

# Biomass Utilization in New Mexico

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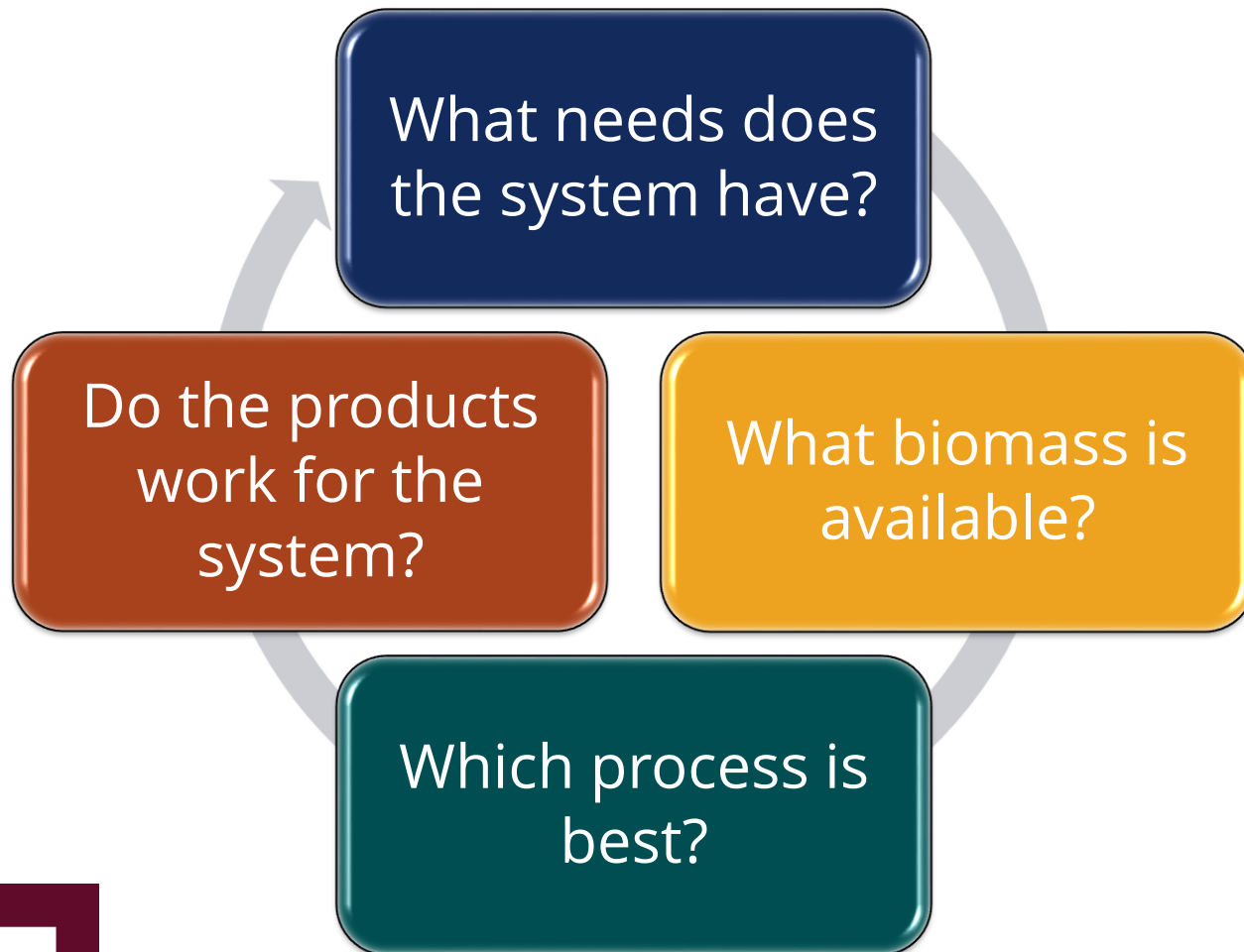
February 23, 2018

# Outline

- Biomass Resources in New Mexico
- Thermochemical Processing of Biomass
- Current Projects
  - Adsorption of NDMA
  - Hybrid Poplar-Excelsior-Biochar Production
  - SBAR: Guar and Guayule
  - Educational Projects



# Biomass Systems Engineering



# Available Biomass



15,000 tons/year



2,000 tons/year



35,000 tons/year



725,000 tons/year

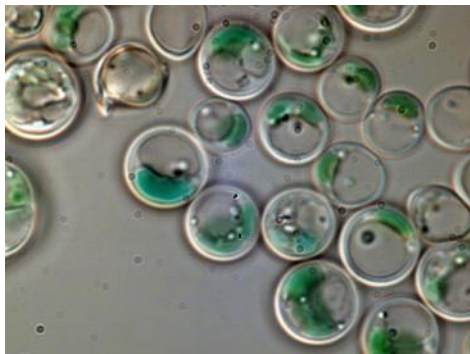


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# Available Biomass



Algae



Four-wing saltbush



Guar



Big saltbush



Guayule



Hybrid poplar

# Thermochemical Processes

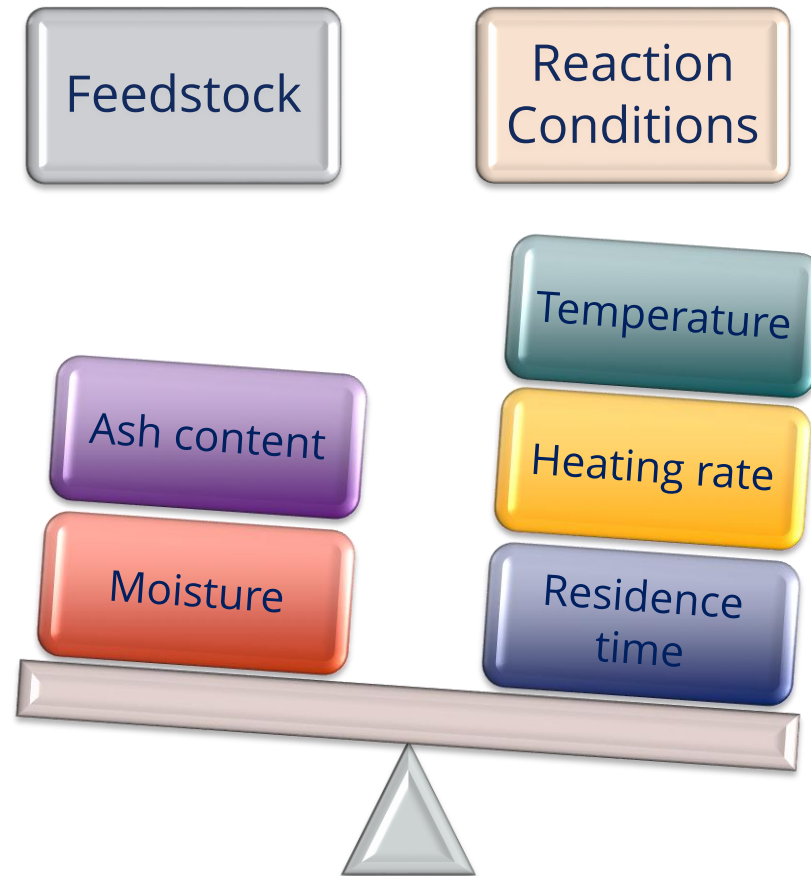
## “Dry”

- Torrefaction
- Slow pyrolysis
- Fast pyrolysis
- Activation
- Gasification
- Combustion

## “Wet”

- Hydrothermal carbonization
- Hydrothermal liquefaction
  - Subcritical
  - Supercritical
- Hydrothermal gasification

# Thermochemical processes yield solid, liquid and gas.



# Thermochemical Processes

## “Dry”

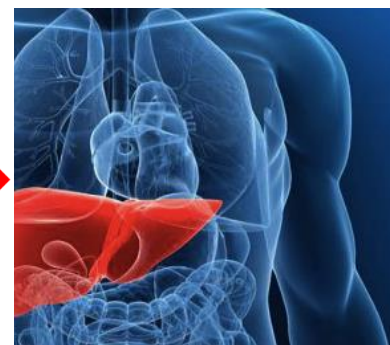
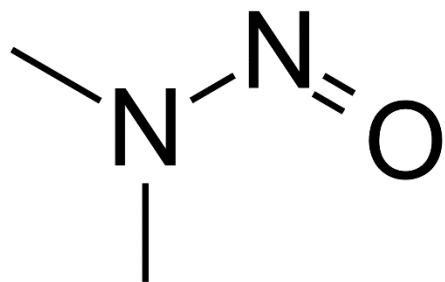
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## “Wet”

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# N-Nitrosodimethylamine (NDMA)



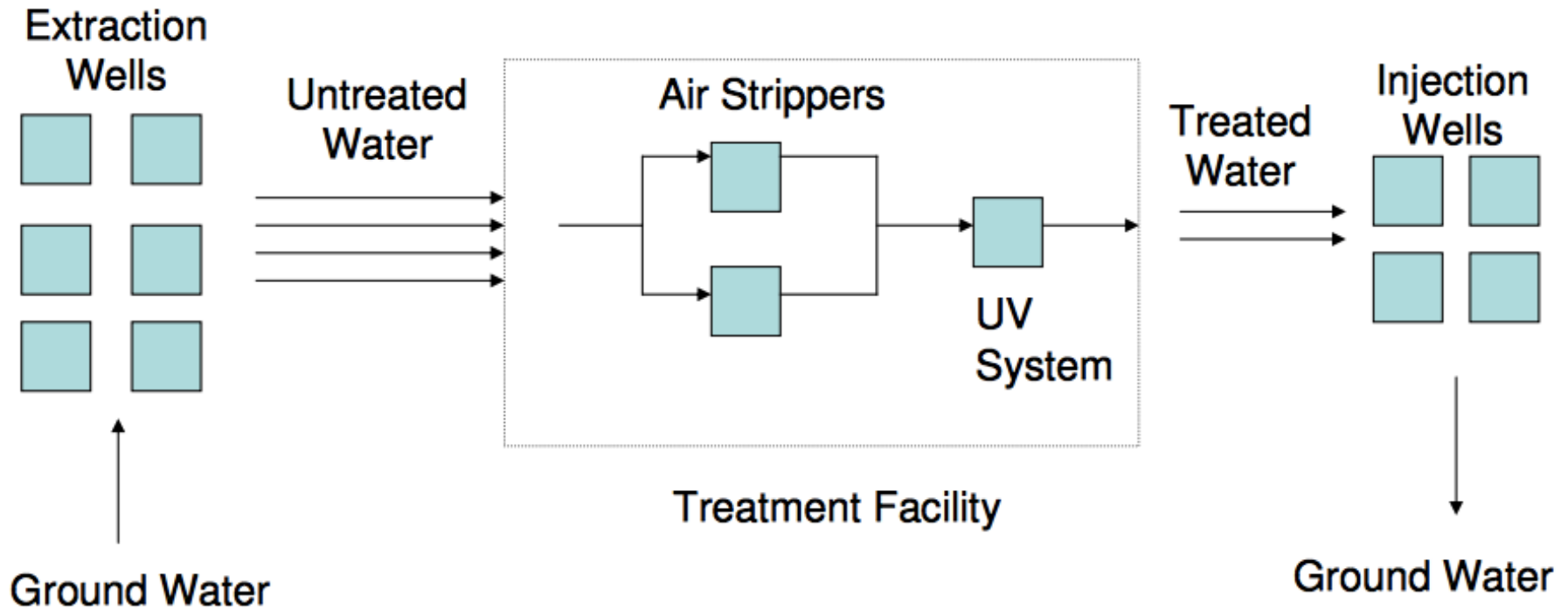
- U.S. EPA contaminant watch list
- Probable human carcinogen:  $1 \times 10^{-6}$  cancer risk for 0.7 ppt (ng/L) in drinking water

# Sources of Contamination

- Treated Aerozine-50 rocket fuel at NASA WSTF in '60s + '70s
- Beer and smoked meats
- Water treatment facilities that use chloroamines



# Removal of NDMA from Groundwater at White Sands Test Facility

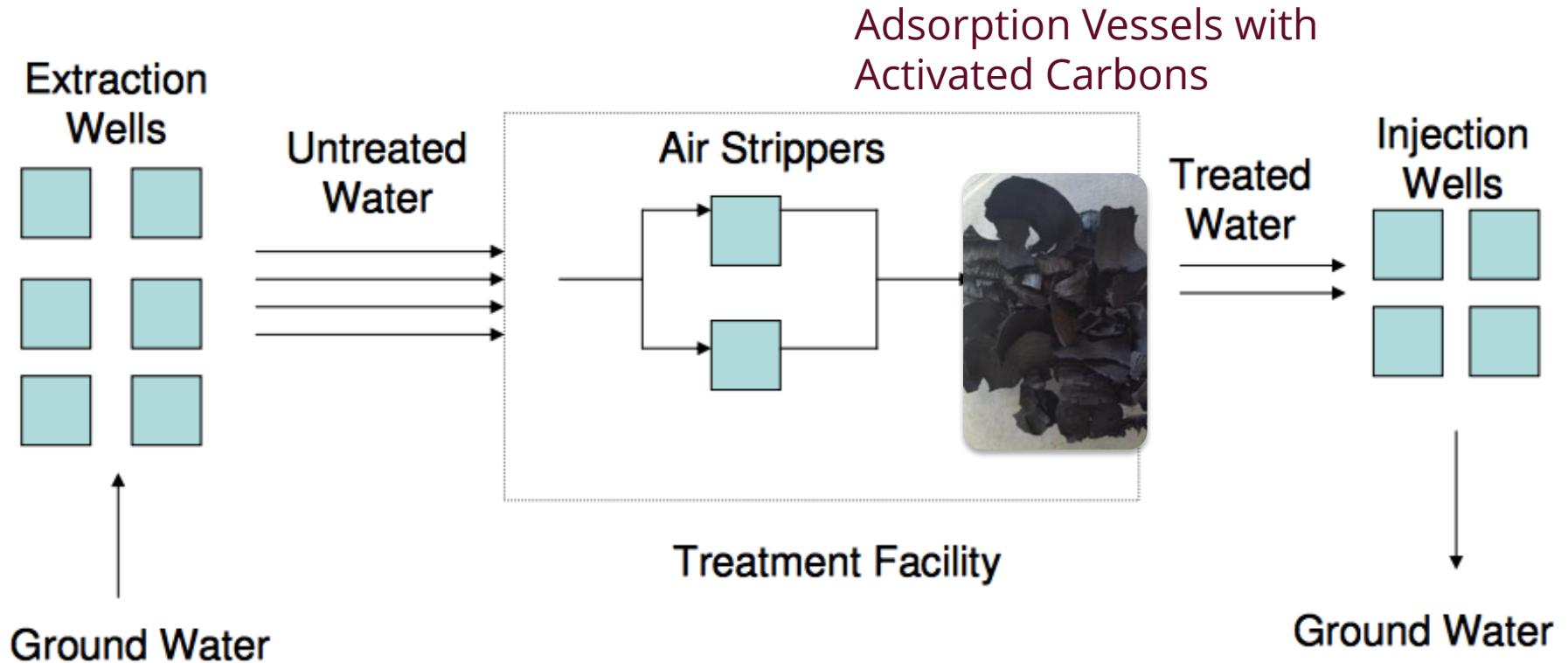


# Current Treatment

- UV photolysis
  - Band around 227 nm
  - Twelve 30-kWatt lamps (Hg vapor: 200-250 nm)
- Annual electrical cost
  - \$112,000 (UV/Ox tower)
  - \$560,000 (entire system)

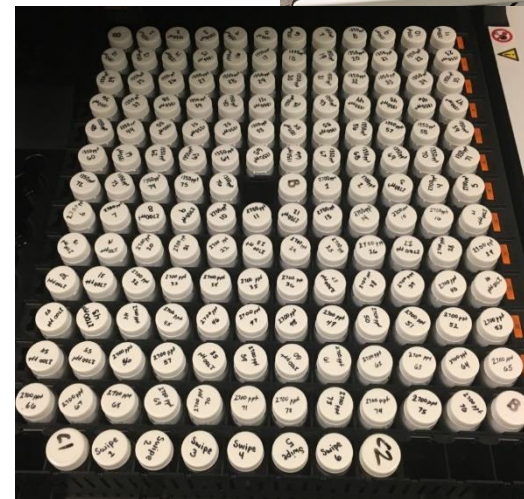
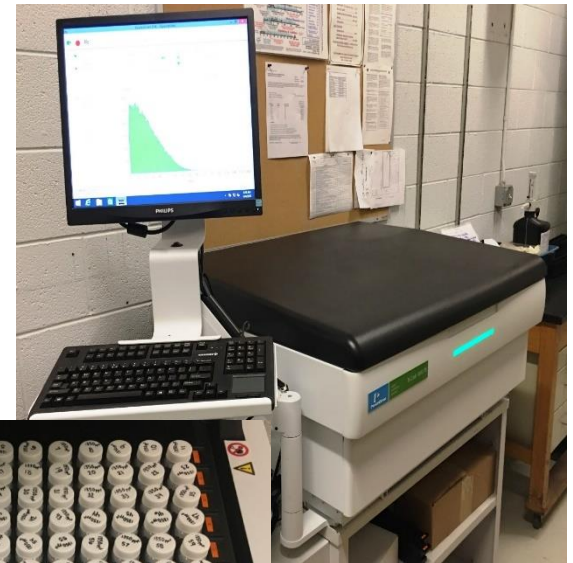


# Removal of NDMA from Groundwater at White Sands Test Facility



# $^{14}\text{C}$ Labeled NDMA Method

- $^{14}\text{C}$  is a  $\beta$  emitter
  - Enables liquid scintillation counting
  - Detection limit is ~5 ppt
  - Relatively safe
- Method development
- Adsorption isotherms
- Adsorption kinetics



# Hybrid Poplar, Excelsior & Biochar

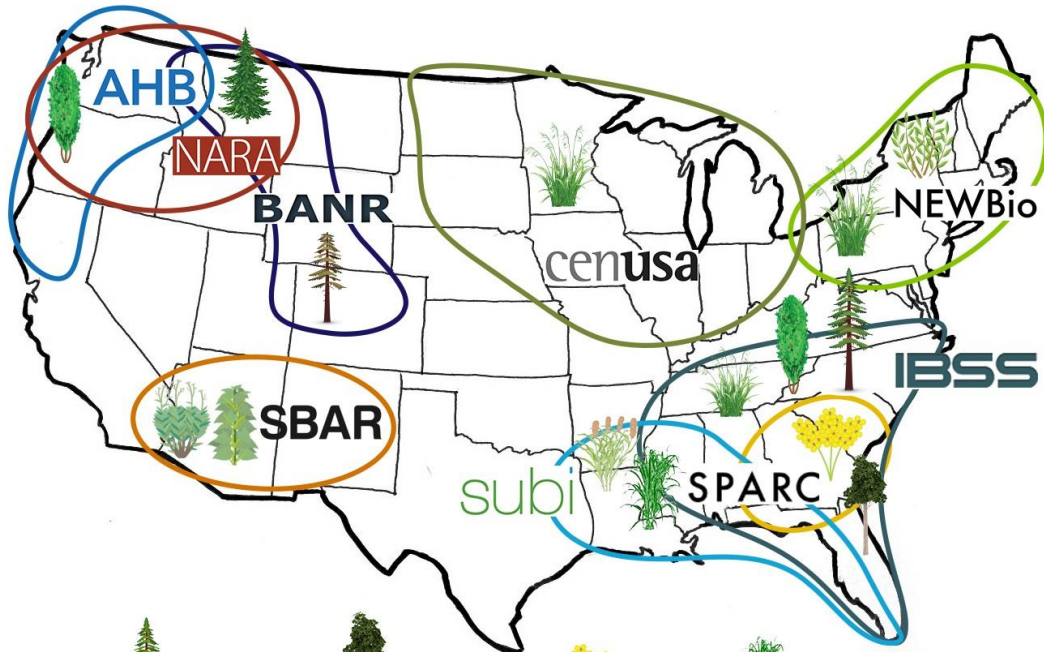














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- |   |  |  |  |
|---|--|--|--|
|  Pine                |  Eucalyptus   |  Carinata |  Sugar Cane/Energy Cane |
|  Forest Residues     |  Shrub Willow |  Guar     |  Perennial Grasses      |
|  Beetle-killed Pine |  Poplar      |  Guayule |  Sorghum               |



**SUSTAINABLE BIOECONOMY**  
 ——— FOR ARID REGIONS ———



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# USDA NIFA Coordinated Agricultural Project

2017-2022, \$15M



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# Guayule

Products: Rubber, Resin, Bagasse → Tires, Chemicals, Jet Fuel



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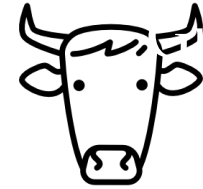
  
**BRIDGESTONE**

# Guar

Seeds, Bagasse → Guar Gum, Animal Feed, Jet Fuel



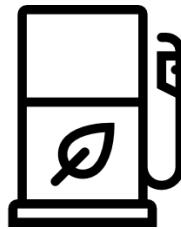
\$3.30 to \$26 kg<sup>-1</sup>



\$0.10 kg<sup>-1</sup>



Bagasse



\$3 gal<sup>-1</sup>



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GR  
GUAR RESOURCES

# Educational Projects



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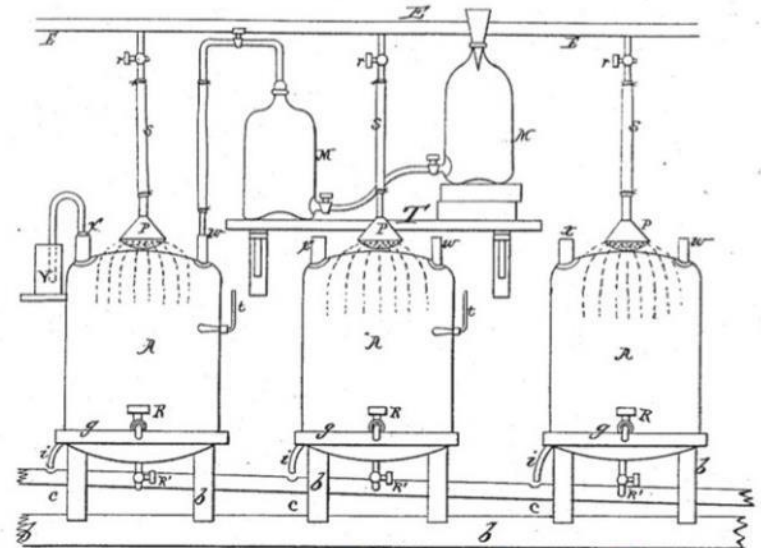
National Needs  
Fellowships: MS and  
PhD Training in  
Chemical Engineering  
and Soil Science

# NMS Brew

No. 135,245.

Patented Jan. 28, 1873.

*Fig. 1.*



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