

## TRANSITIONING TO INDUSTRY TALKS

# **Collaborative Research on Lignocellulosic Biomass and Waste Conversion at the ABPDU**

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## Approach: Support both DOE and industry-funded projects relevant to biomass and waste conversion



**MSW blends to methyl ketones**



**Landfill-designated organic waste to sugars and acids**

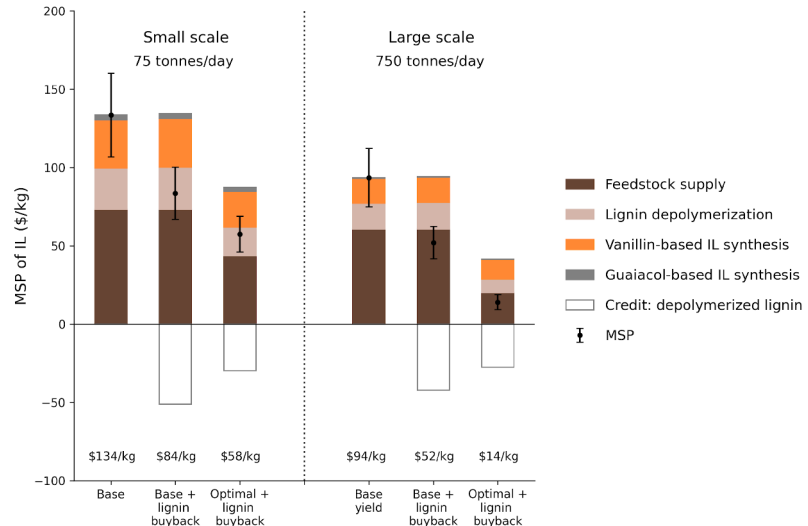
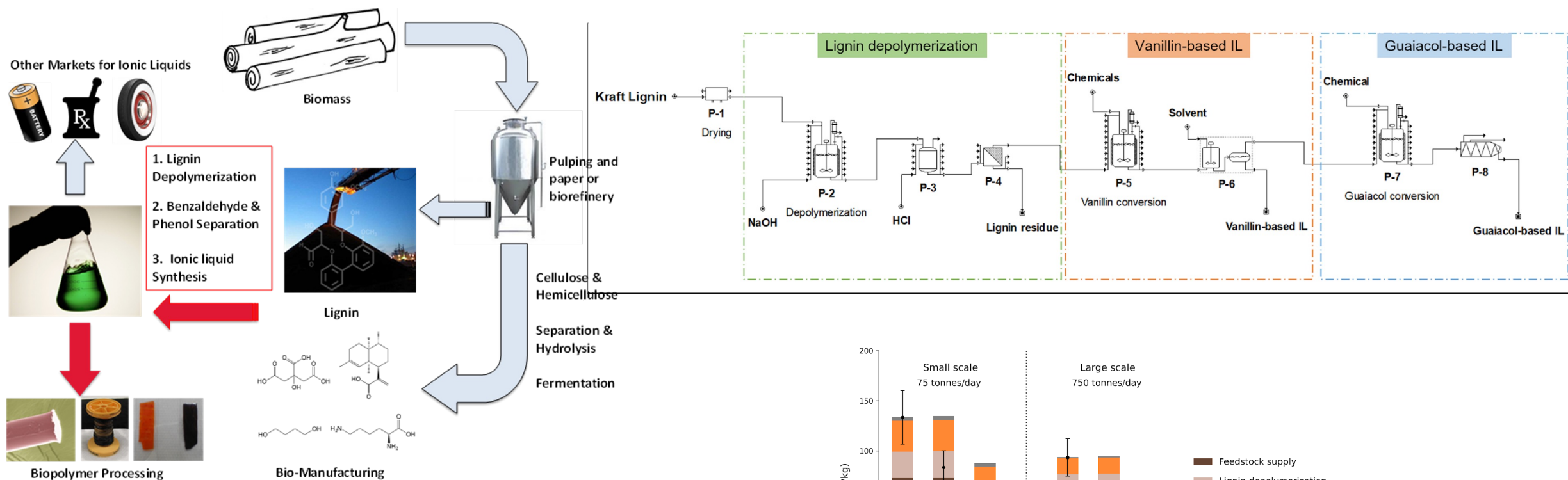


**Post-consumer absorbent hygiene products (AHPs) to sugar and ethanol**



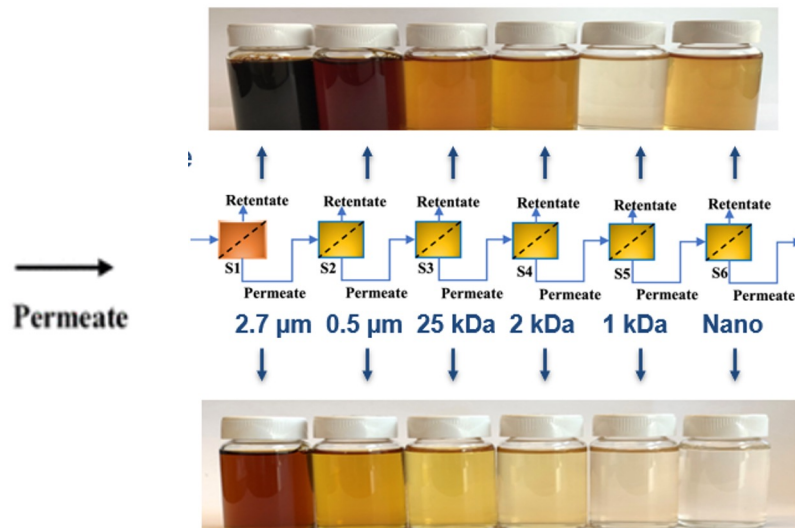
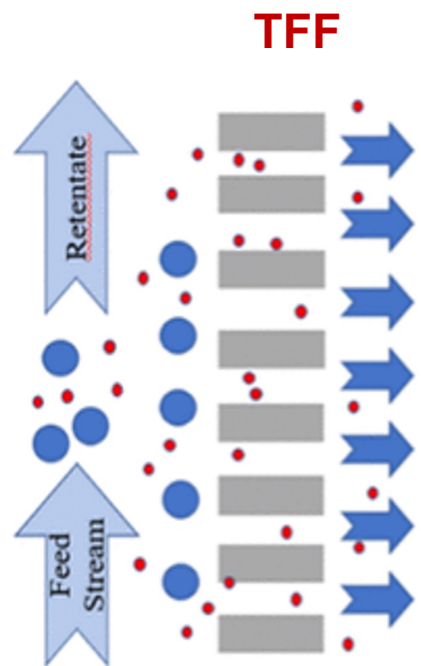
**Almond hulls and shells torrefaction TEA**

# Progress and Outcomes: Lignin derived ionic liquids (LIL)

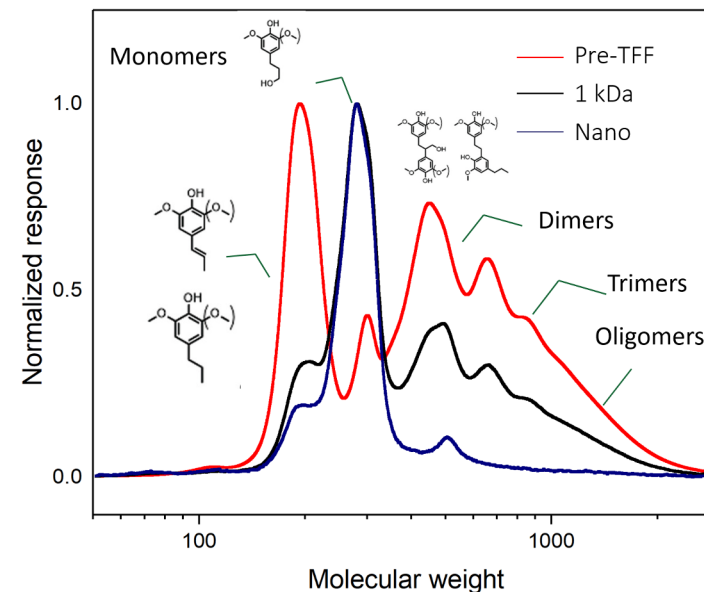


- **Budget: \$500 K TCF funds+ \$500 K cost share**
- TEA results indicate the potential of producing affordable ILs from kraft lignin and the MSP of LIL is \$14/kg with optimal case
- Life-cycle assessment results show the potential to reduce GHG emissions by up to 85% relative to existing ILs ([Ch][Lys])

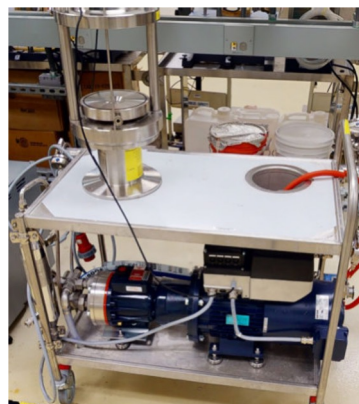
# Progress and Outcomes: Lignin fractionation using Tangential Flow Filtration (TFF)



## GPC analysis of permeate



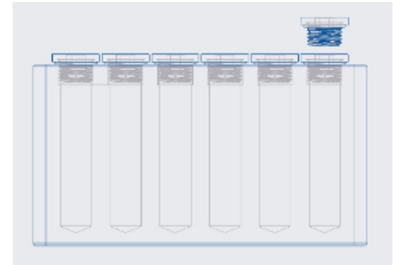
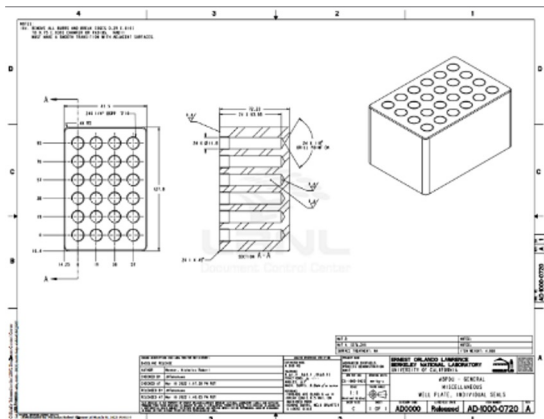
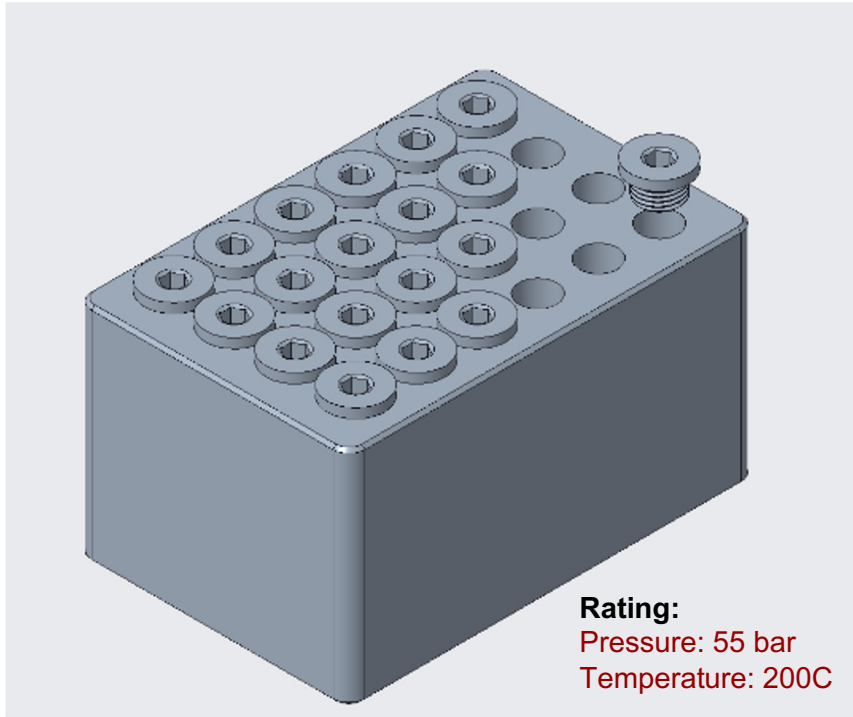
## TEA of the low MW lignin recovery cost



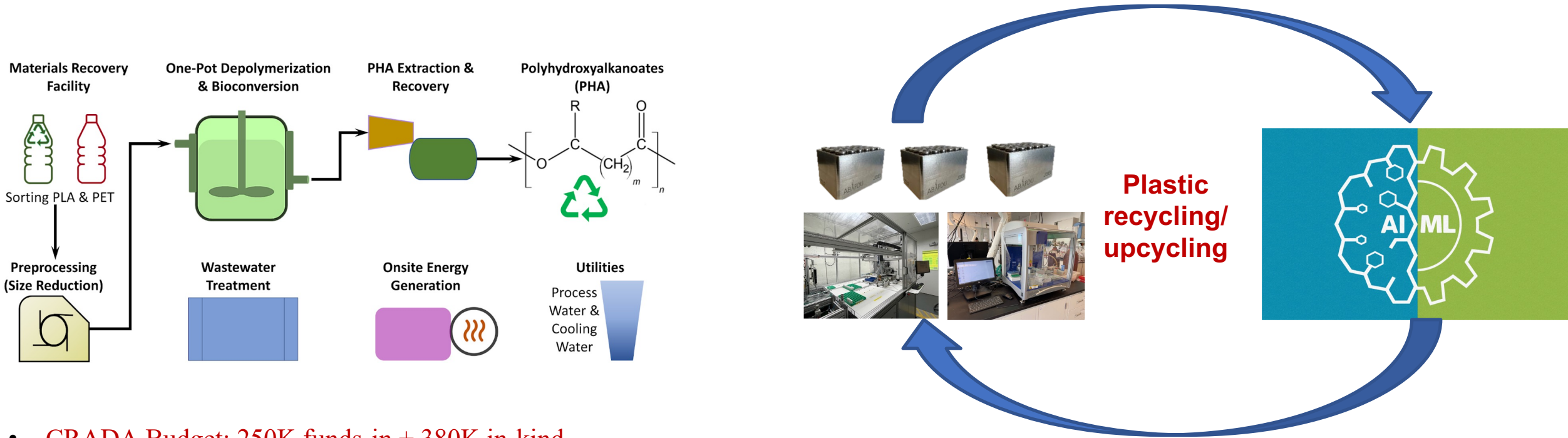
TFF system	Alfa Laval M20 (AL)			
Pretreatment catalysts	Sodium Hydroxide		Cholinium Lysinate	
Lignin (low MW + high MW) in black liquor (g/kg)	44.74		123.4	
MW cut-off	5 kDa	< 400 Da	5 kDa	< 400 Da
Permeate recovery (%)	22.5%	1.9%	36.8%	2.1%
Annual running cost (\$/yr)	133,635	216,136	133,635	216,136
Annual low MW lignin production (tonne/yr)	794	67	3,580	204
Low MW lignin recovery cost (\$/tonne)	168	3,225	37.3	1,058

- AOP Budget: 150K per year
- TFF is capable of fractionating aqueous lignin streams
- A high initial concentration of lignin in the black liquor plays a critical role in the lignin product yield and recovery cost

# Progress and Outcomes: Capability Development for High throughput pressure reactor



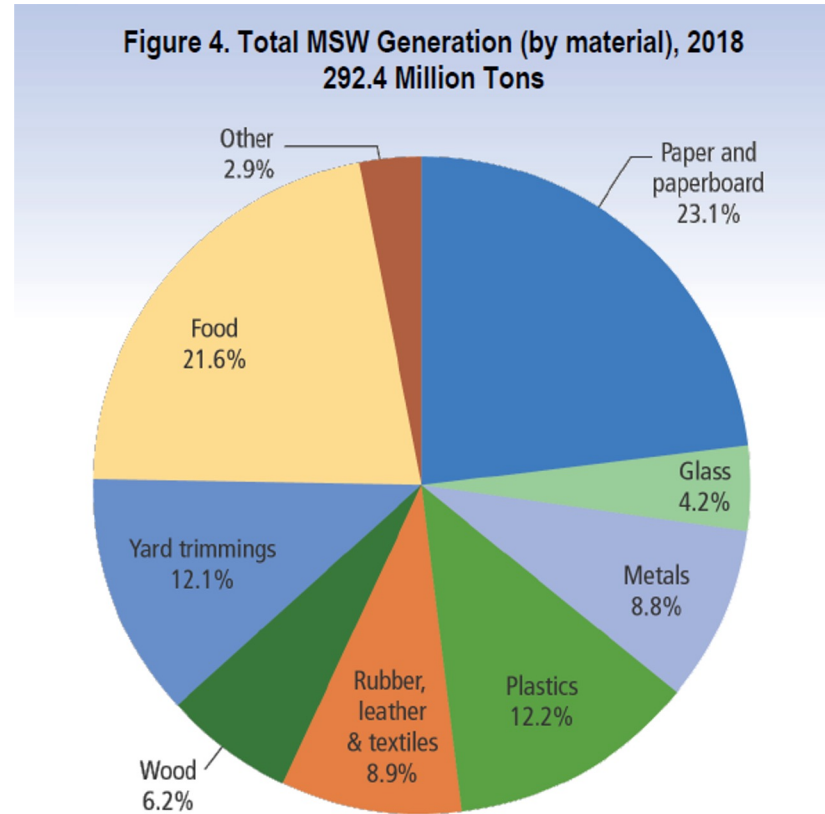
# Progress and Outcomes: Depolymerization of polyester plastic mixtures using aqueous ionic liquid (IL)



- **CRADA Budget: 250K funds-in + 380K in-kind**
- This study demonstrates the feasibility of applying ILs in depolymerization of PET and PLA mixtures using water as the bulk solvent
- The use of an aqueous solution of biocompatible IL allows the direct utilization of depolymerized stream in biological conversion
- Currently focusing on high-throughput screening of IL catalyst for PET depolymerization



# Impact: Increase diversion rate of landfill-designated waste streams



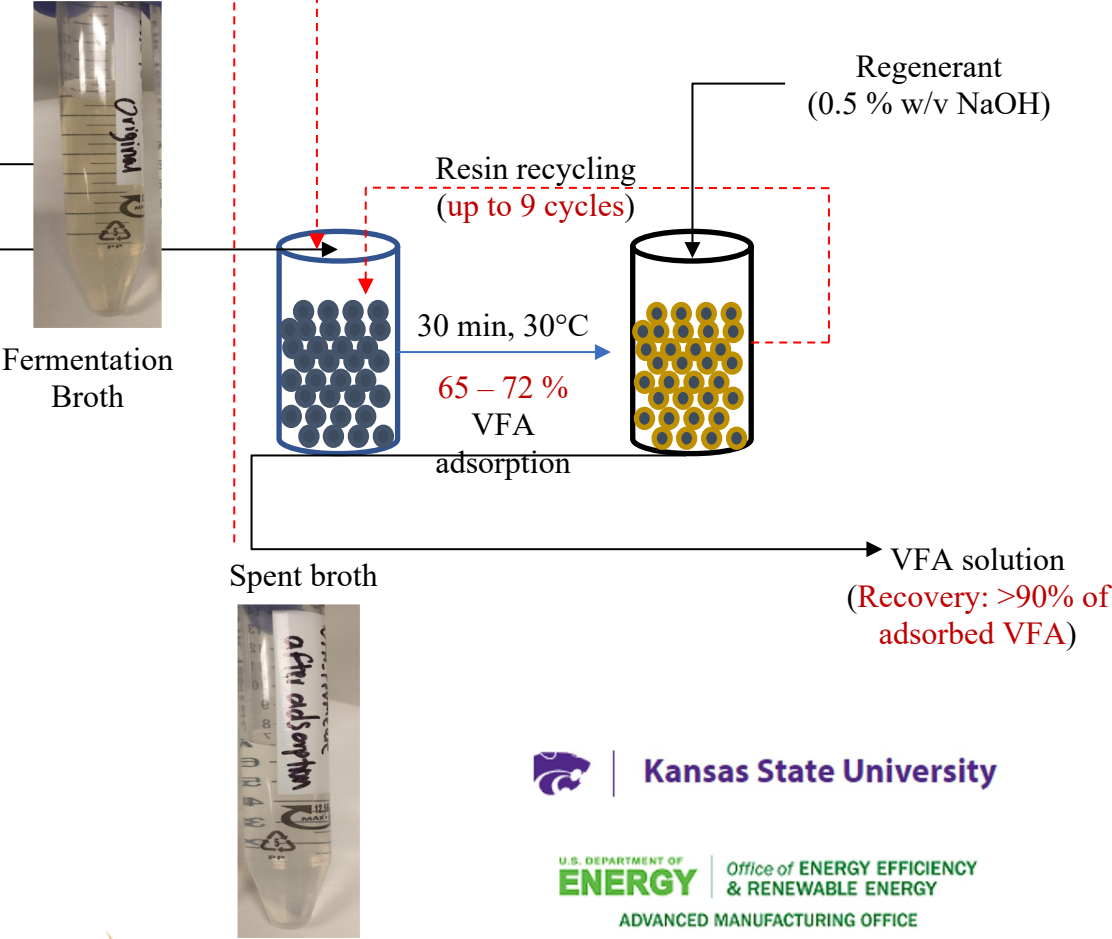
**Organics: ~ 50%**

**Plastics: ~ 20%**



# Impact: Advanced Recovery from wastewater

## Volatile fatty acids (VFA) recovery after fermentation of wastewater



## Rare earth element (REE) recovery from mining-influenced water (MIW)

