Residence Time Chamber Calculation

Gasification via a mechanical fluidised bed

Clean Thermodynamic Energy Conversion Ltd

Technical calculation of the mechanical fluidized bed gasification residence time chamber

Capacity 500 kg/h of Medical Waste

thermal capacity 4000-8000 kcal/kg

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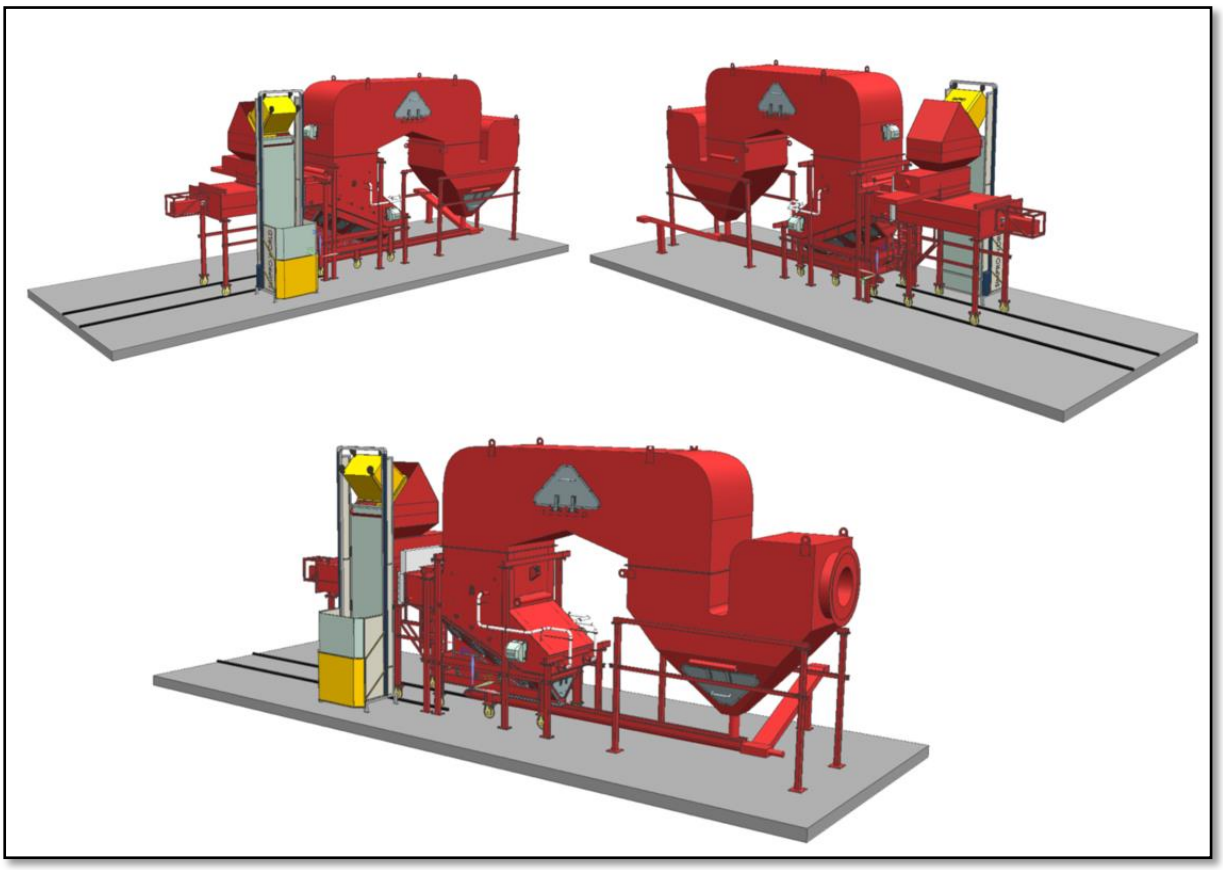

CTEC008

Main Assemblies

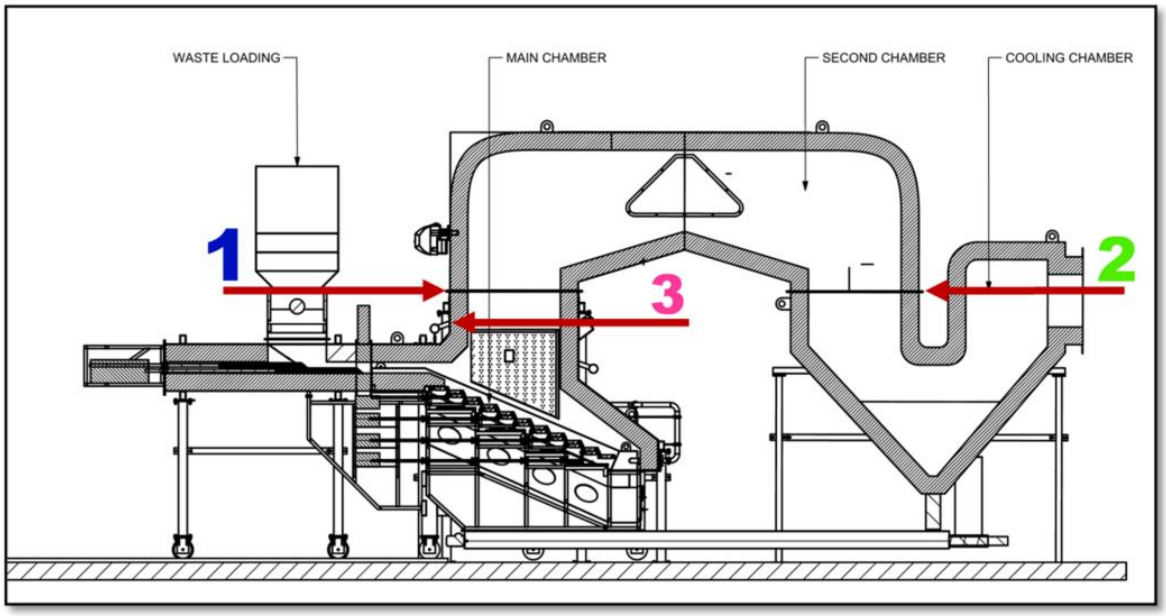

Figure 1

Summary

Syngas is generated through a gasification phase in the main chamber, it is then further ignited using secondary air shown in figure 1 labelled 3. The ignited syngas brings the flue gas temperature over 850°C where it will stay for greater than 2 seconds before entering the cooling chamber labelled 2 in figure 1 where it will cool down to 650°C for downstream heat recovery.

For non hazardous waste gas temperature is required to be >850°C.

Calculation for volume in second chamber for a

residence time greater than 2 seconds

A	time conversion	3600
B	K = conversion	273
C	TEMP °C	900
D	Flue gas m3/h at 900°C	30194
E	Nm3/h	7027

			Working out
K=	4.296703		(900 +273)/273
N mass flow x temp	30192.93	m3/h actual	(7027*4.296)
flue gas per second			
	8.386926	m3/s	(30192/3600)
	16.77385	m3	(8.3869*2)
plus 10% =	1.677385		(16.77/100*10)
=	18.45124	m3	(16.773+1.677)
extra 3m3 for safety	3	m3	
=	21.45124	m3	(18.451+3)
Residence time	2.55	seconds	21.45/8.386

Due to unusual shape of chamber (inverse "U" shape") with dead areas in corners a further safety factor additional 3m3 has be added

An additional extra thermal load of 10% is included

2 seconds residence time at nominal run gives the minimal volume for second chamber at nominal run