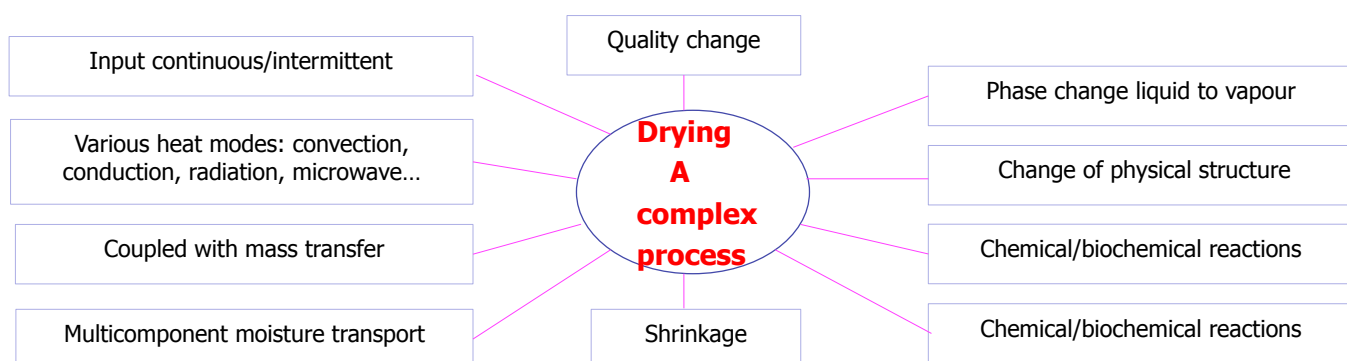


# Gasification of human waste via a microwave plasma discharge

## Human waste pretreatment-drying selection

### Introduction

- "Drying" of feces is an integral part of the R&D project aimed at thermal decomposing of human wastes through gasification of dried wastes in microwave-generated plasma.
- Depending on the origins, the wastes may contain 80-90% w.b. (wet basis) of liquid (water + possibly some urine), which need to be dried to around 20 w.b. (wet basis) before they can be used as fuel for plasma gasification.
- Many types of dryers are commercially available, and the selection of appropriate dryer require expertise knowledge and experience.



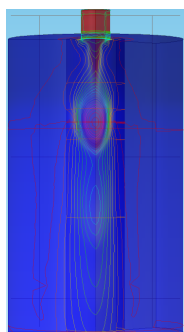
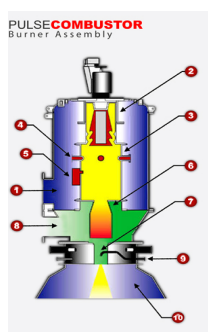
### Typical checklist for selection of dryers

<b>Physical form of feed</b>	Sludge, liquid, pasty, suspension...
<b>Average throughput</b>	kg/h (wet/dry), continuous or kg/batch
<b>Inlet/outlet moisture content</b>	Dry / Wet Basis
<b>Fuel choice</b>	Oil, Gas, Electricity
<b>Product requirement</b>	Power, Flakes, Pellet,
<b>Special requirements</b>	Flammability limits, Toxicity, Fire hazard

Dryer Selection versus Feedstock Form

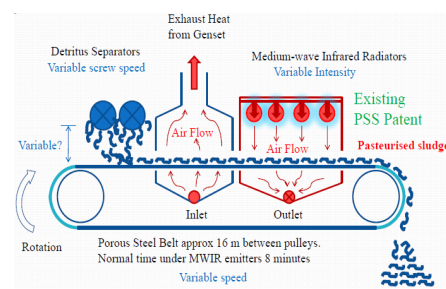
Nature of Feed	Liquids			Cakes		Free-Flowing Solids					Formed Solids	
	Solution	Slurry	Pastes	Centrifuge	Filter	Powder	Granule	Fragile Crystal	Pellet	Fiber		
<i>Convection Dryers</i>												
Belt conveyer dryer												
Flash dryer												
Fluid bed dryer	x	x										
Rotary dryer												
Spray dryer	x	x	x									
Tray dryer (batch)												
Tray dryer (continuous)												
<i>Conduction Dryers</i>												
Drum dryer												
Steam jacket rotary dryer												
Steam tube rotary dryer												
Tray dryer (batch)												
Tray dryer (continuous)												

**Self-sustained system, maximum energy utilization: Pulse combustion spray dryer, ladepa dryer, indirect dryer**



### Current options

- Theoretical (design) study of combustor design for LCV gas pulse combustion and drying
- Experimental study of feces using ladepa dryer and potential collaboration
- Visit national and international drying companies for practical experience



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