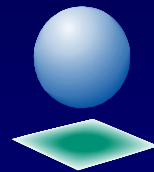


Biosolids Processing/ Product Technologies

SCAP Workshop

September 28, 2004

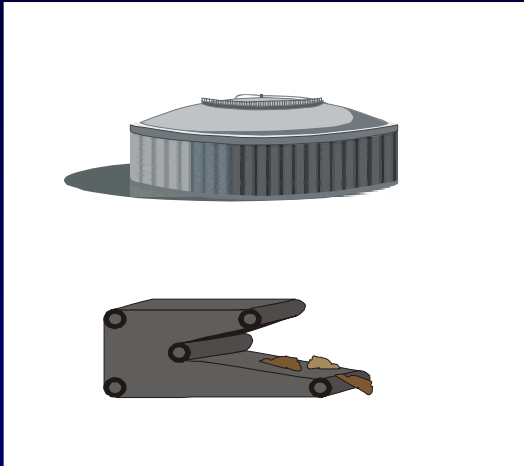
Fred Soroushian



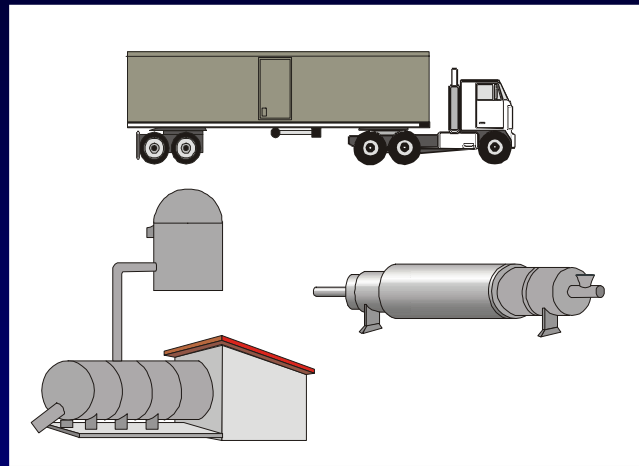
CH2MHILL



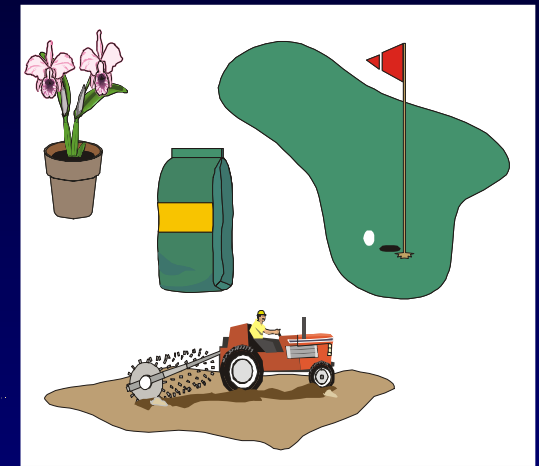
Elements of Biosolids Management Program



Biosolids Treatment



**Biosolids Processing/
Product Technologies**



Markets

Product Markets and Product Technologies Integration

	Composting	Heat Drying	Organo-Mineral Fertilizer	Vitrification	Pyrolysis	Combustion
Retail Outlets	✓	✓	✓			
Nurseries & Ornamentals	✓	✓	✓			
Landscaping	✓	✓	✓			
Energy Production		✓			✓	✓
Construction Materials		✓		✓		



Product Manufacturing Technologies



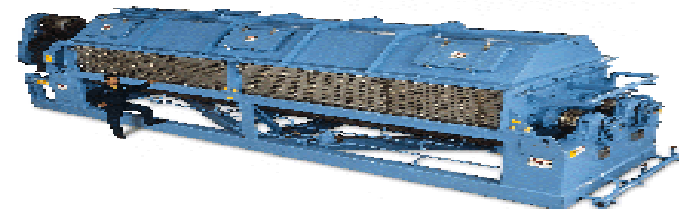
**Products for
Cropping Markets**



**Products for
Energy Markets**



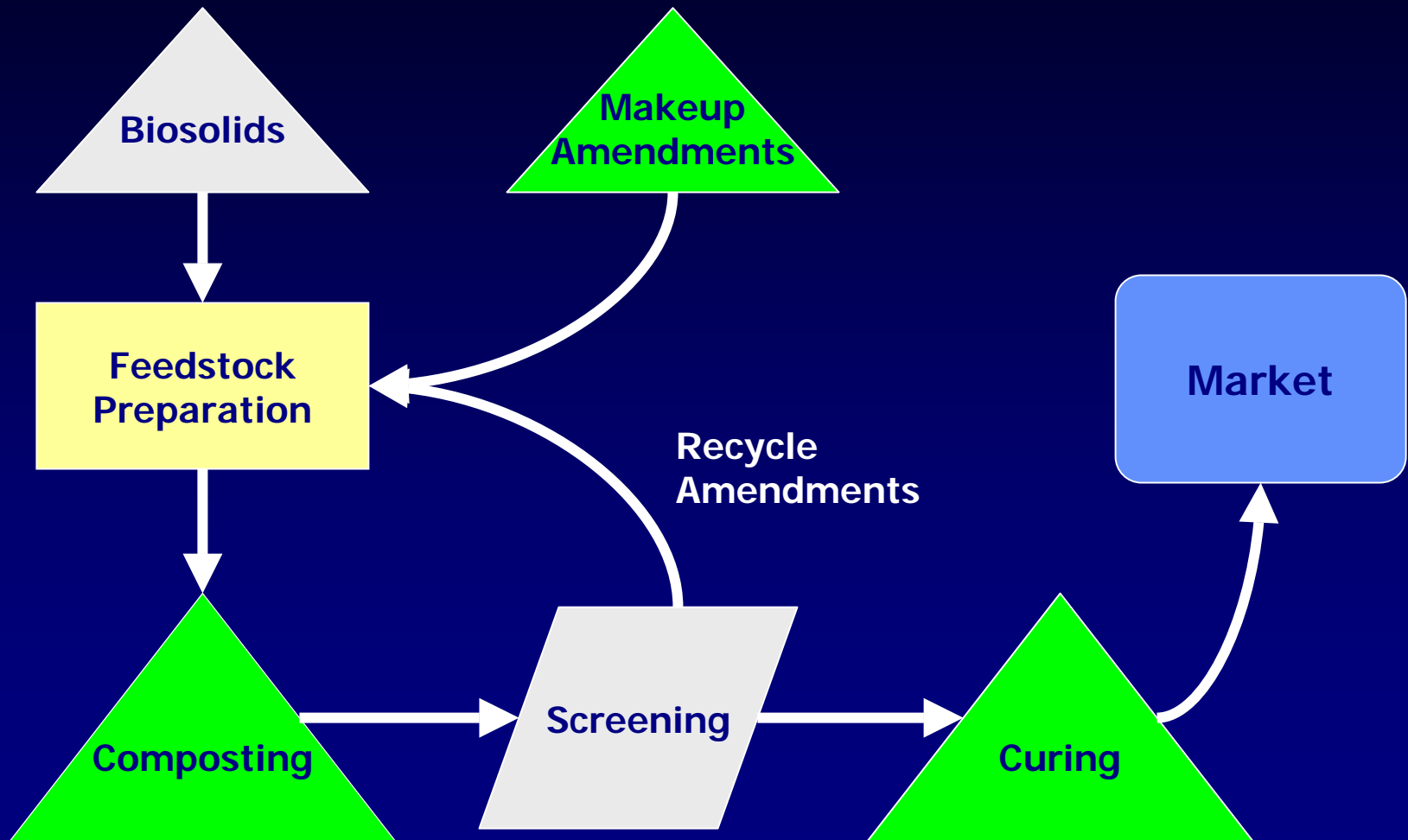
**Products for
Construction Markets**



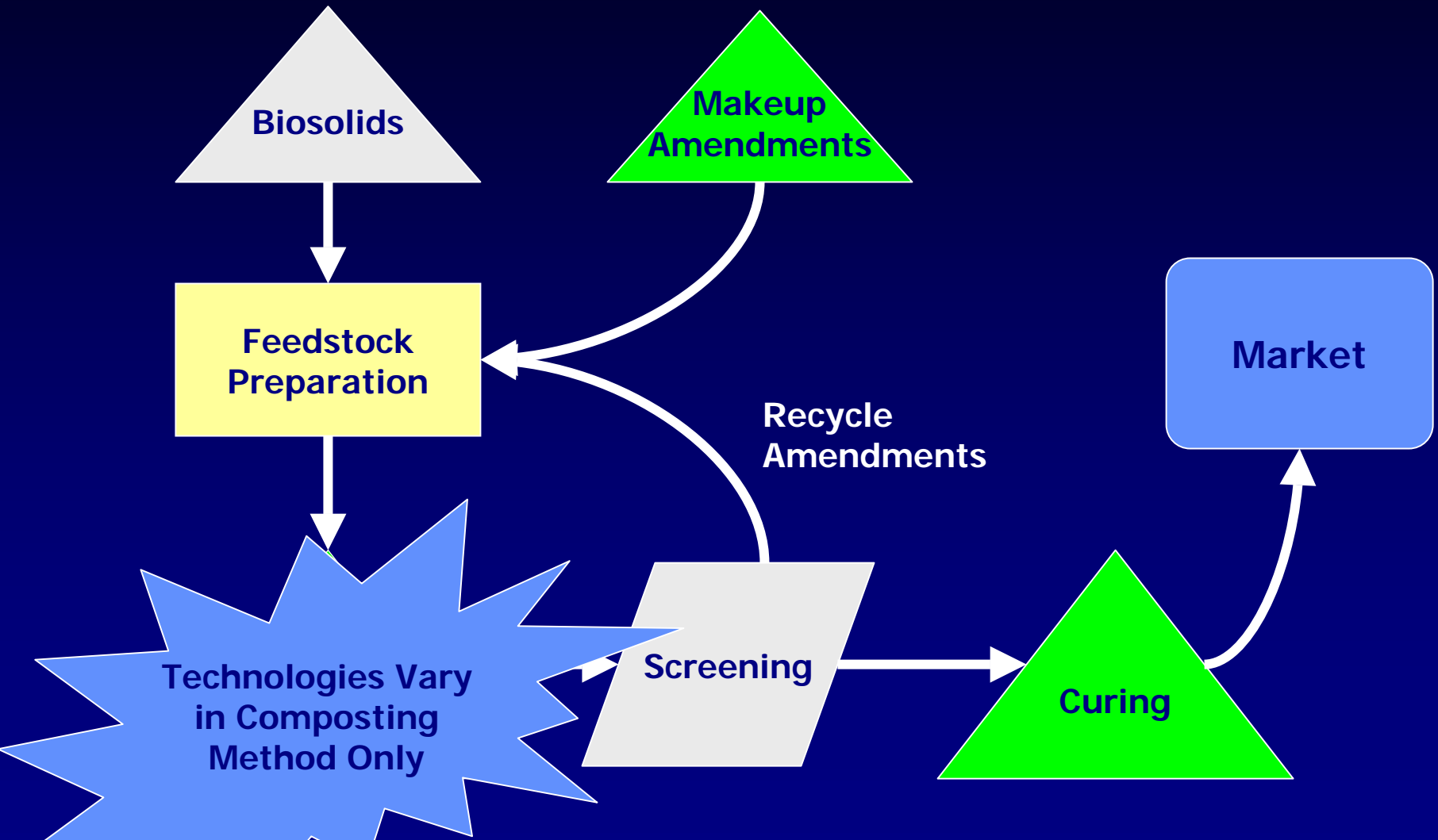
Product Technologies to serve Cropping markets

- ◆ Class A Anaerobic Digestion
- ◆ Solar Drying
- ◆ Composting
- ◆ Chemical Stabilization
- ◆ Heat Drying (Pellets)
- ◆ Organo-Mineral Fertilizer Production
- ◆ Bactericides

Composting Process



Composting Technologies



Composting Technologies

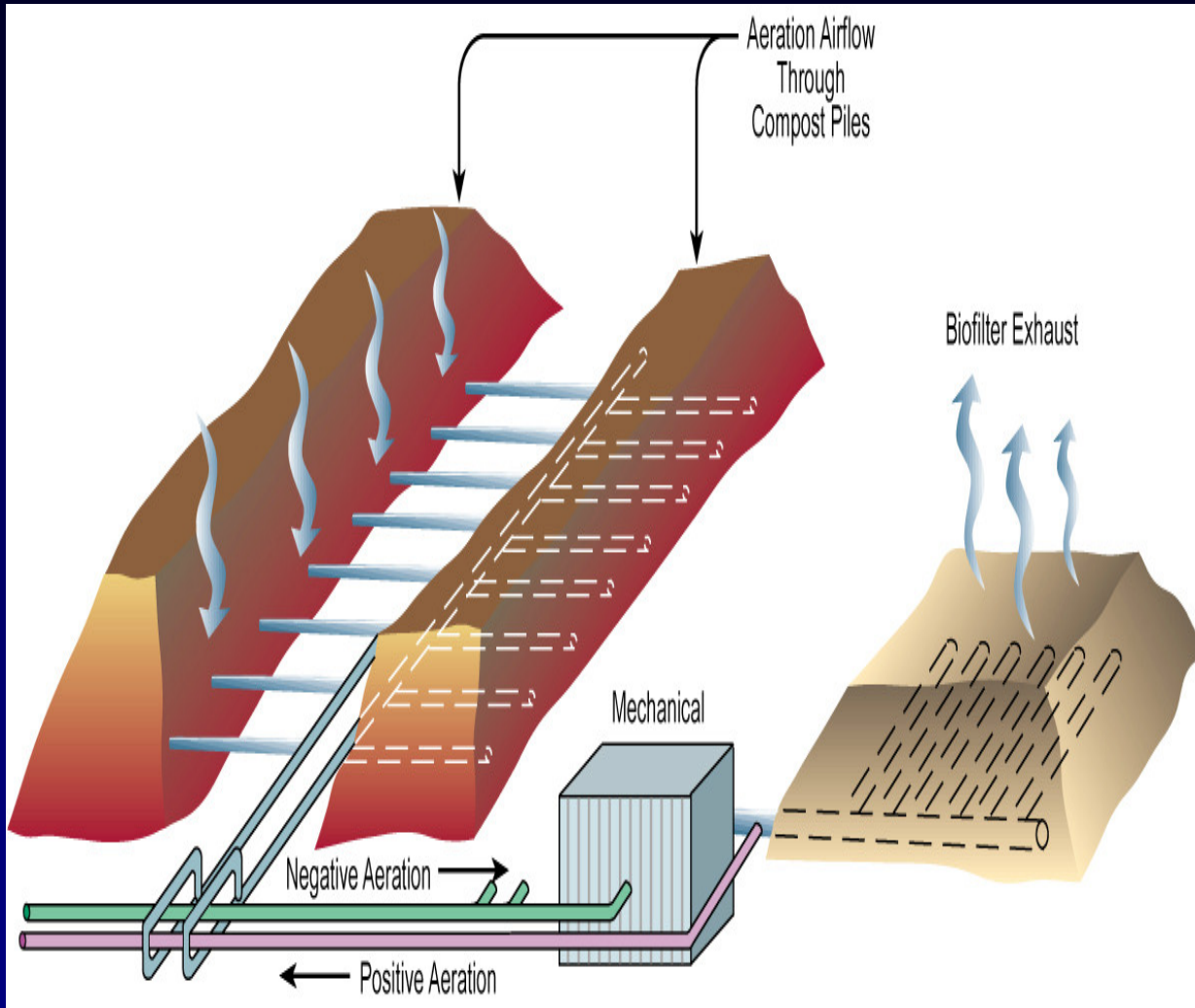
- ◆ Windrow
- ◆ Aerated Static Pile
- ◆ In-Vessel (IPS, Longwood, HotRot, American Biotech)
- ◆ Vermiculture



Open-air Windrow Composting



Aerated Static Pile Composting



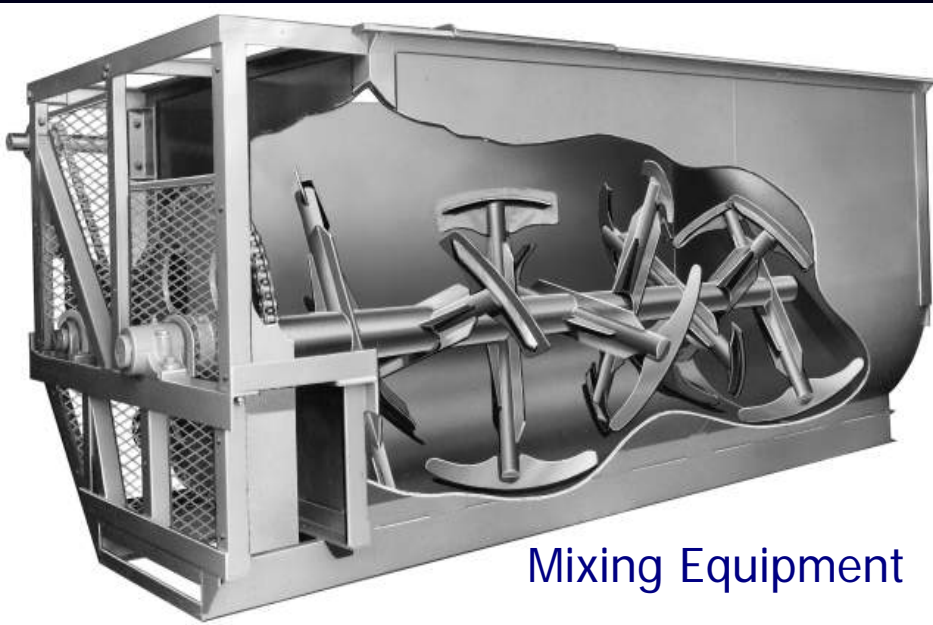
Agitated Bin In-vessel Composting



HotRot In-Vessel Composting



Mixing, Screening, Curing & Storage



Mixing Equipment



Screening



Curing



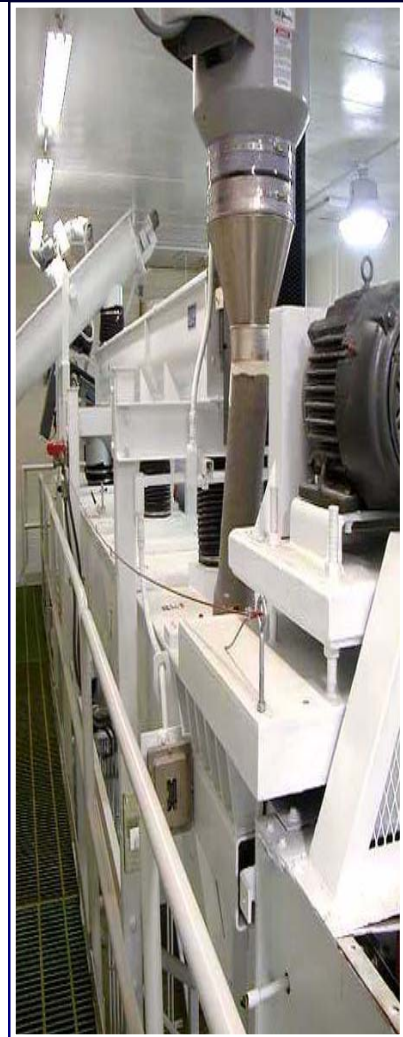
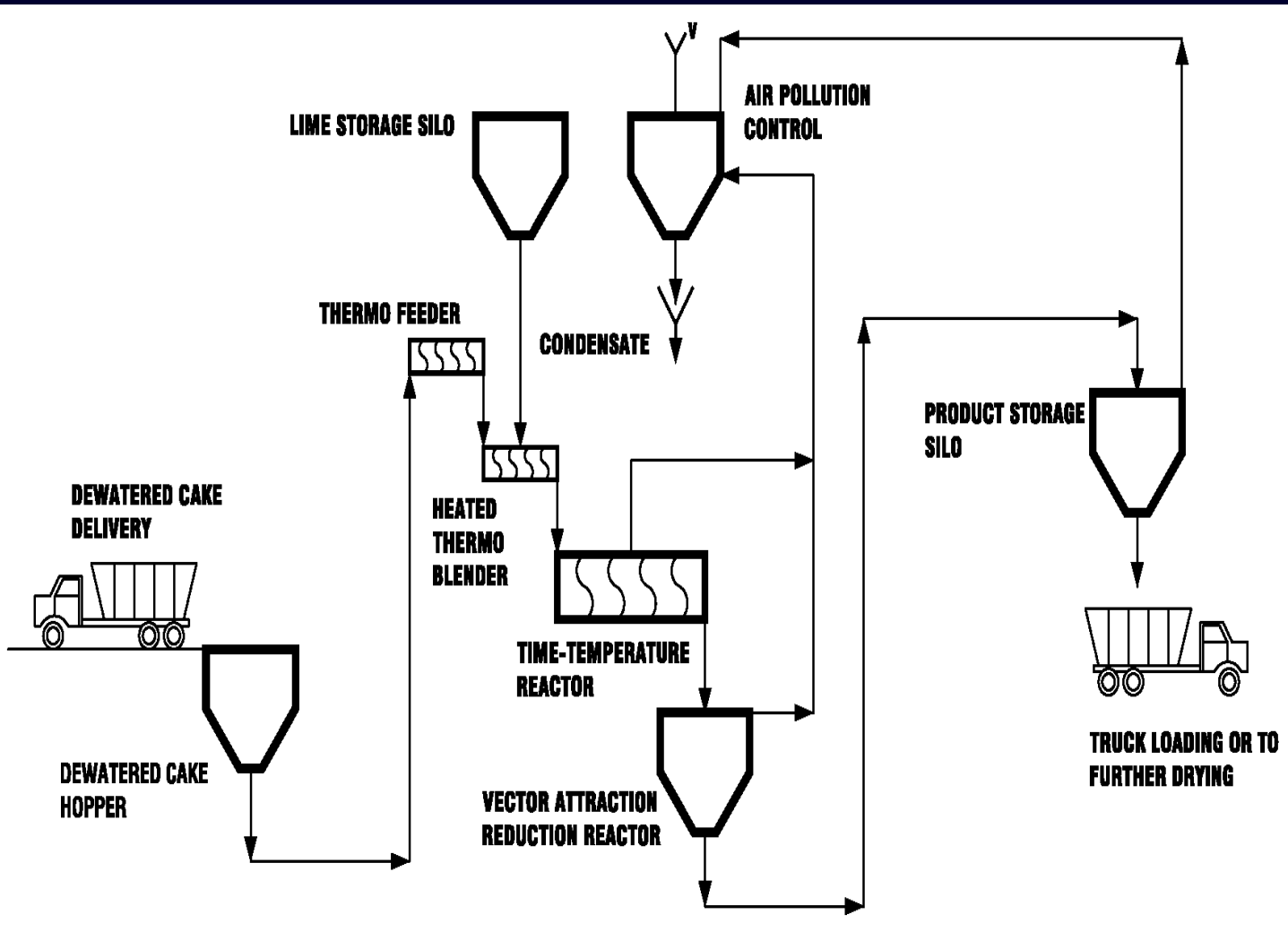
Storage

Chemical Stabilization

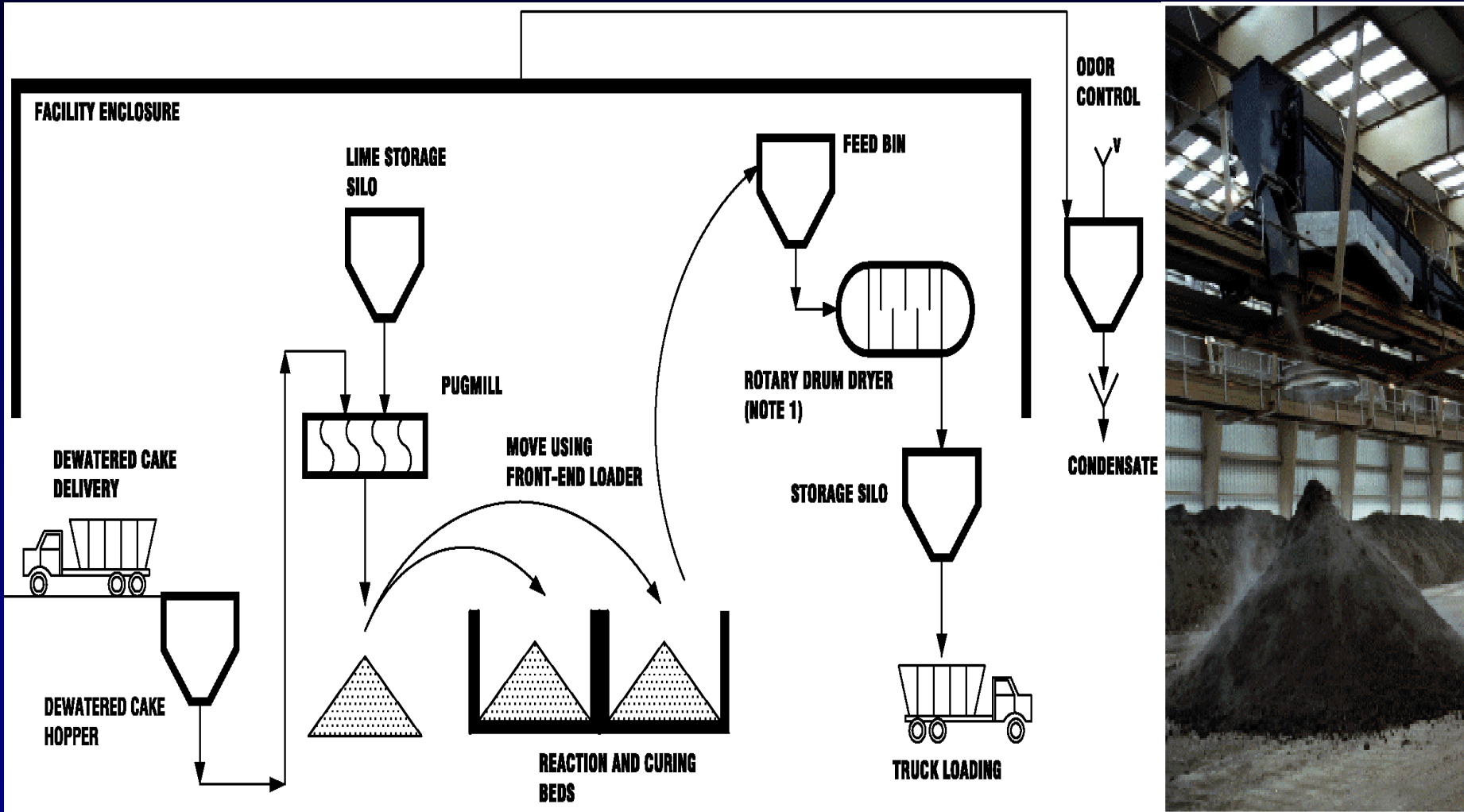
- ◆ Neat Alkali Stabilization (RDP, Bioaset)
- ◆ Fly Ash Stabilization (N-Viro)
- ◆ Neutralization



RDP Lime Stabilization Process



N-Viro Lime Stabilization Process



Lime Stabilization Processes



RDP Process



N-Viro Process

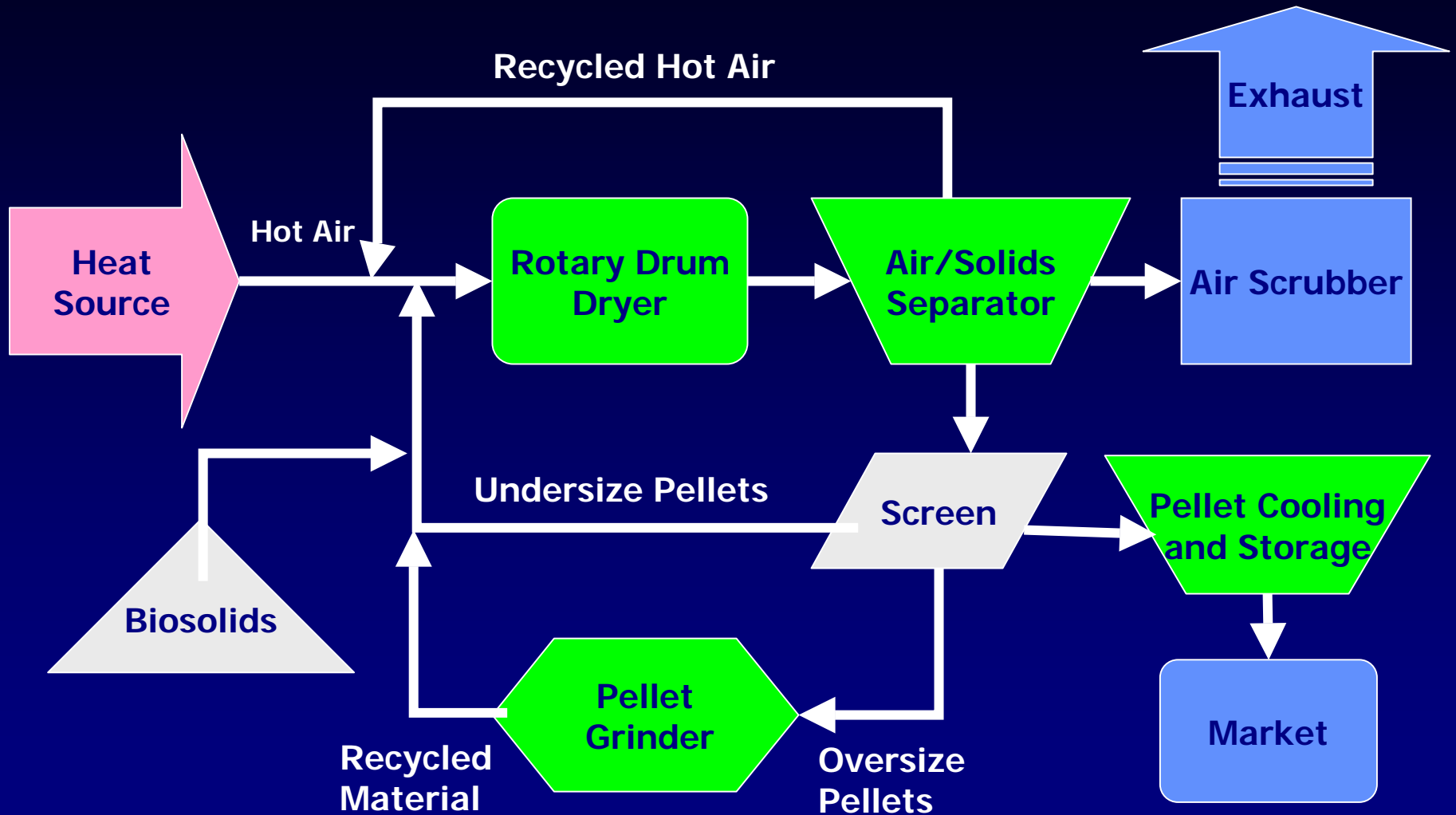


Heat Drying

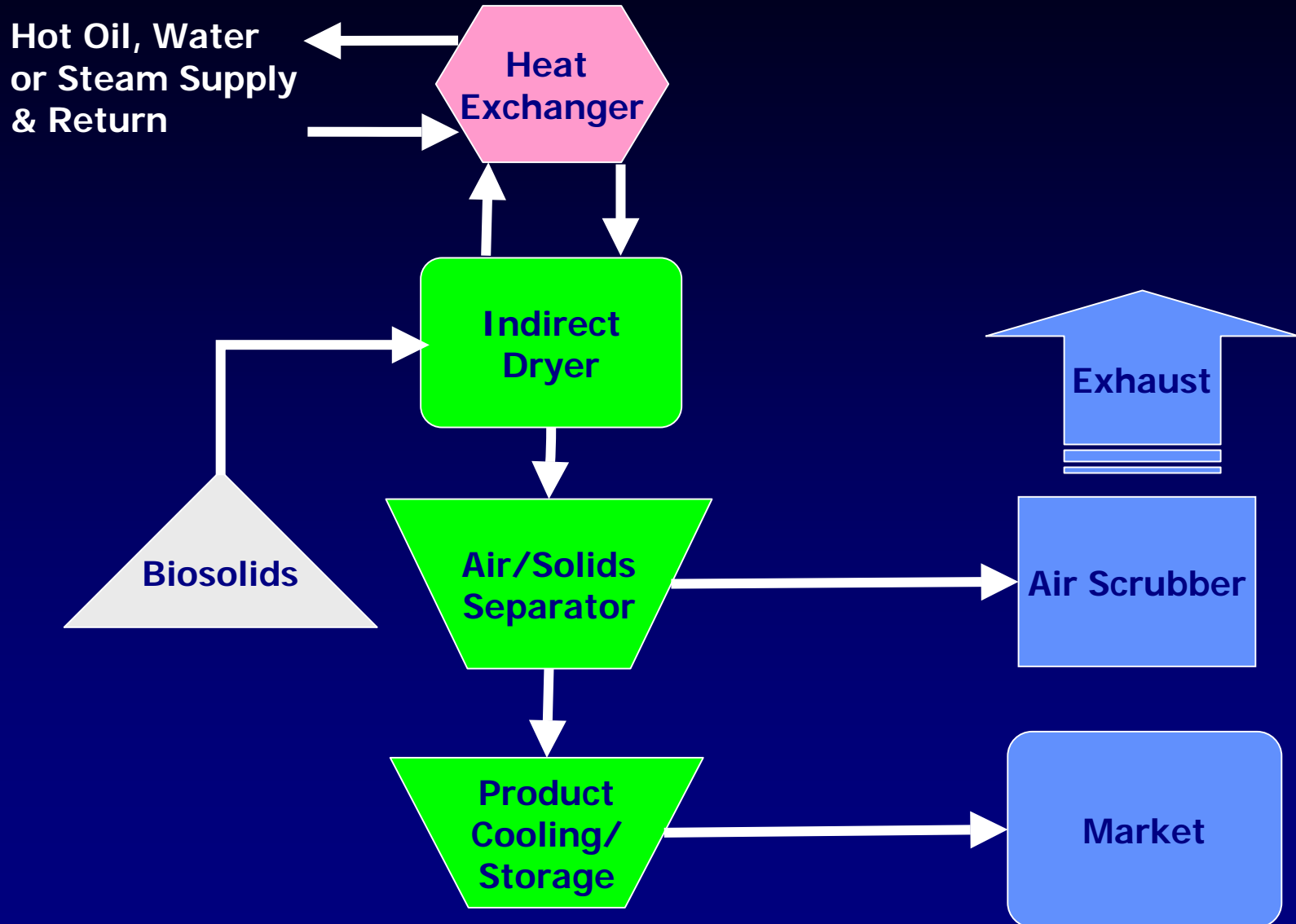
- ◆ Direct Drying (Rotary Drum, Belt, Flash & Fluidized Bed Dryers)
- ◆ Indirect Drying (Disk, Paddle, Multiple Heart, Rotary Drum & Fluidized Bed Dryers)



Direct Rotary Drum Dryer System



Indirect Dryer System



Rotary Drum Dryers



Belt and Paddle Dryers



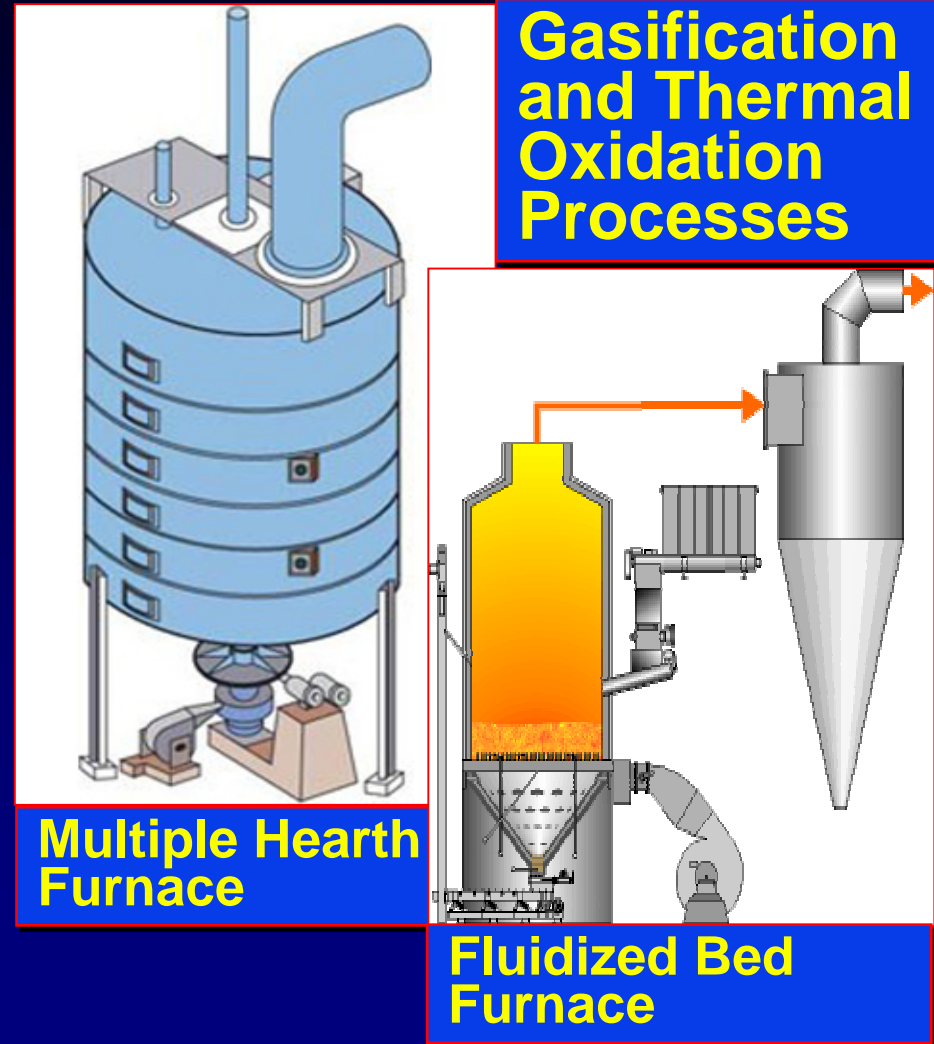
Belt Dryer



Paddle Dryer

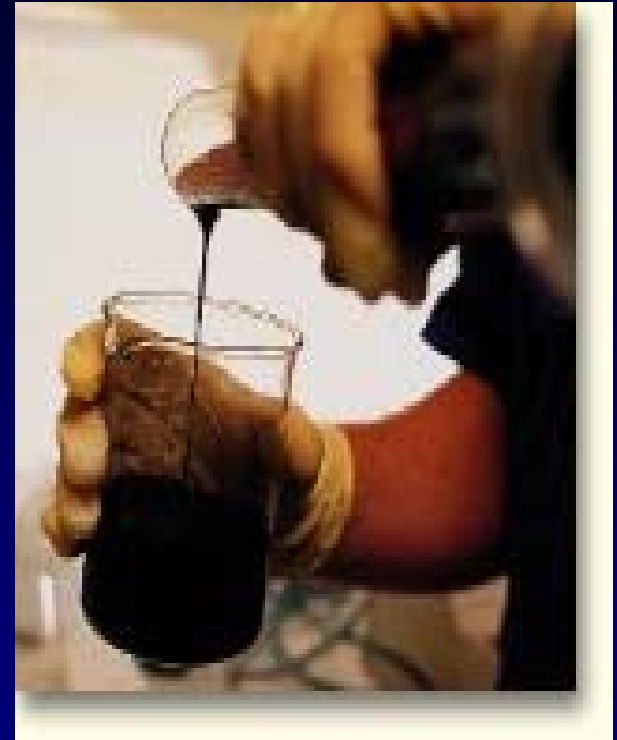
Product Technologies to Serve Energy Markets

- ◆ Heat Drying
- ◆ Pyrolysis
- ◆ Gasification/Starved Air Combustion
- ◆ Thermal Oxidation (Combustion/Co-combustion)
- ◆ Super Critical Water Oxidation
- ◆ Deep-well Energy Recovery

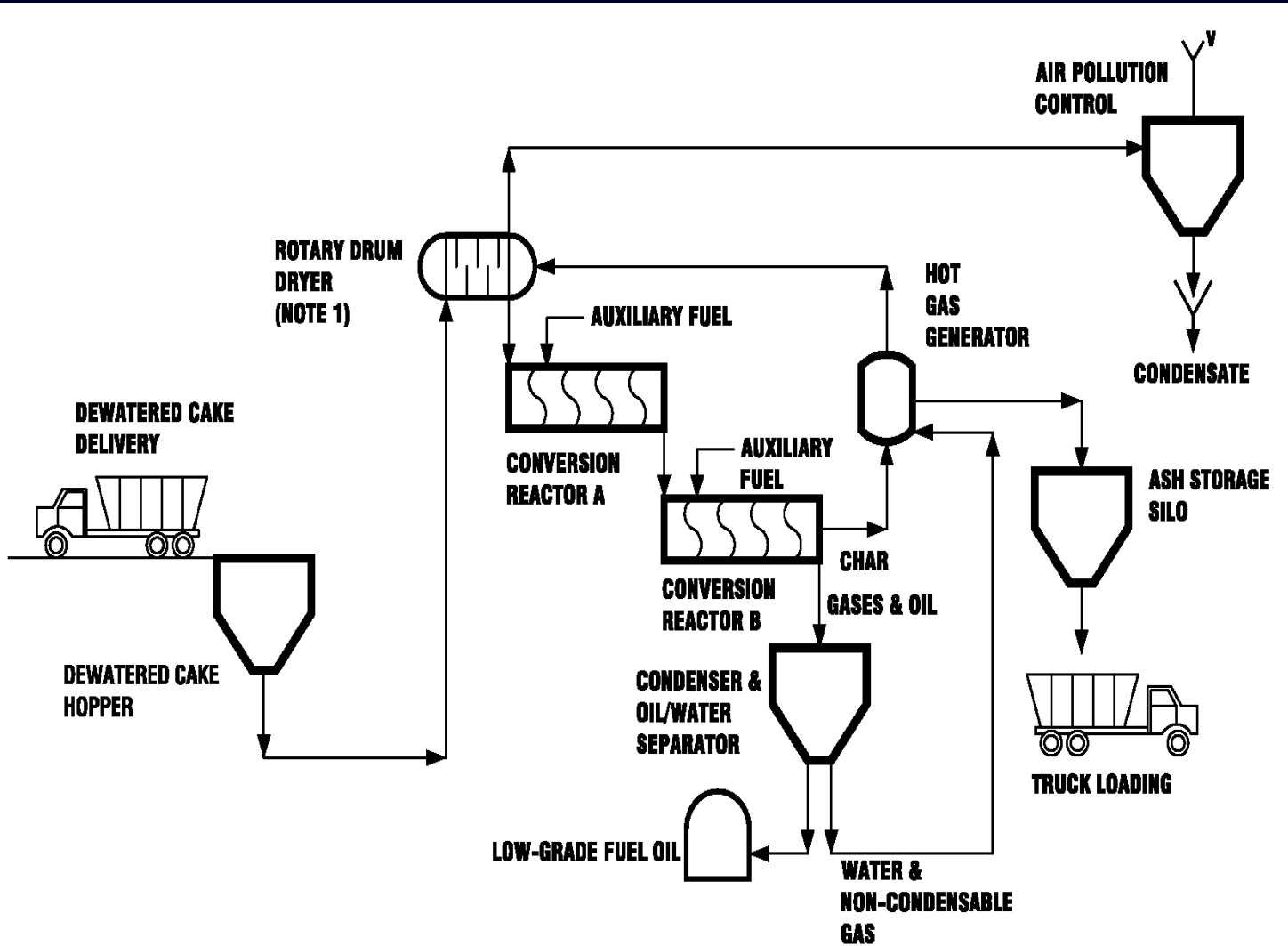


Pyrolysis

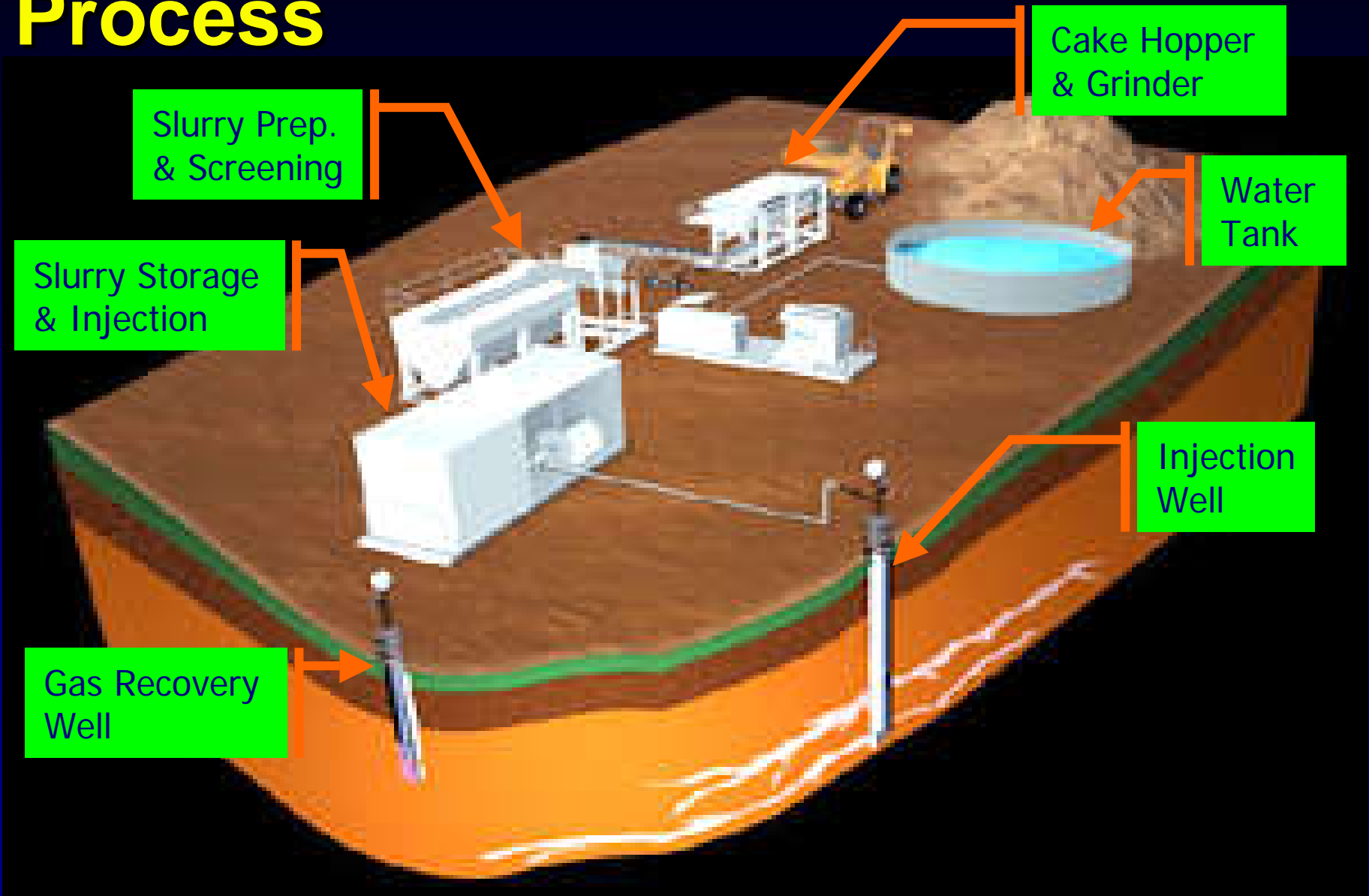
- ◆ No Oxygen
- ◆ Low-Temperature (<600 °F)- EnerTech
- ◆ Mid-Temperature (800 to 1,000 °F) - Enersludge
- ◆ High-Temperature (1,200 to 1,800 °F) - IES
- ◆ Product - Char, Low Grade Oil and Combustible Gases



EnerSludge Process



Deep-Well Energy Recovery Process

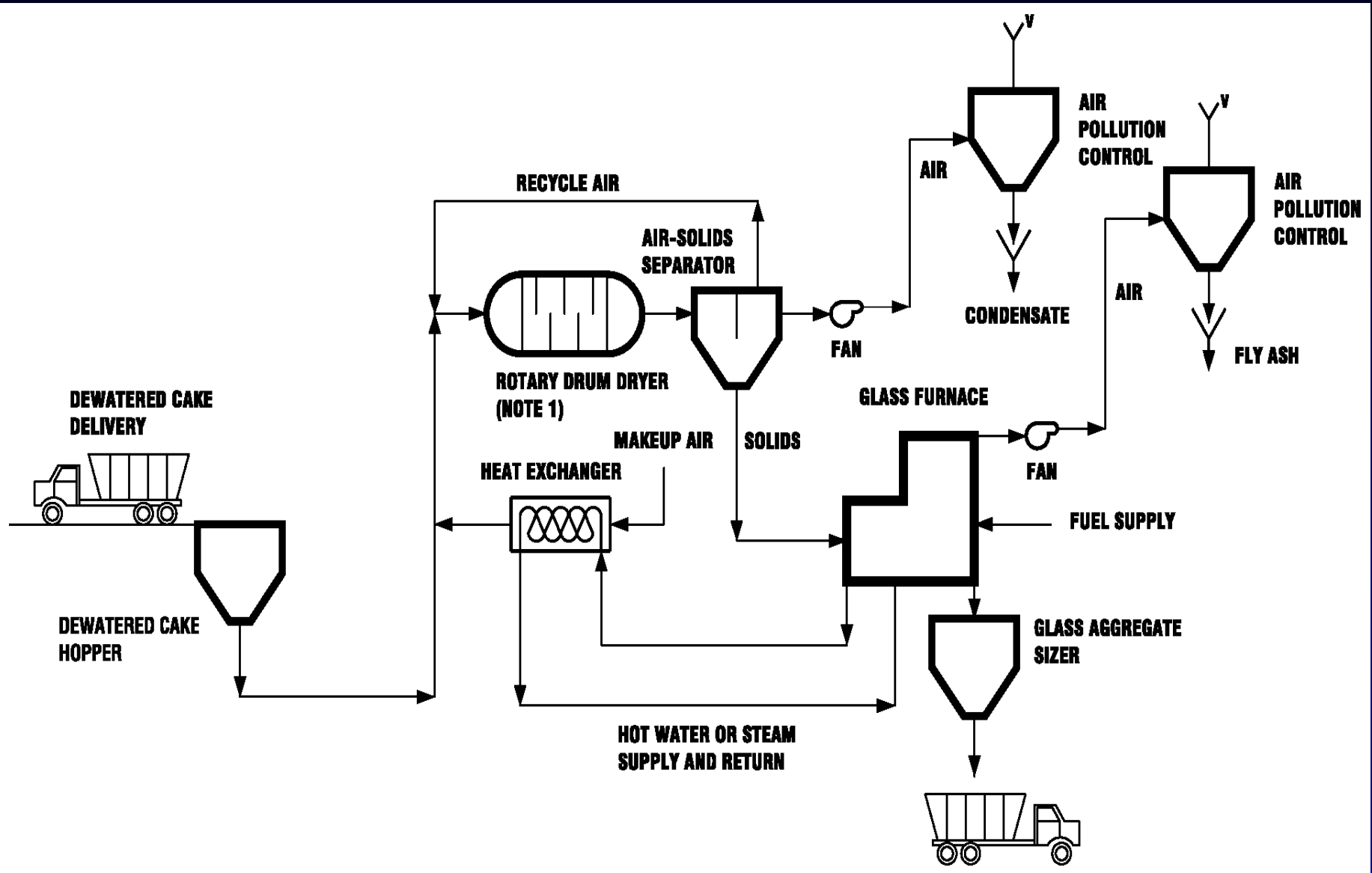


Product Technologies to Serve Construction Markets

- ◆ Vitrification
- ◆ Drying with Heated Soils
- ◆ Mixing Class A Cake with Inert Material



Vitrification Process



Minergy Vitrification



**Minergy's GlassPack Plant
Winneconne, Wisconsin**

Long-Term Sustainability = Diversification

- ✓ Multiple Technologies
- ✓ Multiple Sites
- ✓ Multiple Products / Markets
- ✓ Failsafe Backup Options



History of Biosolids Management

1980's



1990's



2000's

