Textile Sludge Incineration

Lecture-35
Textile sludge constituents

• The chemical analysis of textile sludge is very important in order to quantify several contaminants which, in high levels in the sludge, lead to concerns that textile sludge application to land may potentially result in adverse environmental impacts.

• Thus, the main challenge related to the agricultural use of sludge is to determine the maximum application rate to avoid immediate environmental impacts, as well as to establish the maximum long-term rate that will not result in excessive leaching of contaminants or accumulation of trace metals/recalcitrant compounds in soils and plants.
Textile sludge management

• Mounting difficulties in the use of textile sludge in agriculture and landfill disposal has made incineration an attractive solution for sludge disposal.

• In April 2000, the European Commission published a work document on sludge that included new proposed limits of organic contaminants for the agricultural use of sludge.

• The implementation in some European towns of the Landfill Directive has meant that it is no longer possible to dispose of biodegradable waste in landfill. Particularly textile sludge.
Textile Sludge situation

• The Directive of European commission also stated to Member States to reduce by 35% of the amount of biodegradable waste disposed in landfill within 15 years.

• Alternative solutions, especially for those types of sludge that are not suitable for agricultural use, are urgently needed and textile sludge incineration is one answer.
Other sludge vs textile sludge

- Sewage sludge is a poor material in terms of calorific value, thus limiting the convenience of electric energy recovery when it is finally disposed by incineration.

- Furthermore, since sludge incineration plants need to use a continuous - rather than batch - process to avoid refractory stress, this corresponds to high operational costs.

- The main objective was to overcome the specific problems and costs of sludge incineration produced from the textile industry.

- A new technology was developed that uses a high-tech furnace that can withstand the thermal shocks that are induced by the frequent shutdowns at night and start ups during the day.
Textile sludge incineration

- Textile sludge incineration (TSI) helped to demonstrate that the electrical energy produced by this system is feasible and convenient for plants of medium capacity.

- TSI also helped to demonstrate that ashes produced from sludge incineration are suitable for CO$_2$ sequestration at the end of the process when the exhaust gases are cool.

- TSI helped to demonstrate that sludge incineration is both environmentally friendly and cost effective in comparison with other available solutions.
A case study on TSI

- The ETP Sludge generated by Raymond Textile Ltd. is Co-incinerated in the Captive Power House Boiler in irreversible and environmental sound manner without influencing emissions on partial replacement of traditional fuel.

- Co-incineration benefits upgrade waste management, reduce environmental impacts, improve the industrial sector’s competitiveness decreases largely the cost of waste management of ETP sludge.
The analysis results

• The analysis results of the stack parameters revealed that the emission values are well below the standards set by Central Pollution Control Board for the common Hazardous Waste Incinerations.

• The Captive Power House perforce requires high temperature in the boiler around 10000°C. Such high temperature conditions ensure no noxious emission during the co-incineration of the waste materials.
TSI

• Whether or not TSI has produced by diffusion any airborne pollutants;

• Finally to check the final outcome of a lifecycle assessment (LCA) of sludge incineration.

• This would compare the new process both with a conventional one in which sludge is disposed in a landfill site and with the current incineration system presently carried out with a multiple hearth furnace.
Study observation to check the viability

- The average and range of concentrations of various parameters sampled during pre co-incineration and post co-incineration periods with coal and during trial with co-incineration of ETP Sludge waste along with coal in Boiler.

- Ambient air quality was found to be normal representing the industrial activities.

- The general observations of emission during the trial co-incineration study are

- The particulate emissions were always less than 50 mg/Nm$^3$;
Study Observations

- Sulphur Dioxide emissions were observed to be less than below detectable limit i.e. 3.2 mg/Nm$^3$;

- Oxides of Nitrogen emissions, which are much depended on the temperature, were found to be slightly higher during the co-incineration period than when coal is used;

- There is an increase in HF emission during co-incineration period whereas the HCL emissions showed the decreasing trend;

- No volatile organics and PAH were generated during the entire trial period;

- Dioxins & Furans were less than 0.012 ng TEQ/Nm$^3$ all the times; and Though Heavy metals and Mercury were found to be emitted from the stack, the concentrations were less than 0.02 mg/Nm$^3$ for Cd+Tl, less than 0.02 mg/Nm$^3$ for mercury and less than 0.03 mg/Nm$^3$ for all other metals.