



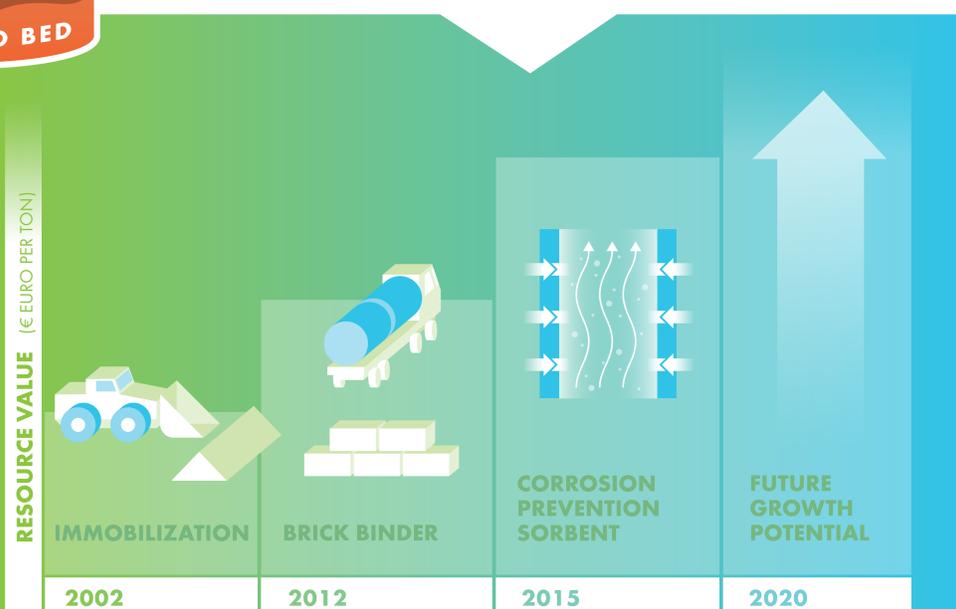
RESOURCE UPCYCLING

About 180.000 tonnes per year of this paper sludge finds its way to the Thermal Conversion Installation (TCI) owned and operated by AVR. AVR's site in Duiven, close to the German border, serves front-end customers from both countries, disposing their sludge. After a careful blend of different customers' sludge, generally based on calorific values, dry matter and ash content, it is pelletized and injected to a fluidized bed at a well-controlled temperature. The conversion process in the TCI processes 20 tons per hour, recovering heat from fibers while preserving the valuable minerals.

FROM THE BIOMASS CASCADE



Over the years, the 'MEP' subsidy scheme supported electricity, and currently the SDE+ scheme supports the renewable 'short cyclic' carbon based heat supply. Without the latter, many more households in the area would still be heating with fossil gas. The future growth potential is seasonal heat buffering in an aquifer ca. 500m below the surface.



TopCrete® is applied in 3 different markets that were developed over the years. At first it only served as reactive binder in ground works, later expanded as cement replacement in building products. On top of those markets, AVR's in-house developed desulfurizing dry sorbent application took off in 2015. Injected in AVR's flue gas cleaning, it is reducing operating and maintenance costs in boilers for (bio-) energy from waste. This market has good growth potential the coming years.

OUR BIOBASED ANSWER

AVR.