



# Coomtech SMR Technology

How it works!



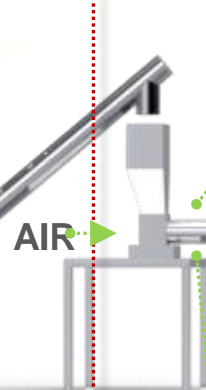
# Our team has created an incredibly **simple but market changing technology** ... Process Line Concept

## FEED ZONE

Off the Shelf Equipment

Product Feed

Hopper/ Bag



## COOMTECH DRYING ZONE

**COOMTECH SMR PROCESS LINE (Intellectual Property Protection)**

- Readily removed Drying Cartridges • Modular Section Enable Easy Scaling
- Easy Maintenance • Inevitable issues in one section need not shut the system down
- Works with existing handling plant equipment such as a blowers, hoppers, cyclones

Rotary Valve

Treatment Air

Treatment Air

Treatment Air

Acceleration Zone

Spin Air (Spin Section)

Spin Air (Spin Section)

Spin Air (Spin Section)

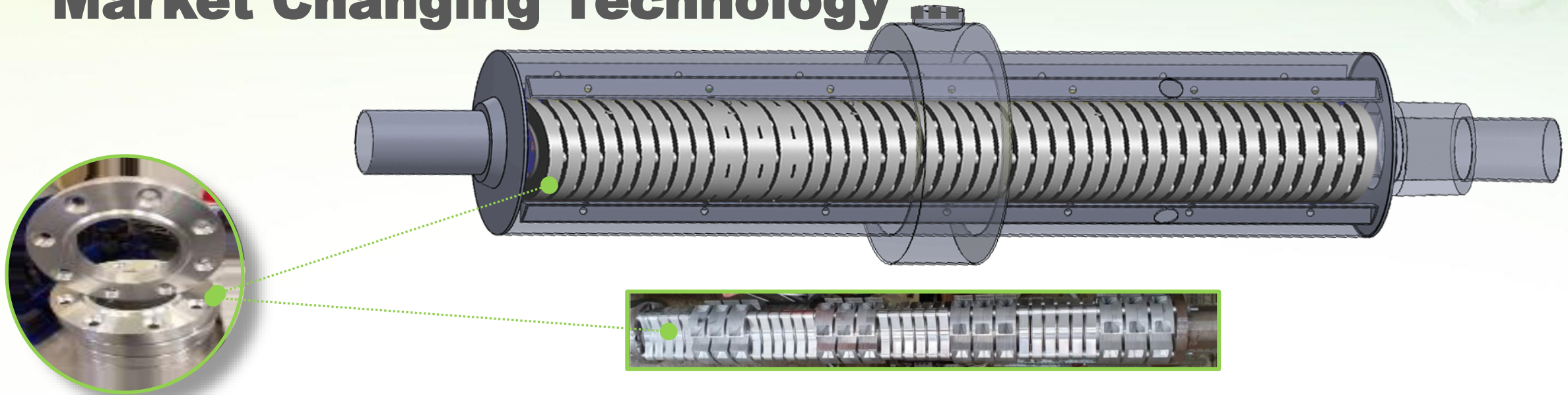
## RECEIVING ZONE

Off the Shelf Equipment

Cyclone - Filler & Hopper  
Blow to Storage Or Dispatch



# The Plenum Drying Chamber Market Changing Technology



## No moving parts inside chamber (Increasing Reliability):

Coomtech's patented process uses managed aggressive turbulent air to remove moisture from the surface of particles

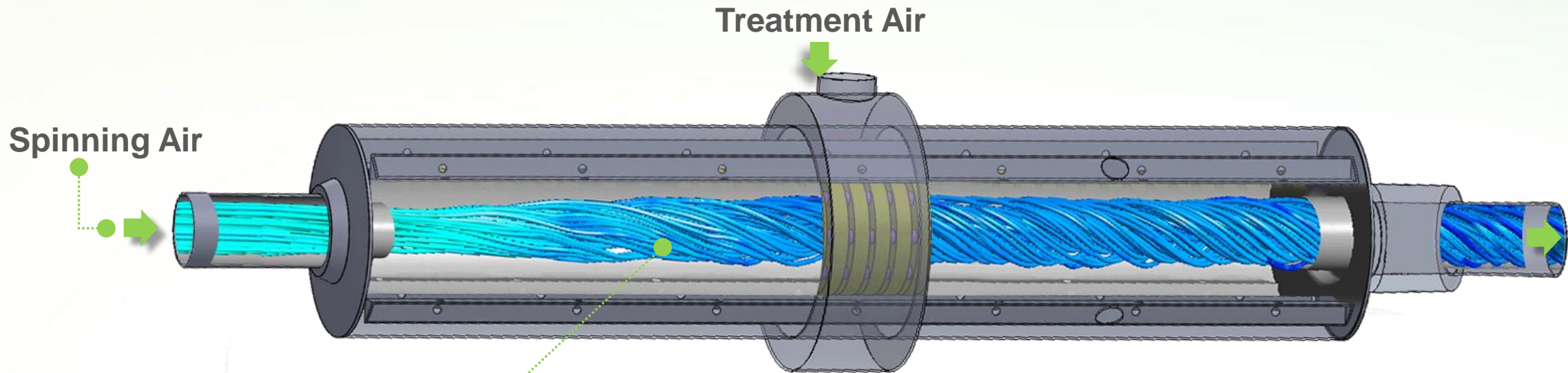
- Our patented process is called Surface Moisture Removal ("SMR").
- Using air (as opposed to heat) is lower in energy demand.
- Lower in emissions (CO<sub>2</sub>).
- Maintains the mineral chemical composition.

## Patented technology: WO2018/083485

The technology we have developed is patented.

The intellectual property/know how is the specific parameters in the spin and drying section that enable the surface moisture to be sheered or "blown off" the mineral/fuel primarily as a vapour and aerosol.

# The Plenum Drying Chamber Market Changing Technology ...

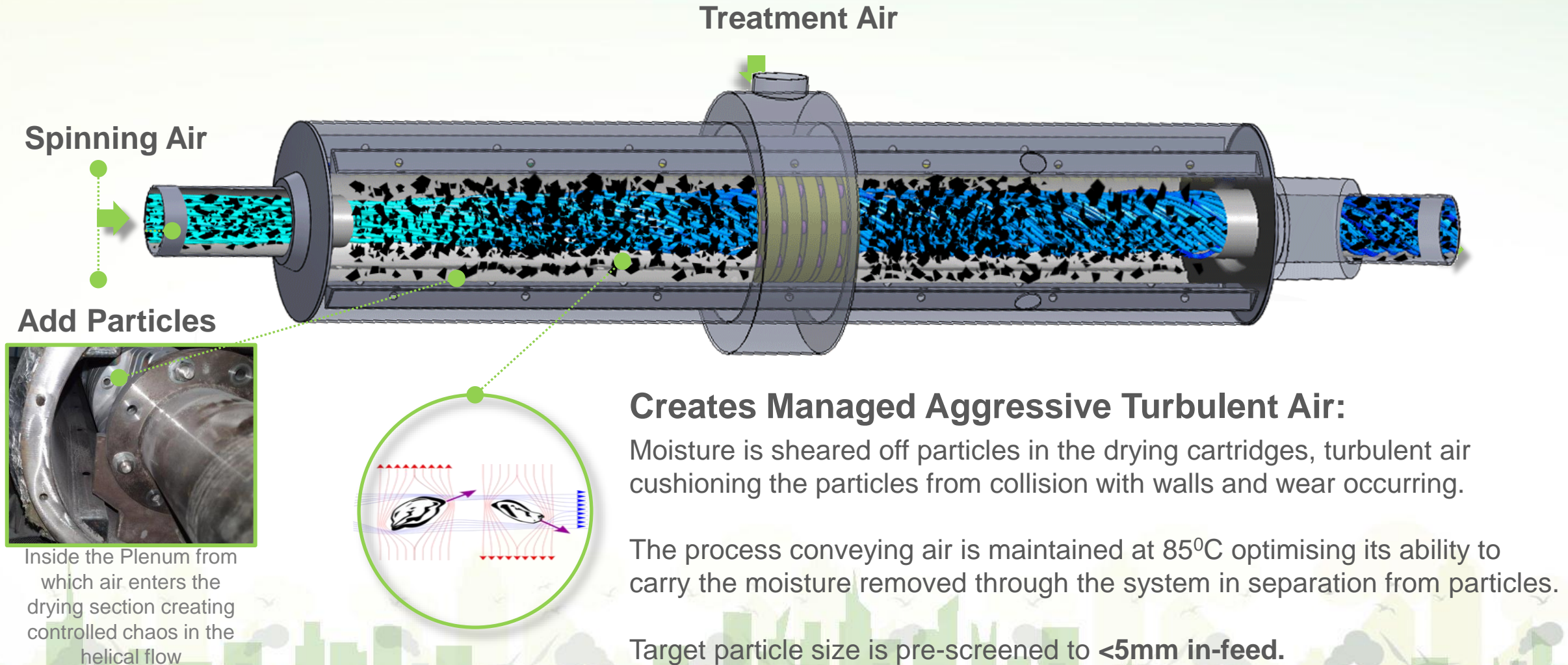


## Creates Helix Effect:

The managed helix facilitates control of the product stream throughout the process.

Minimal heat at all is used to carry moisture in the process ( $85^{\circ}\text{C}$  v  $400^{\circ}\text{C}+$ ), meaning significantly lower energy costs than thermal drying, as well as lower maintenance costs (due to no wear and tear from heating and cooling).

# The Plenum Drying Chamber Market Changing Technology ...



## Coomtech Development and Demonstration rigs:



These operational facilities are both co-located in the North West UK, at Adlington currently, though plans for 2021 are to move to a client site and more spacious location.



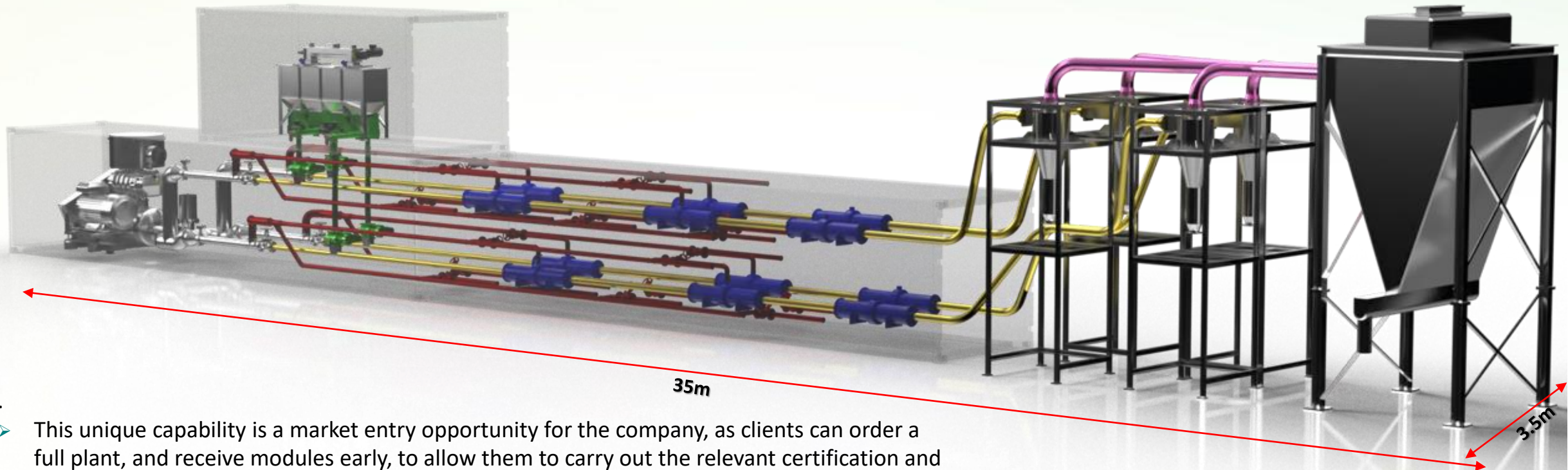
# Application & Integration

Coomtech SMR modular units in the beneficiation process.



# Coomtech SMR Modular Construction

- A unique feature of the Coomtech system is in its modularity. Currently, clients have to specify the plant capacity they require and purchase a single large thermal drying unit.



- This unique capability is a market entry opportunity for the company, as clients can order a full plant, and receive modules early, to allow them to carry out the relevant certification and client sample runs efficiently and quickly, ahead of the rest of the production modules.
- Coomtech SMR's modular design, container frame mounted in units able to deliver, depending on materials, from 32,250 Mtpa up to 48,000 Mtpa.

Dried product is deliverable to silo, to transportation, to process plant direct.

# Coomtech Modularisation : Making operating commitments easy!

- Readily **Scalable** – can grow with the business at minimum entry cost
- **Stand-alone or integrated to existing power and waste heat resources** reducing costs further
- Can have own CHP energy source and fuel options incl. UK & EU – LNG – biogas / USA – Natural Gas & CNG - biogas
- Skid (container) mounted for **demountability** – lower planning threshold
- Pre-processing - Coomtech SMR plugs into existing materials handling for improved material beneficiation
- Post drying – blown or vacuum to storage or shipment vehicle – direct to further processing
- Multi module systems – can provide multi product channels on same plant
- Single Module:
  - viable development plant for client site
  - viable product approval module for certification
  - viable for preparing volumes for clients to test and approval product for off-take

# Coomtech Modularisation :Production Performance Focussed Design

## Production Focus

- Modularity enables sections of the system to be run while others are shut down.
- Feasible to run more than one product - e.g. PFA and GBFS in separate sections.
- Limited time to start up - no thermal heat up and cool down either end of production.
- Performs best in uninterrupted production cycles running in equilibrium.
- Control system (plus online monitoring to Coomtech) enables continuous performance optimisation.
- Manning for systems of 100,000+ mtpa can be 2 men, one loading the system one on Controls /shift supervisor if required.
- Controls can be integrated with other existing plant control room system.
- EPC Guarantee underwrites plant performance.

## Maintenance Focus

- Maintenance contracts with the key component suppliers are back to back with the EPC.
- Coomtech Drying Cartridges are sealed modular units which are designed dropped in and out of a line with ease. (*breaking the seals invalidates the License*)
- Modularity makes the system accessible for service and maintenance.
- The majority of the components are “off-the-shelf” and have tried and tested service track records.
- An individual module can be serviced without stopping production.
- Coomtech provide a holding stock on-site for service needs and emergency situations.
- Coomtech recommend a annual routine maintenance programme which they will support on the ground.

# Coomtech SMR in Ash Beneficiation

- As the pressure to recover ash from stockpiles and lagoons increases Coomtech recognises the necessity to beneficiate the raw material to optimise it for re-use in construction markets. This includes such tasks as sizing, bulk dewatering, drying, carbon reduction and possibly milling of the more compacted particles.
- **All the common ash beneficiation processes are improved when applied to dry material - all recovered ash requires drying**
- Coomtech can offer a drying solution that reduces energy use, and CO2 emissions, while improving the efficiency of other processes mentioned above, so reducing overall beneficiation costs and improving environmental impact.
- **Carbon Reduction example:**
  - ❑ **Carbon Burn Out Systems (CBO):** Whether a rotary, flatbed, or fluidised bed the thermal technologies for the burn off of carbon must first remove the moisture in the product to begin the carbon burn. Coomtech can pre-dry the product utilising waste heat from the CBO while increasing the efficiency of the system to focus on the carbon burn out from a dry raw material.
  - ❑ **Electrostatic Carbon Reduction:** A still lower moisture content is required in a electrostatic systems and is critical to the system efficiency. Coomtech SMR can provide that degree of drying at a minimal power use. The process efficiency is improved compared to a wetter product where the electrostatic process requires a greater degree of drying, traditionally thermally, prior to effective carbon removal.
  - ❑ **Physical Separation:** carbon held in the larger particle size portion can be separated without the application of either of the above technology types, the process aided by the impact of Coomtech SMR on the particle size distribution.
- **Milling / grinding example:**
  - ❑ Milling and grinding equipment that reduces ash to the particle size distribution demanded by the cement and ready-mix/pre-cast concrete industries is universally impacted by wet product and the cost of processing energy and maintenance can be reduced substantially by dry product.

# Standalone Sites Recommended Power Plants – *scalable power supply from 300 kW to 4 Mw units*

- Coomtech are allied with AB Energy Cogeneration Group and recommend the use of their GE engines, heat exchange systems co-generating from natural, compressed, or liquid gas on standalone sites.
- For this plant the Ecomax 3NGS plant is the smallest recommended and exemplifies the range, delivered as a containerised unit similar to the photo (below).



**Temp Footnote on Energy:**

The benefit of utilising the CHP heat delivery for the combined heat and power requirement is that a total electric system will utilise approx. 201% kW at up to 3 x cost per kW used

**ECOMAX<sup>®</sup>**  
N A T U R A L G A S

ECOMAX 3NGS

*Example Only*

Electric Power	kW	329
Introduced power	kW	851
Available thermal power:		
Engine block Warm H <sub>2</sub> O	kW	231
Exhaust gas fumes - warm H <sub>2</sub> O	kW	202
Total recovery of warm H <sub>2</sub> O	kW	433
alternatively		
8-bar steam (at 90 °C)	kW	181
Steam flow 8 bar (food 90 ° C)	kW	281
TOTAL yield		
Electricity yield	%	89,7%
Thermal performance (Warm H <sub>2</sub> O production)		51,0%
NOx referred to 5% of O <sub>2</sub>		
	mg/Nm <sup>3</sup>	450



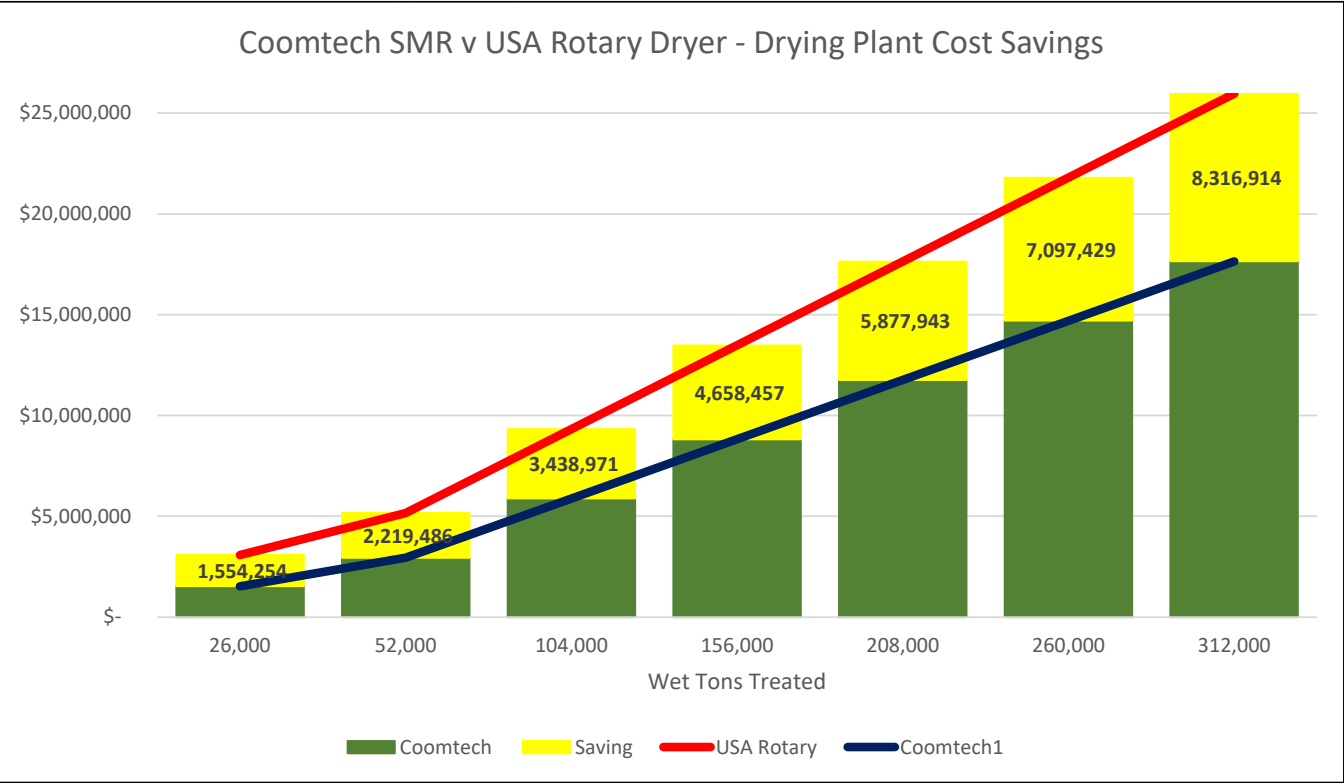
# Comparative Technology Studies

**Coomtech –V- Rotary Drying Kiln & Rotary Paddle Flash Drier**

**Like for Like Levelised Capex and Opex Costs Studies ex. Market Data**



# Like For Like Performance Versus Rotary Drying Plant



Data Resource						
Scenario:	USA - Thermal Drying					
No	Wet Tons Treated	Capex \$'s	Heat Cost Per Ton \$	Annual Power Cost	10 Year Power	Capex & Power
1	26,000	\$ 1,000,000	\$ 8.00	\$ 208,000	\$ 2,080,000	\$ 3,080,000
2	52,000	\$ 1,000,000	\$ 8.00	\$ 416,000	\$ 4,160,000	\$ 5,160,000
3	104,000	\$ 1,000,000	\$ 8.00	\$ 832,000	\$ 8,320,000	\$ 9,320,000
4	156,000	\$ 1,000,000	\$ 8.00	\$ 1,248,000	\$ 12,480,000	\$ 13,480,000
5	208,000	\$ 1,000,000	\$ 8.00	\$ 1,664,000	\$ 16,640,000	\$ 17,640,000
6	260,000	\$ 1,000,000	\$ 8.00	\$ 2,080,000	\$ 20,800,000	\$ 21,800,000
7	312,000	\$ 1,000,000	\$ 8.00	\$ 2,496,000	\$ 24,960,000	\$ 25,960,000
Scenario:	Coomtech - SMR					
No	Wet Tons Treated	Capex \$'s	Heat Cost Per Ton \$	Annual Power Cost	10 Year Power	Capex & Power
1	26,000	\$ 446,746	\$ 4.15	\$ 107,900	\$ 1,079,000	\$ 1,525,746
2	52,000	\$ 782,514	\$ 4.15	\$ 215,800	\$ 2,158,000	\$ 2,940,514
3	104,000	\$ 1,565,029	\$ 4.15	\$ 431,600	\$ 4,316,000	\$ 5,881,029
4	156,000	\$ 2,347,543	\$ 4.15	\$ 647,400	\$ 6,474,000	\$ 8,821,543
5	208,000	\$ 3,130,057	\$ 4.15	\$ 863,200	\$ 8,632,000	\$ 11,762,057
6	260,000	\$ 3,912,571	\$ 4.15	\$ 1,079,000	\$ 10,790,000	\$ 14,702,571
7	312,000	\$ 4,695,086	\$ 4.15	\$ 1,294,800	\$ 12,948,000	\$ 17,643,086
Cost Comparison						
	Wet Tons Treated	USA Rotary	Coomtech	Saving	Coomtech1	
	26,000	\$ 3,080,000	\$ 1,525,746	\$ 1,554,254	\$ 1,525,746	
	52,000	\$ 5,160,000	\$ 2,940,514	\$ 2,219,486	\$ 2,940,514	
	104,000	\$ 9,320,000	\$ 5,881,029	\$ 3,438,971	\$ 5,881,029	
	156,000	\$ 13,480,000	\$ 8,821,543	\$ 4,658,457	\$ 8,821,543	
	208,000	\$ 17,640,000	\$ 11,762,057	\$ 5,877,943	\$ 11,762,057	
	260,000	\$ 21,800,000	\$ 14,702,571	\$ 7,097,429	\$ 14,702,571	
	312,000	\$ 25,960,000	\$ 17,643,086	\$ 8,316,914	\$ 17,643,086	

## Cost Comparison Summary

### Coomtech SMR Dryer V Rotary Paddle Flash Dryer



#### Introduction

This file contains the calculation made to compare the Coomtech SMR Drying (SMR) plant, with the current best in class (Hasemag HRD 2170 - Rotary Paddle Flash Dryer - RFPD) bulk dryers available on the market.

#### Method

Capital and operating costs for a RFPD to provide a whole life costs were acquired and compared to the same Capital and operating costs for a SMR plant.

The RFPD specified was designed to handle 150 Tonnes per hour or 1,188,000 Tonnes per annum.

The SMR was specified to handle 60 Tonnes per hour or, 432,000 Tonnes per annum.

Capital costs, Operating costs and Emissions Costs were calculated for both solutions, and are shown below.



#### Detailed Calculations

Volume - Tonnes:		432,000			
Total Costs	GBP	Annual Ops Cost Incl Depn	Annual Ops Cost Excl Depn	Annual Ops Cost Excl Depn & Co2	Capital
RFPD		4,319,194	3,969,194	3,596,868	3,500,000
SMR		2,655,619	1,874,029	1,788,480	7,815,905
SMR Saving		1,663,575	2,095,165	1,808,388	
SMR Saving %		38.5%	52.8%	50.3%	
Cost Per Tonne	GBP	Ops Cost Incl Depn	Ops Cost Excl Depn	Ops Cost Excl Depn & Co2	Annual Cost divided by Volume
RFPD		10.00	9.19	8.33	
SMR		6.15	4.34	4.14	
SMR Saving		3.85	4.85	4.19	
SMR Saving %		38.5%	52.8%	50.3%	



# Clean Technologies

Low Cost, Low Energy Drying

## Contact details

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