Accelerating the Transition to a Circular Economy with High-Throughput Technologies

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Introduction

Nowadays, our economies and industries are heavily depending on limited, fossil-based resources that do not contribute to a circular economy.

Many governments and companies have taken the initiative to integrate circular economy in their politics and regulations and still more companies join the trend. To facilitate the movement toward a circular economy and waste recycling, high throughput technology offers a rapid, precise and fully digitali zed tool to enable efficient:

1. Development of new sustainable processes
2. Transition of existing processes to reduces waste production and increase process efficiency and flexibility
3. Utilization of renewable resources
4. Recycling of process wastes back into existing value chains

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hte's technologies at the core of circular economy

New Process Development from A → Z

To fulfill the set sustainability targets, many industries are considering the development of environmental-friendly processes and the use of alternative feedstocks (e.g., sugar). In most cases such an action is a time & cost demanding process that can slow down and affect target achievement.

hte offers its expertise in a fully digitalized environment and supports clients by acceleration of new process development. hte serves in the field of catalysts synthesis, catalyst characterization and catalyst screening & testing: from powder to extrudates and from batch to continuous setup.

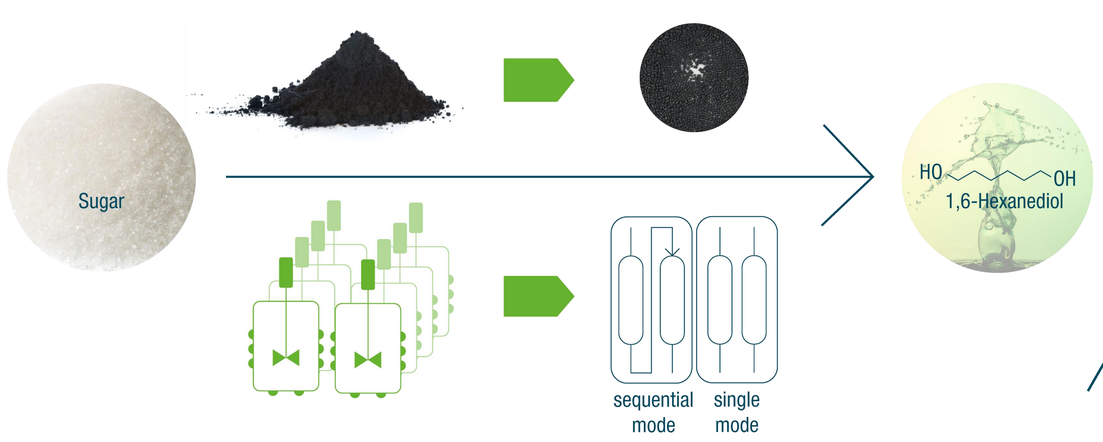


Figure 1. Conversion of sugar derivatives into 1,6 Hexanediol. Full process development from powder to extrudate and from batch to bench

Process Optimization

Many companies are working on process integration and new feed processing. One example is the co-processing of Bio-crude and secondary refinery stream (e.g., VGO) in the refinery units to support their movement towards biorefinery.

hte supports customers in the filed of catalyst testing using new alternative feedstocks. Applying a fully automated testing equipment in lab-scale, hte generates relevant and high-quality data in short period of time. The outcome can be implemented directly in existing operation facilities, leading directly to cost & resource savings and increased credibility of the optimized process.

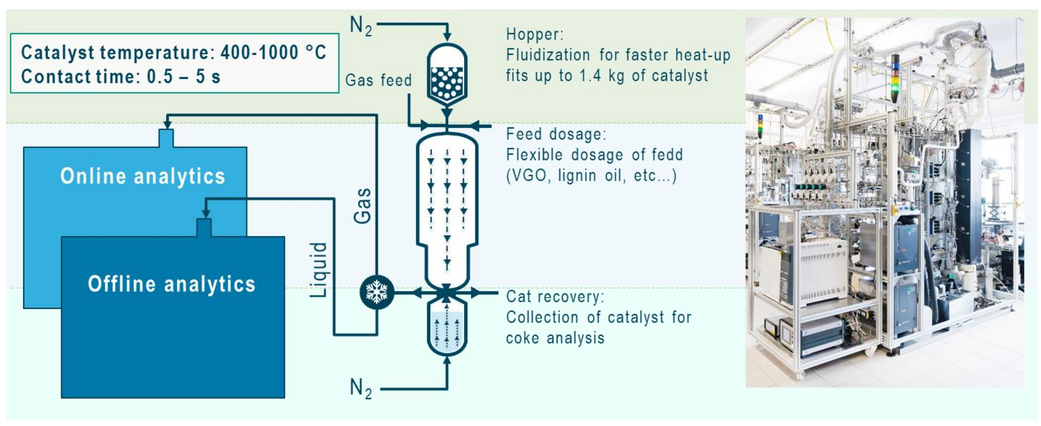


Figure 2. Micro down flow unit at hte. Thermal and catalytic cracking of different feeds can be carried on in a similar way to the FCC unit

Recycling: Upcycling of Pyrolysis Oil

In every process, minimizing wastes, as well as recycling & upcycling is an essential building block in circular economy. Especially, the polymer industry is faced with the challenge, imposed by regulation and consumer demand, to reintroduce polymeric waste back into existing value chains.

hte facilitates the transition of the industry by accelerating R&D in the field of plastic waste recycling. This includes the upgrading of pyrolysis oil derived from polymeric waste to meet the specification of existing assets. hte's fully automated tool set facilitates different processes including hydrotreatment and hydrocracking for fuel and chemical applications.

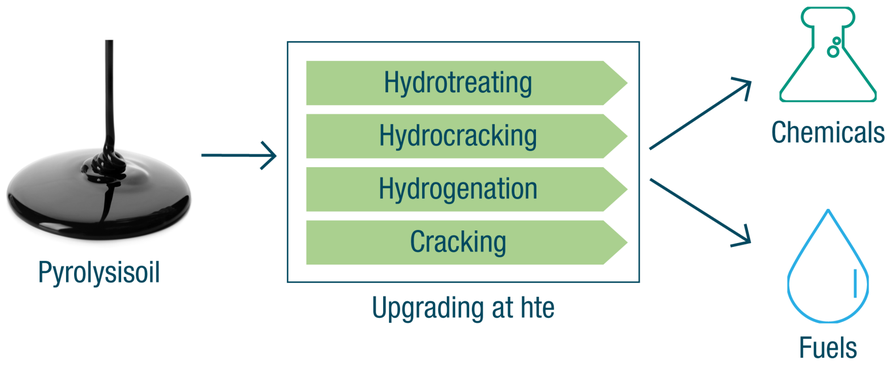
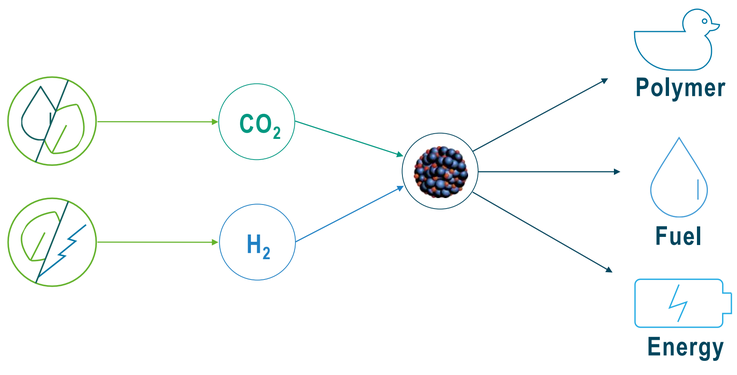


Figure 3. Pyrolysis oil upgrading towards chemicals and fuels using hte technologies

Renewable Resources

Utilization of renewable resources as novel feedstocks has become the focus of governments and corporate strategies. In the last years hte has contributed in many project towards utilization of renewables (e.g., sugar, lignin).

Yet, with more than 20 years experience in the filed of Syngas conversion, hte is actively working in the utilization of renewable gaseous feedstocks. This includes the transformation of CO_2 and green/blue Hydrogen into chemicals that ultimately find applications in polymer, fuel and energy sectors. The gas phase multifold units at hte and the digitalized workflow enable an efficient catalysts screening in the fields of MeOH synthesis, FT, MTO, methanation and WGS.



Catalytic processes:

- Methanol synthesis
- Fisher-Tropsch (FT)
- Methanol-to-Olefins (MTO)
- Methanation
- Water gas shift (WGS)

Figure 4. Utilization of renewable CO_2 and H_2 using different catalytic processes offered by hte