JENIKE®
& JOHANSON
SCIENCE ENGINEERING DESIGN

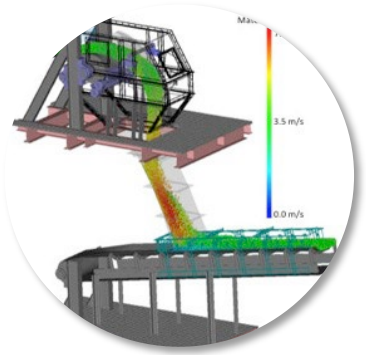
Feeding Challenges in High Pressure Gasification of Advanced Biofuels

Dr. Jayant Khambekar

Senior Consultant

About Us: Jenike

- We are a technology company with expertise in bulk solids flow.
- We provide engineered solutions to various challenging bulk solids handling applications, using a science-based approach.
- Founded by Dr. Jenike nearly 60 years ago.



Renewable Biofuels Industry – Current Status

- Exciting time - lots of activity, IRA
  - SAF production targets
    - 3 billion gallons per year by 2030
    - 35 billion gallons per year by 2050
  - Renewable biofuels production targets
  - Net Zero emissions targets by 2050
- Current biofuels production rates are very low compared to these targets
  - In 2022, airlines consumed ~17.5 billion gallons jet fuel
  - whereas only ~16 million gallons SAF produced (~ 0.1 %)

- Key question: How are we going to get there ?

Renewable Biofuels Industry – Current Status

Source: https://ethanol.nebraska.gov/ag-in-the-classroom/

Source: https://www.nationalgeographic.com/animals/article/animal-fat-tyson-renewable-fuel

LIMITED SUPPLY !

Renewable Biofuels Industry – Current Status

Source: https://www.energy.gov/sites/default/files/2015/04/f22/demonstration_market_transformation_han_3414.pdf

DIFFICULT to HANDLE !

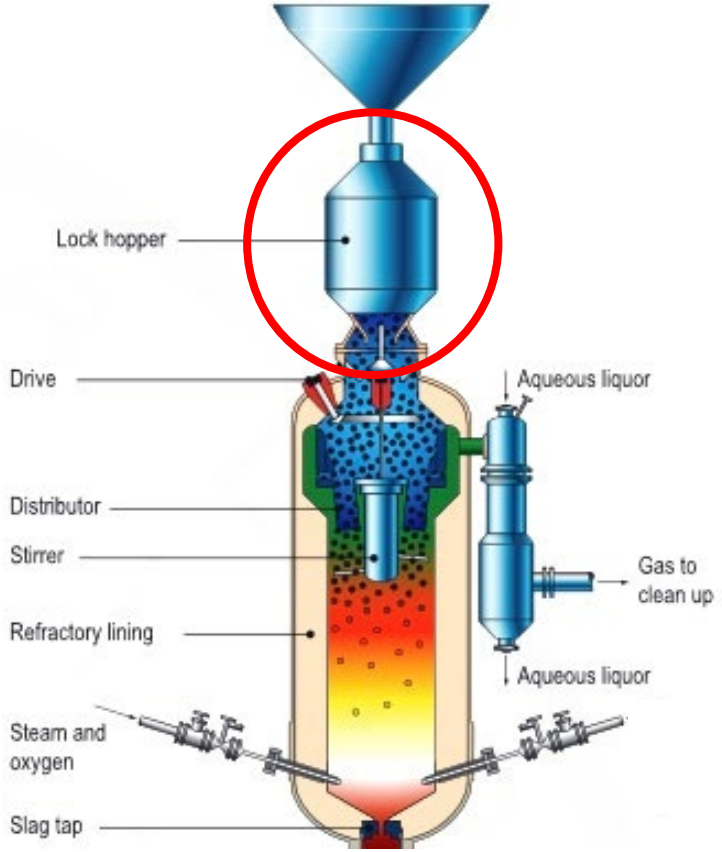
Renewable Biofuels Industry – Current Status

- Key question: How are we going to get there ?
- Use agricultural residue, forest residue, MSW as feedstock
  - Must have RELIABLE handling system

Renewable Biofuels Industry – Current Status

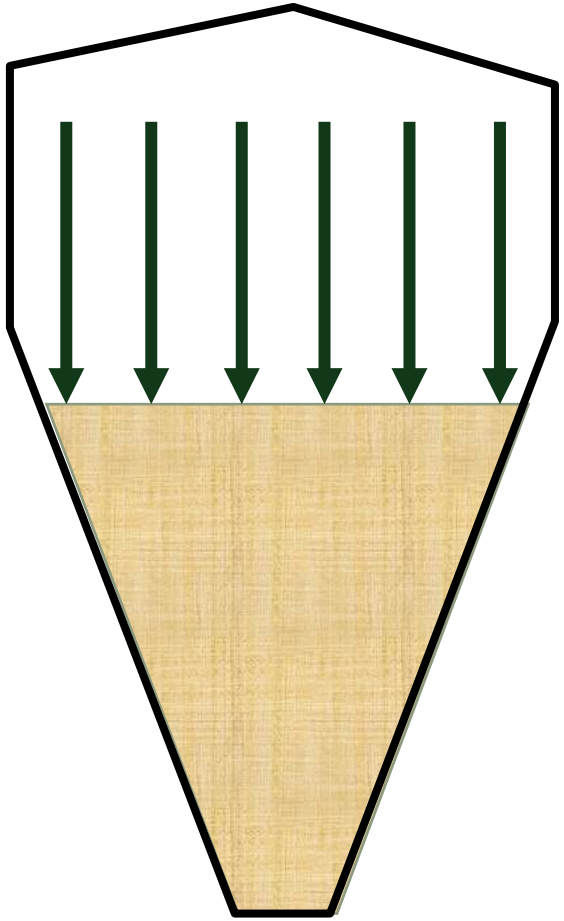
- Not just handle, but must RELIABLY feed into high-pressure reactors
- Many technologies for making biofuels use high-pressure reactors
  - Gasification
  - Pyrolysis
  - Enzymatic hydrolysis
- Handling biomass and MSW is already challenging, but feeding biomass into high-pressure environments is a level above in terms of challenges.
- Many examples of struggles at commercial-scale biofuels plants using corn stover, wheat straw, forest residue and MSW.

Presently Used Technologies and Issues



Source: https://netl.doe.gov/research/coal/energy-systems/gasification/gasifipedia/bgl

Presently Used Technologies and Issues

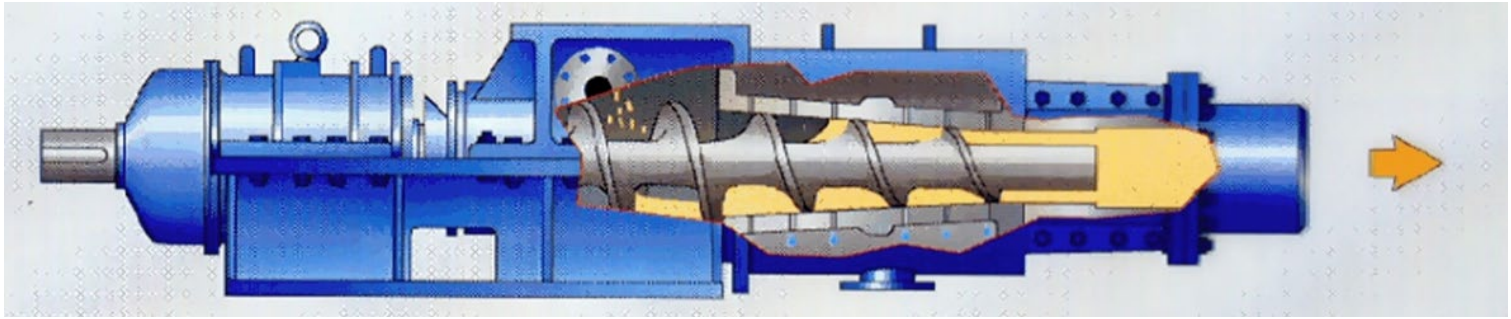


Presently Used Technologies and Issues

Arching

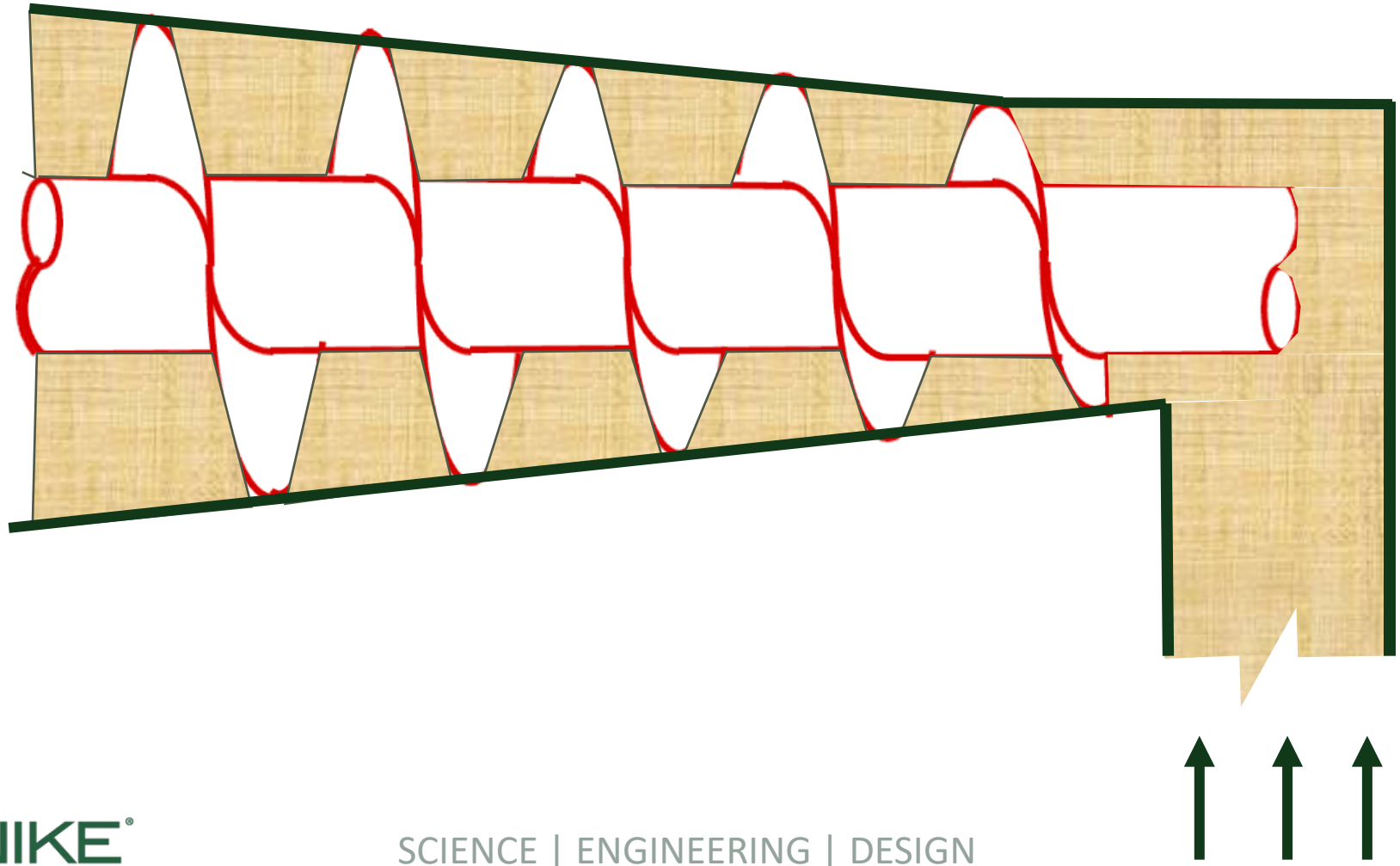
Ratholing

Presently Used Technologies and Issues

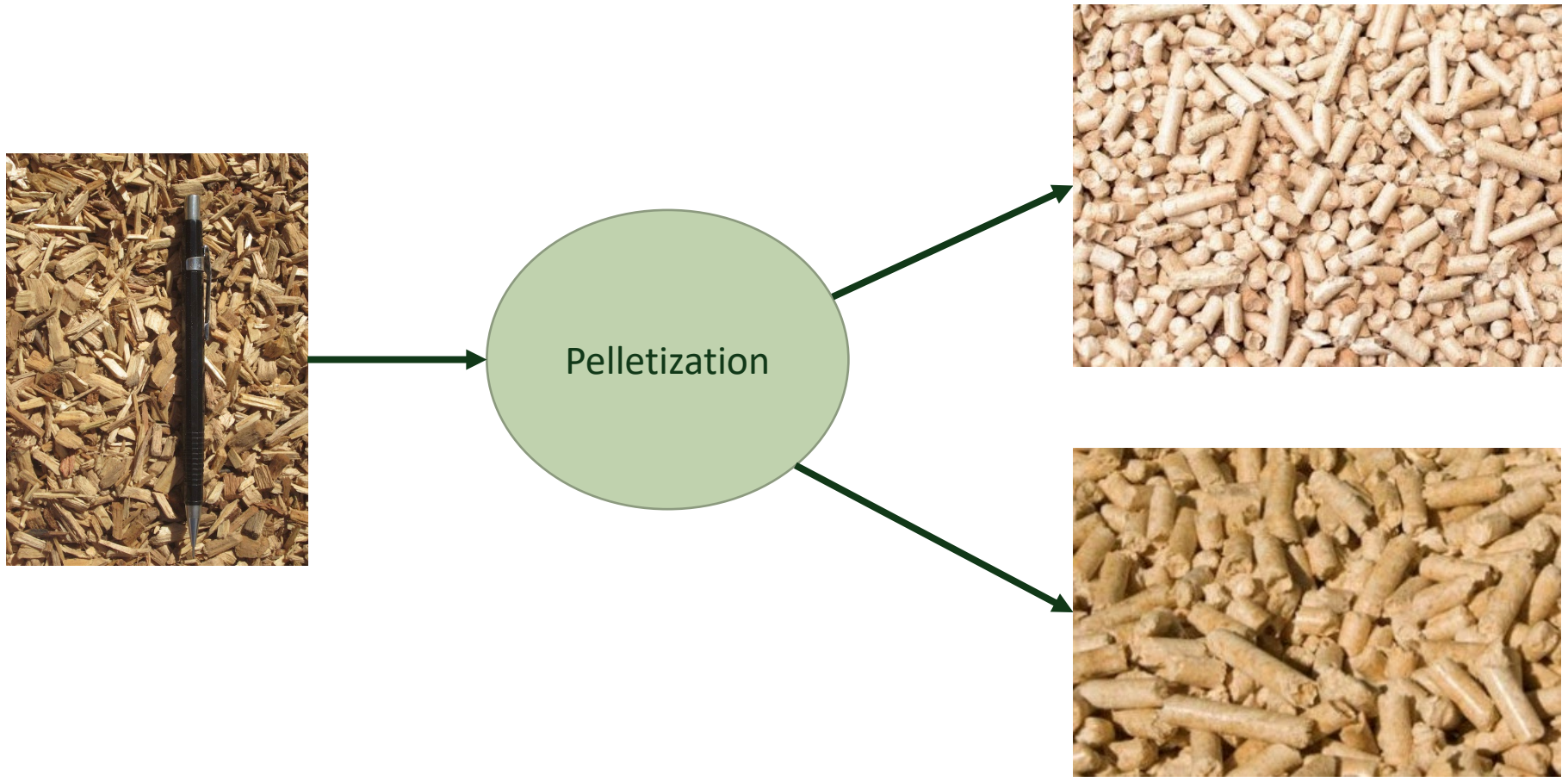


Source: Final report, DOE Cooperative Agreement No. DE-FC26-00NT40904, Feb 2003

Presently Used Technologies and Issues



Solution: Pre-treatment Needed



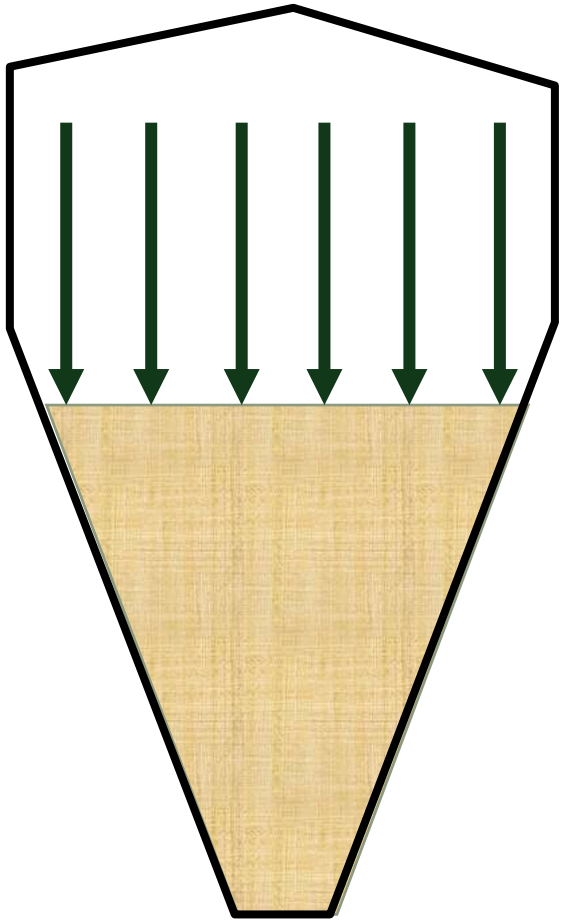
OPEX !

Pre-treatment Needed

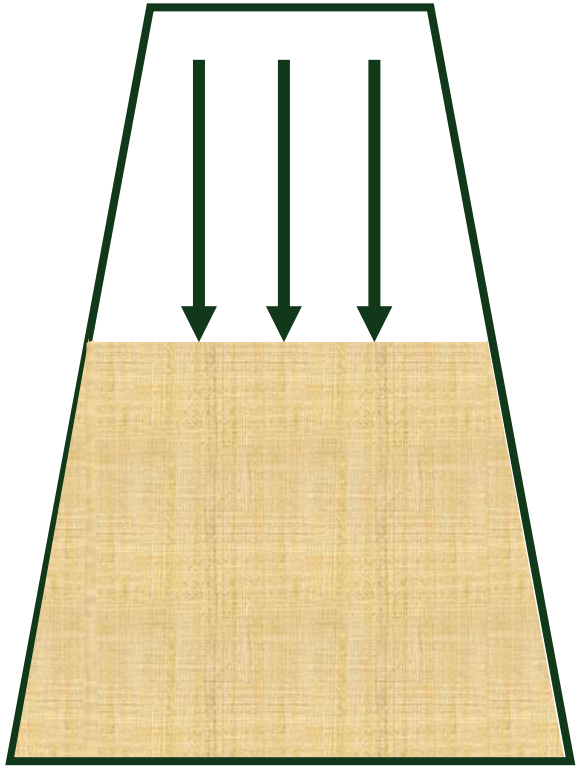
Size-reduction

OPEX !

Jen-Zero™ Technology for Feeding High Pressure Biofuels Reactor



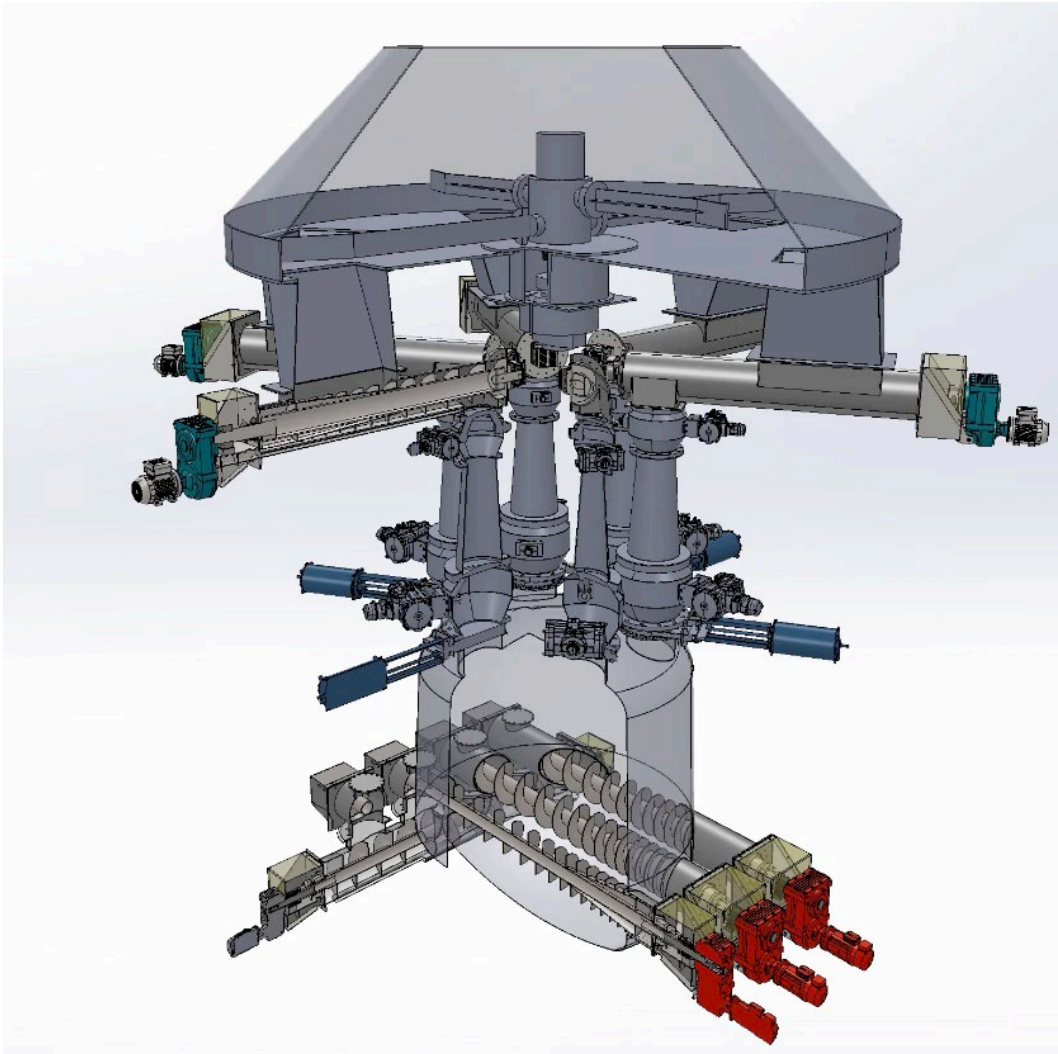
Vs.



Doing it on a commercial scale !

Patent-pending technology

Jen-Zero™ for Feeding High Pressure Reactors



Patent-pending technology

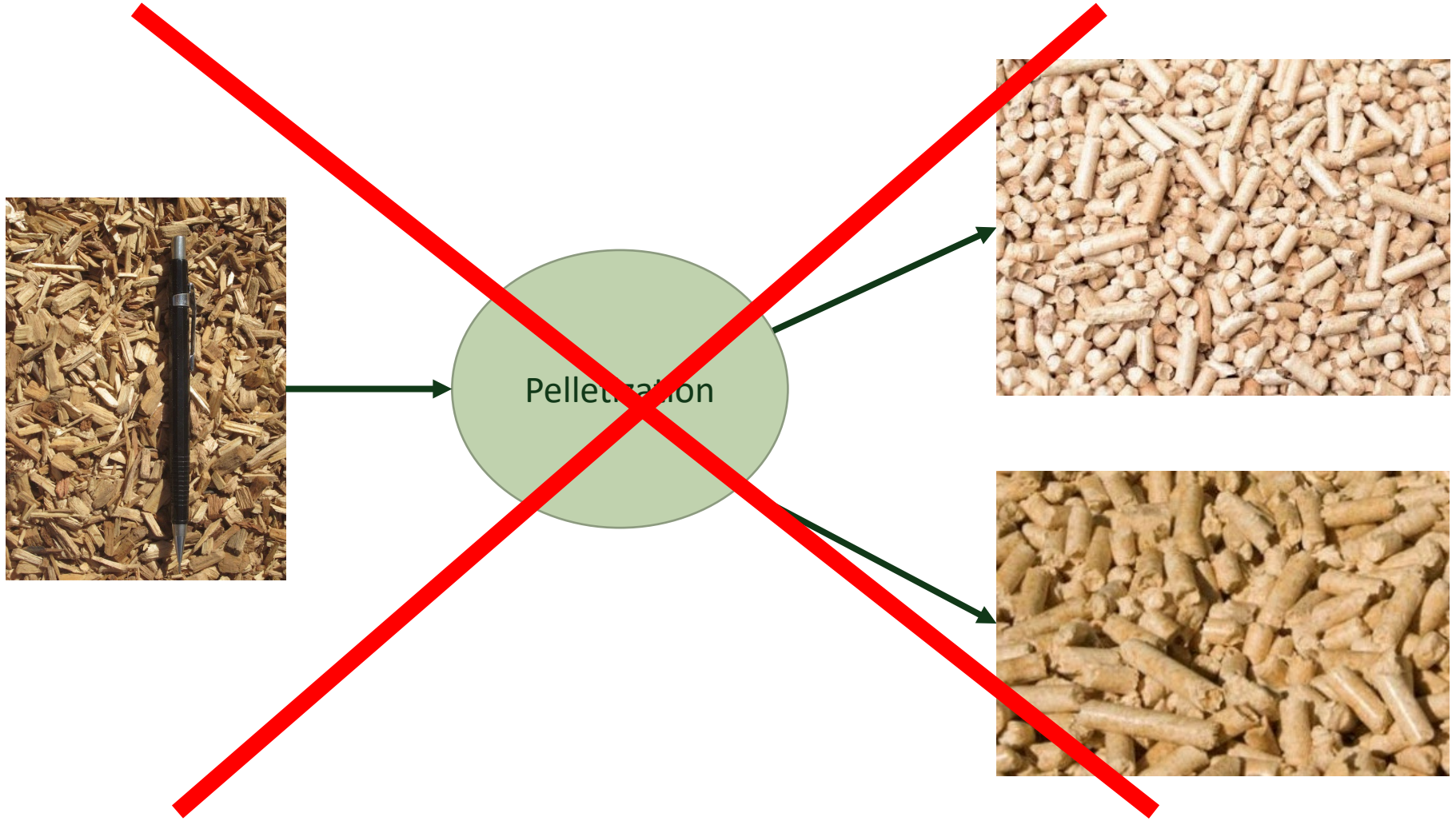
Animation video

Advantages of Jen-Zero™

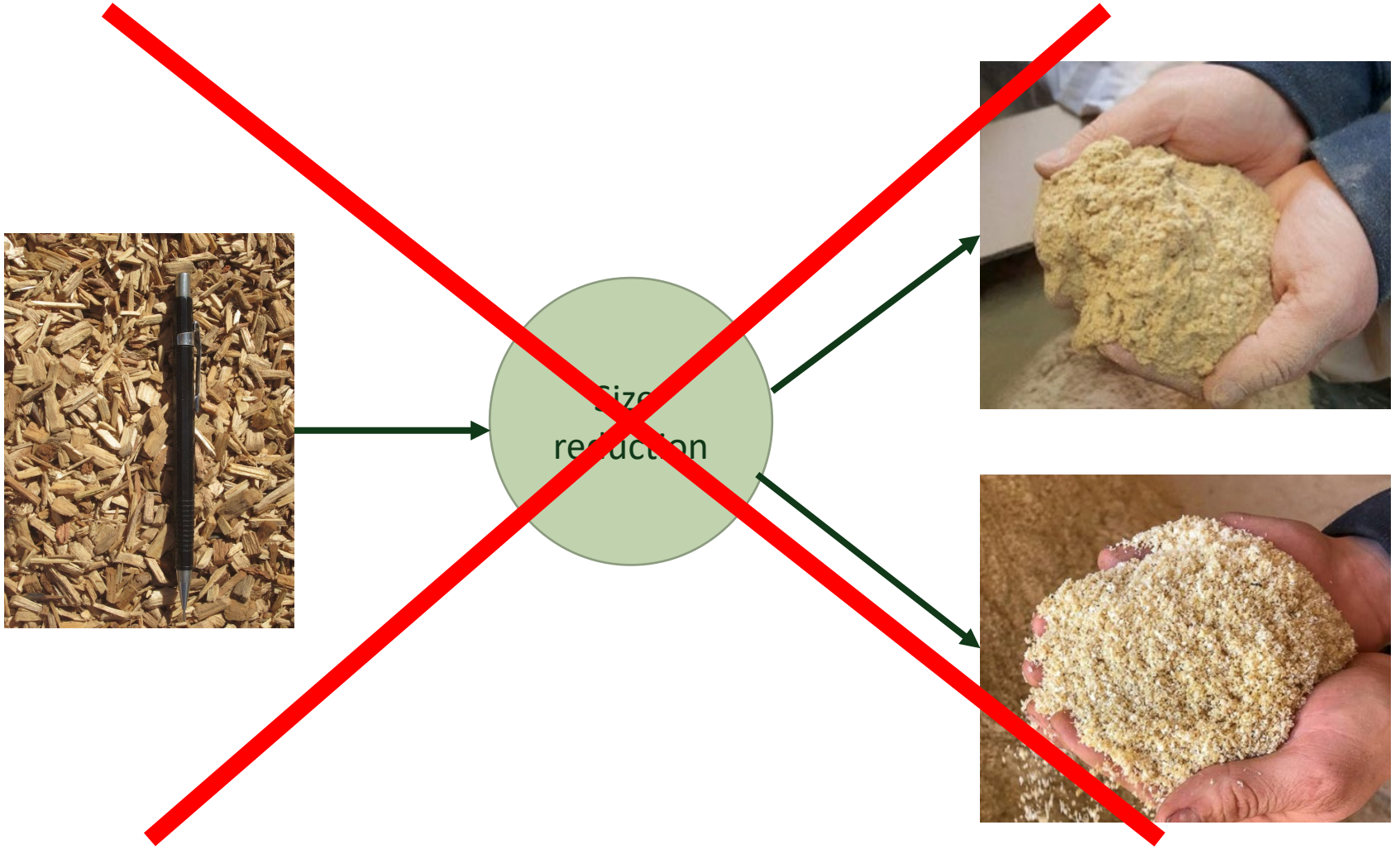
Arching

Ratholing

Jen-Zero™: No Pre-treatment Needed



Jen-Zero™: No Pre-treatment Needed



Conclusions

- Feeding biomass and MSW feedstocks to a high-pressure biofuels reactor is one of the most challenging areas in achieving reliability and consistency in advanced biofuels production.
- Existing technologies such as conventional lock hoppers and plug screw feeders have limitations in terms of type of feedstock and particle size required for reliable operation.
- This increases OPEX for these existing technologies.
- Jenike has launched a new patent-pending technology, Jen-Zero™, specifically to address these challenges to achieve reliable flow and reduce OPEX.

Questions ??

STOP BY OUR BOOTH