



# “REFERENCE MATERIALS” FOR WASTE ANALYSIS

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  - Wastes produced by the incinerators
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# Implementation of European regulation on waste

- Directive 1999/31/CE : the “Landfill Directive”
  - in force in Italy with the D.Lgs.36/2003
- Decision 2003/33/CE on acceptance criteria of landfilling wastes
  - in force in Italy with the new DM 3 August 2005 on the acceptance criteria in landfilling





# Change of waste classification criteria

- Waste hazard based on composition not only origin
  - Decision 2000/532/CE
  - art.2 Decision 2001/118/CE
  - Annex III, Directive 91/689/CEE





# Hierarchy of waste characterization

## 1° Basic characterization criteria:

- Source
- Description of the waste producing process
- Total chemical composition
- Leaching behavior  
(Liquid/solid ratio, other leaching control parameters like pH, redox potential, complex formation capacity)
- Physic-mechanical parameters  
(grain size, temperature, mechanical strength, durability, ...)

## 2° Periodical compliance tests to confirm basic characterization

## 3° Quick “in situ” tests to confirm waste identity





# APAT - CSM Project

The project is funded by the **Law 93/01** with the objective to assure:

- homogeneous and minimum standard at national level of environmental monitoring control;
- formation activity in order to support the application of regional and national regulations;
- implementation of the national environmental information system.





# Project Objectives

- to produce Reference Materials (RMs)
- to improve analytical data quality in basic characterization
- to characterize
  - solid refuse fuel (SRF)
  - fly ash from MSWI/SRF
  - bottom ash from MSWI/SRF
- to characterize wastes generated in plasma torch incineration of:
  - oil containing PCB
  - residues from vehicle plastic parts grinding
  - fly ash.





# Project Activities

## PART A

- improving knowledge of incineration process cycles
- collection and characterization of the different wastes produced and the SRF used as fuel.

## PART B

- characterization of plasma torch wastes from burning of oil containing PCB, vehicle plastic parts grinding residues and MSWI fly ashes.
- cost/benefit calculation vs conventional treatments



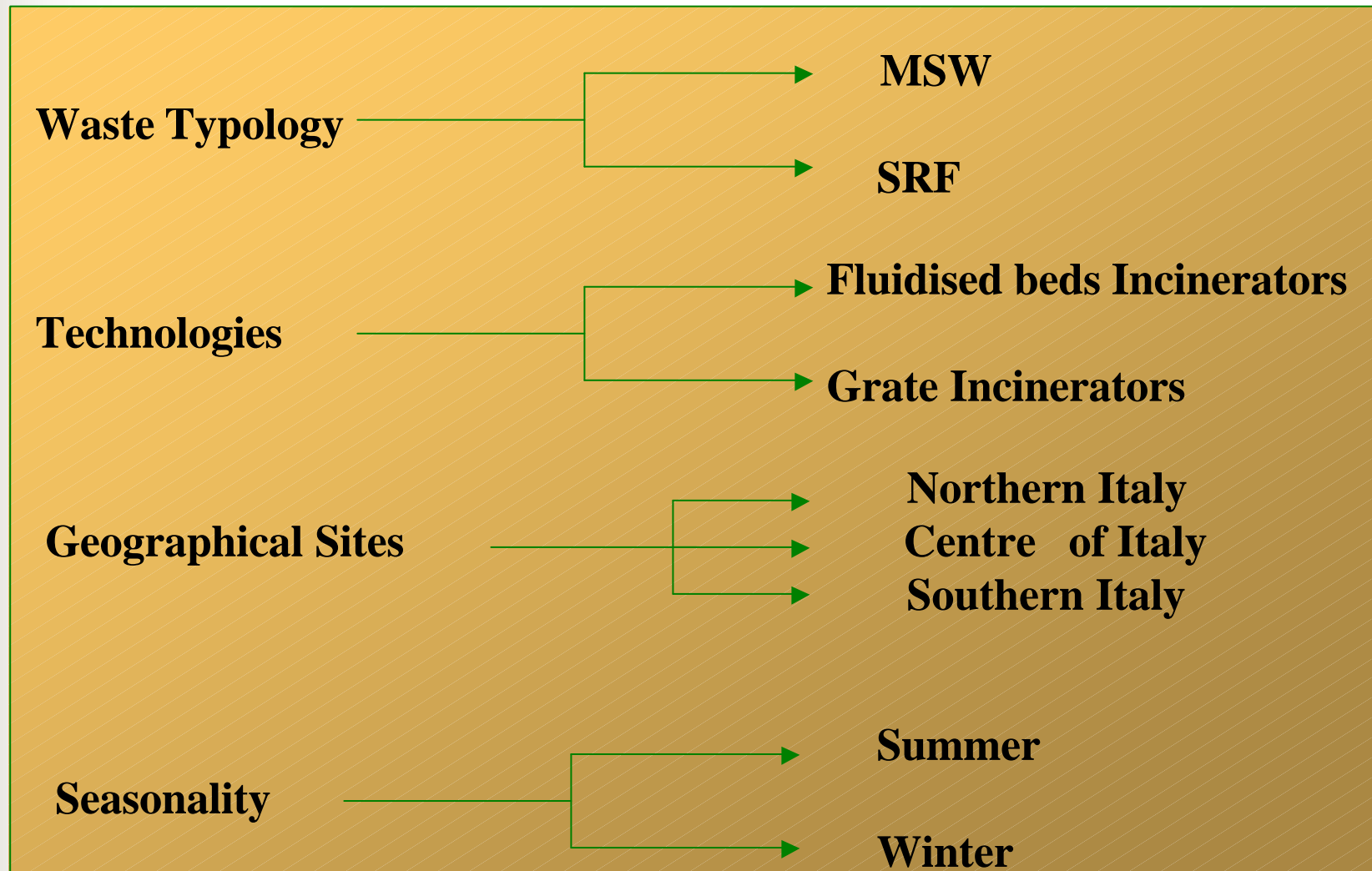


# Part A - First Steps

- Selection of MSW and SRF incinerating plants
- Decision on waste collection criteria and basic characterization
  - number of different wastes produced by each plants
  - period in which to collect representative waste samples
  - strategy of sampling and preparation of laboratory sample



# Incinerator selection criteria



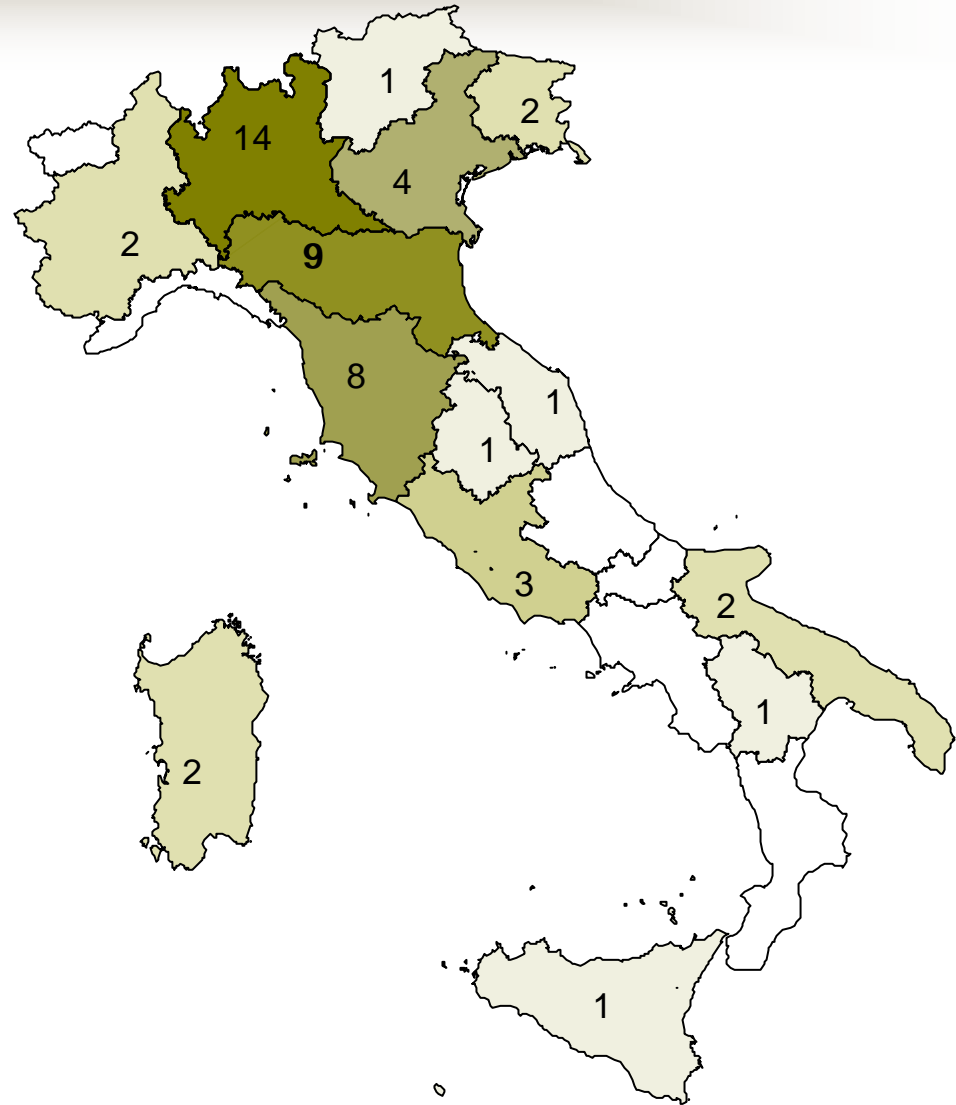
# Italian situation of MSWI plants

Technologies	N° incinerators	Potentiality (tons/d)	Treated quantity in 2003 (tons)
Grate Incinerators	38	11091	3 056 944
Fluidised beds Incinerators	9	2060	352 751
Rotary kiln Incinerators	2	340	79 081
Fluidised beds and rotary kiln Incinerators	2	-	-
<b>TOTAL</b>	<b>51</b>	<b>12891</b>	<b>3 488 776</b>

Source :APAT



# Geographical distribution of MSW/SRF Incinerators





## The analysis of Italian incinerators has shown:

- 13 plants use SRF as a fuel,
  - 9 fluidised beds
  - 4 grate incinerators;
  
- 38 plants use MSW
  - no separately collected
  - all grate incinerators.



# Selected Incinerators Plants

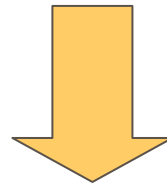
Technologies	Waste	Geographycal Area	N° of plants	N° samples
Grate Incinerators built before 2000	MSW	NORTH	2	2
				3
		CENTER	2	2
				2
SOUTH	1	2		
Grate Incinerators built after 2000	SRF	CENTER	1	2
Grate Incinerators built after 2000	MSW	NORTH	2	2
				2
		CENTER	1	2
SOUTH	1	2		
Fluidised beds Incinerators	SRF	NORTH	2	2
				2
		CENTER	1	2
SOUTH	1	2		



# Total numbers of selected Incinerators:

**14** out of **51**

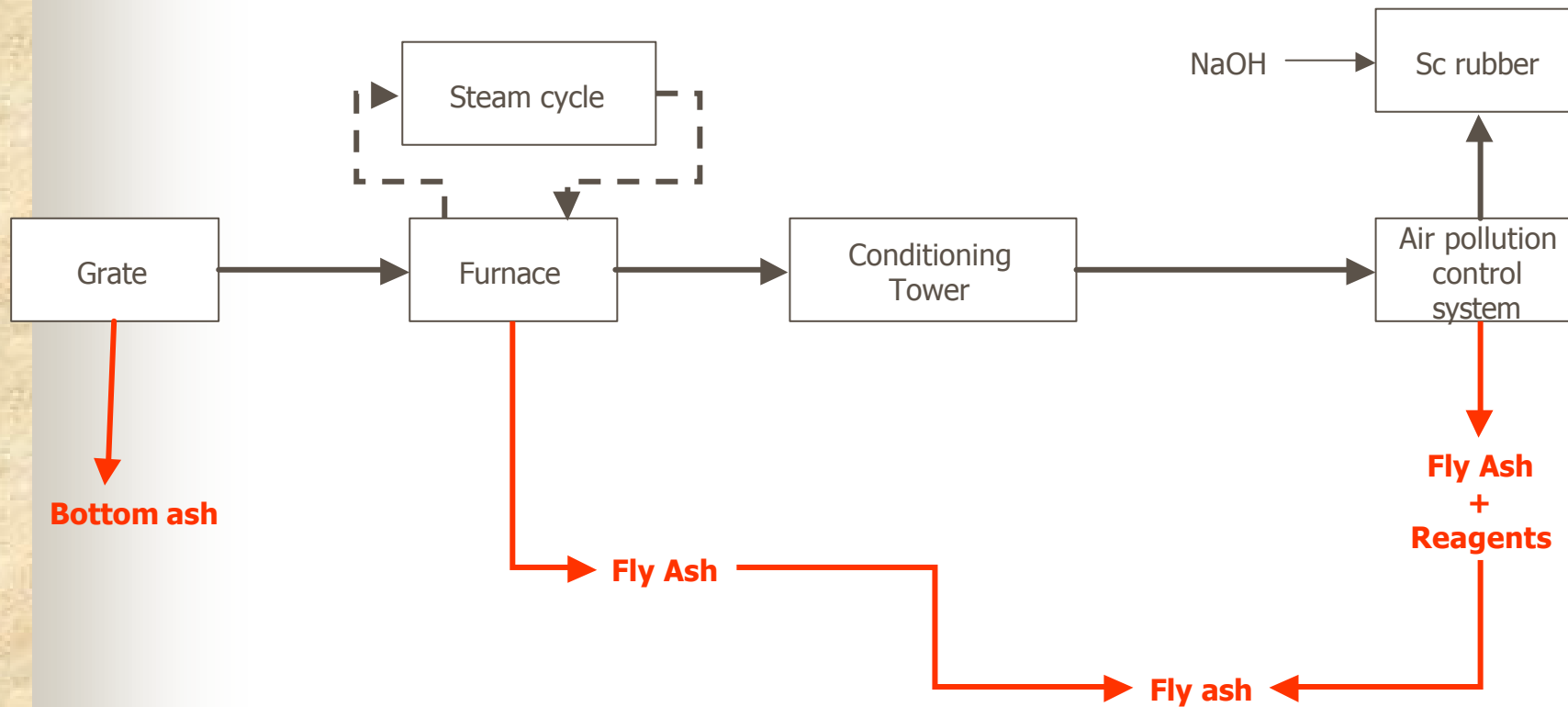
- **7** plants using MSW as fuel, all “Grate Incinerators”
- **7** plants using SRF as a fuel
  - **3** “Grate Incinerators”
  - **4** “Fluidised beds Incinerators”



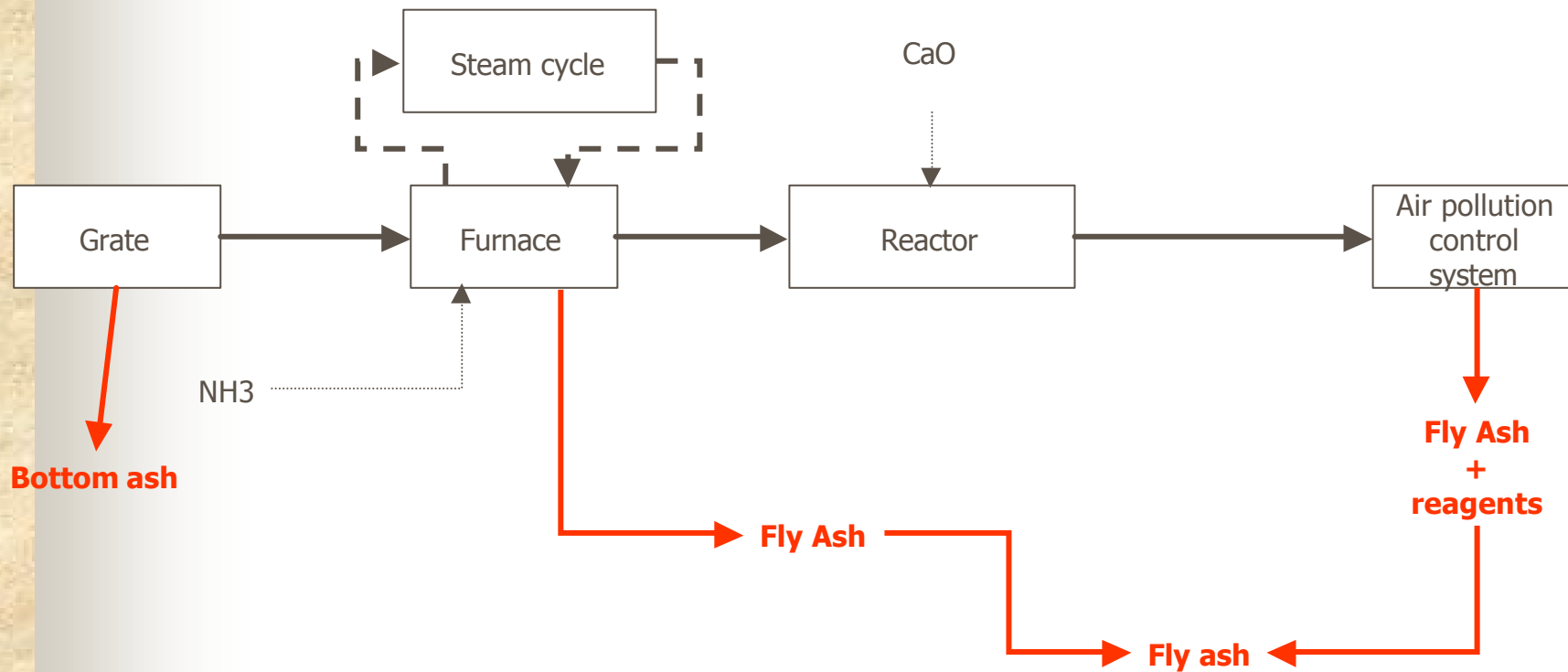
**29** waste samples: **14** bottom ashes and **15** fly ashes



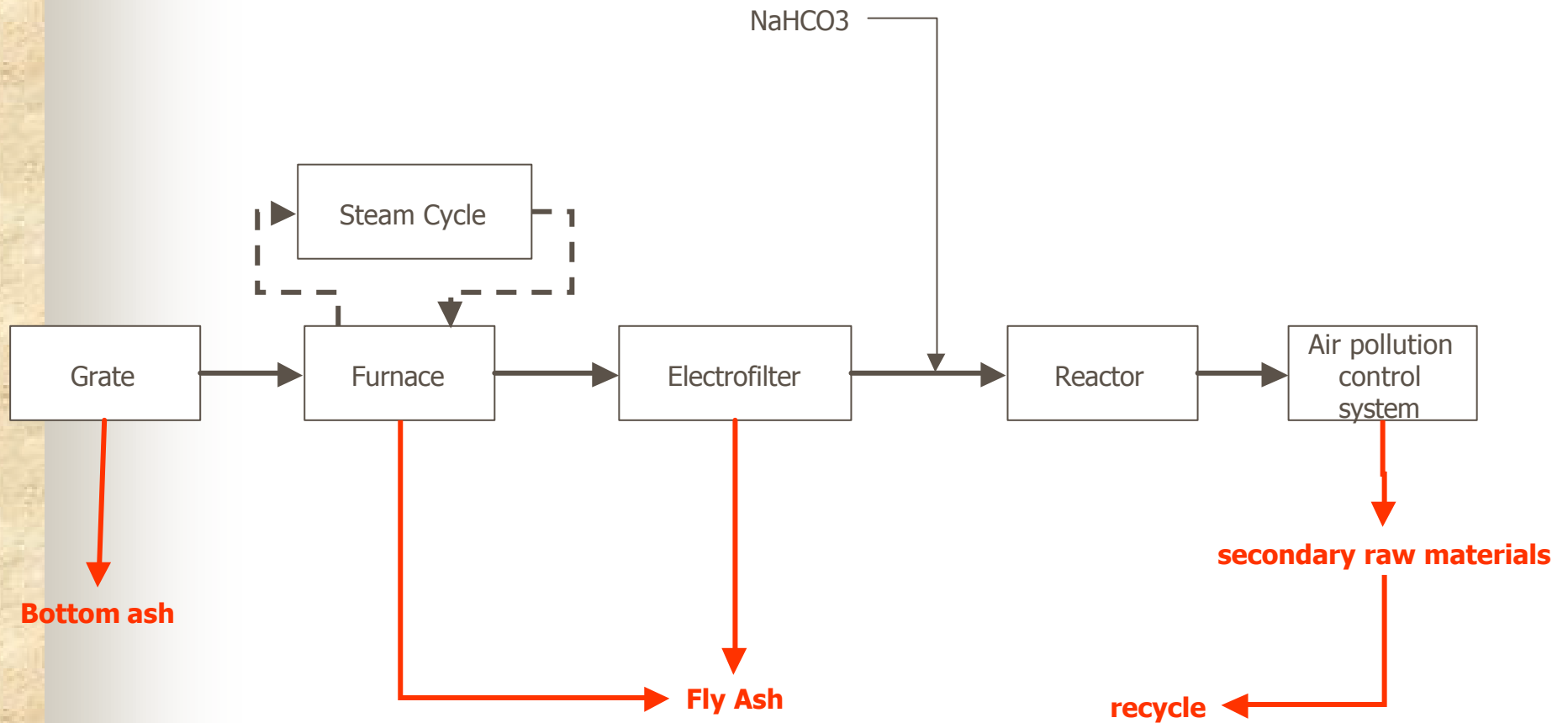
# Grate Incinerator using MSW – Northern Italy



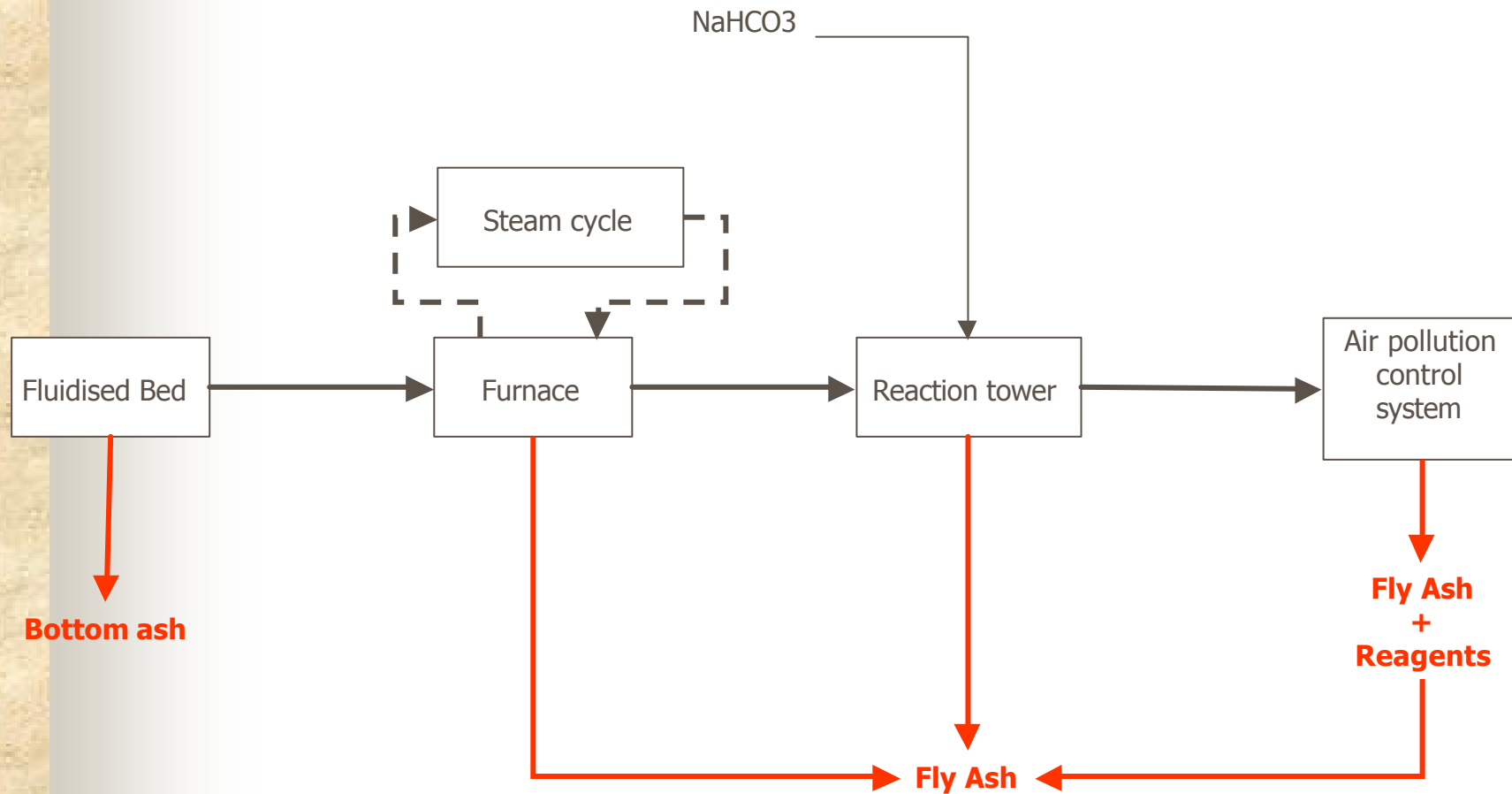
# SRF grate incinerator – centre of Italy



# MSW grate Incinerator – Northern Italy



# SRF Fluidised bed incinerators – Southern Italy





# Characterization analysis of fly and bottom ashes in the selected incineration plants

## FLY ASH AND BOTTOM ASH

**C, S, Cl**

**Cd, Tl, Hg, Mo, Sb, As, Pb, Cr, Co, Cu, Mn, Ni, V, Sn**

**Al<sub>2</sub>O<sub>3</sub>, SiO<sub>2</sub>, CaO, MgO, Fe<sub>2</sub>O<sub>3</sub>, K<sub>2</sub>O, Na<sub>2</sub>O, P<sub>2</sub>O<sub>5</sub>, SO<sub>3</sub>**

**PAH**

**Leaching test (as in UNI 10802 derived from EN 12457 option 2)**

**Leaching test (pH stat as described in the draft prEN 14997)**



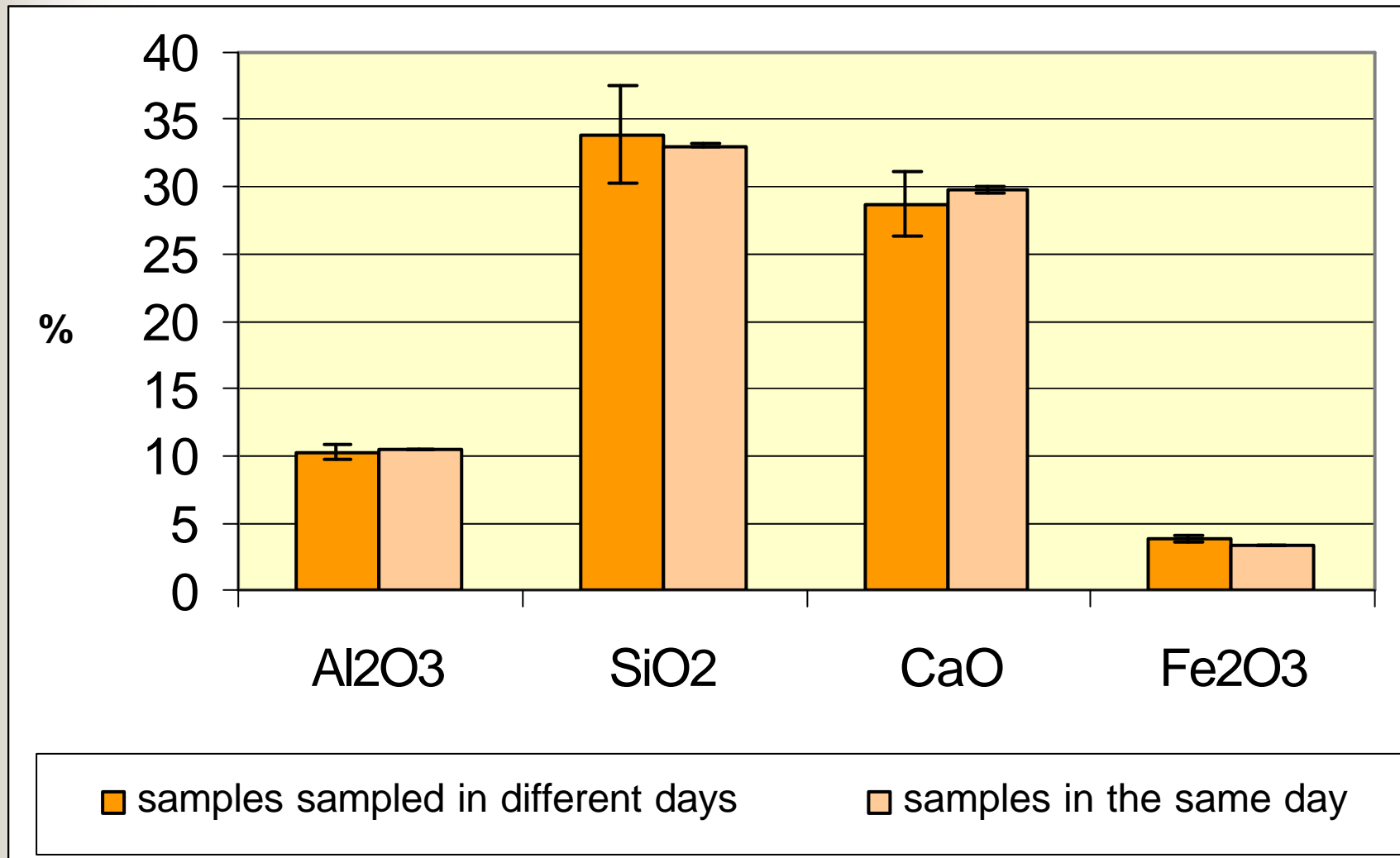


# Characterization analysis of SRF used in selected plants

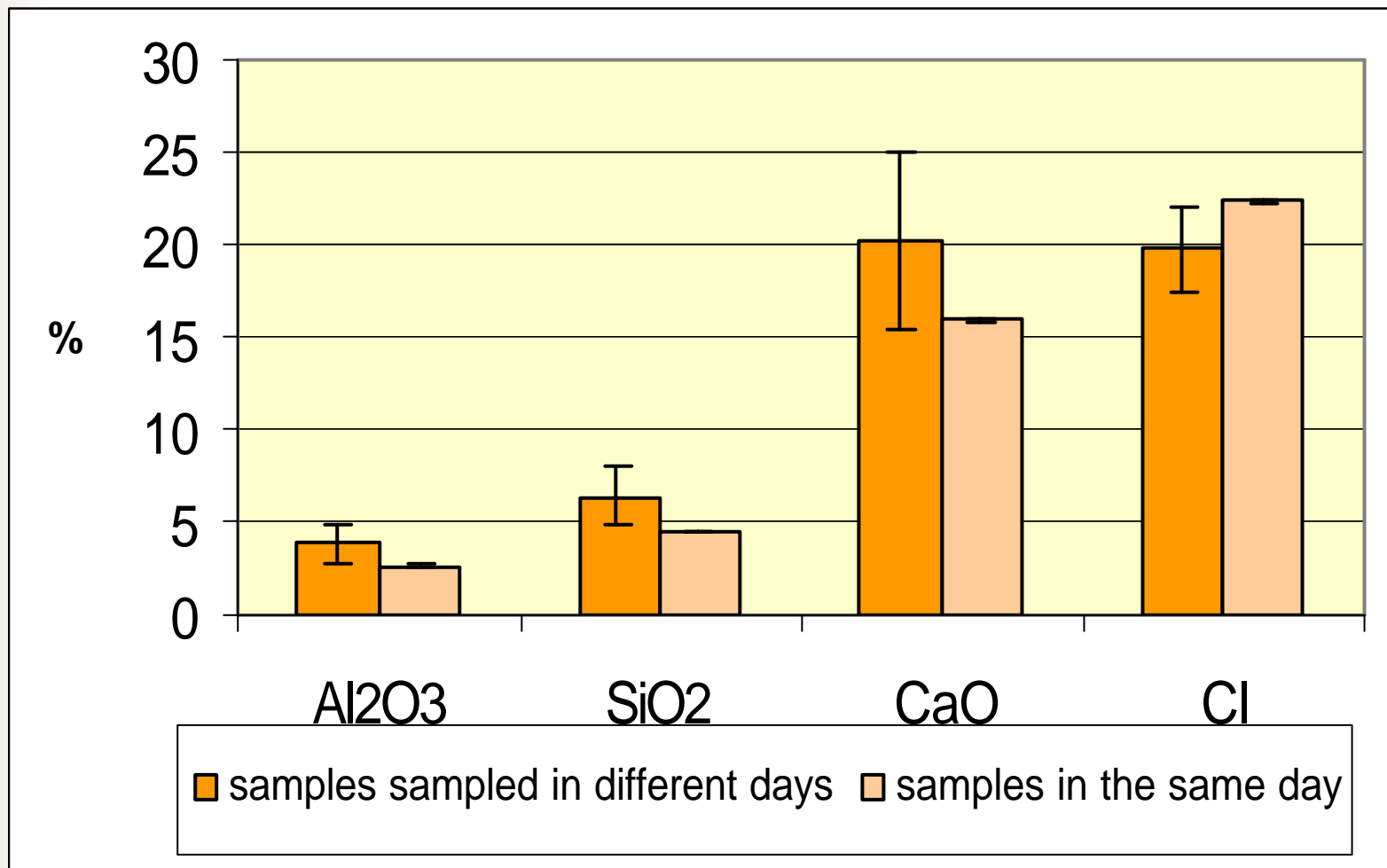
SRF
C, H, N, O, S, Cl
Calorific Power, ashes
Cd, Tl, Hg, Mo, Sb, As, Pb, Cr, Co, Cu, Mn, Ni, V, Sn
Al <sub>2</sub> O <sub>3</sub> , SiO <sub>2</sub> , CaO, MgO, Fe <sub>2</sub> O <sub>3</sub> , K <sub>2</sub> O, Na <sub>2</sub> O, P <sub>2</sub> O <sub>5</sub> , MnO, TiO <sub>2</sub>
Particle size distribution



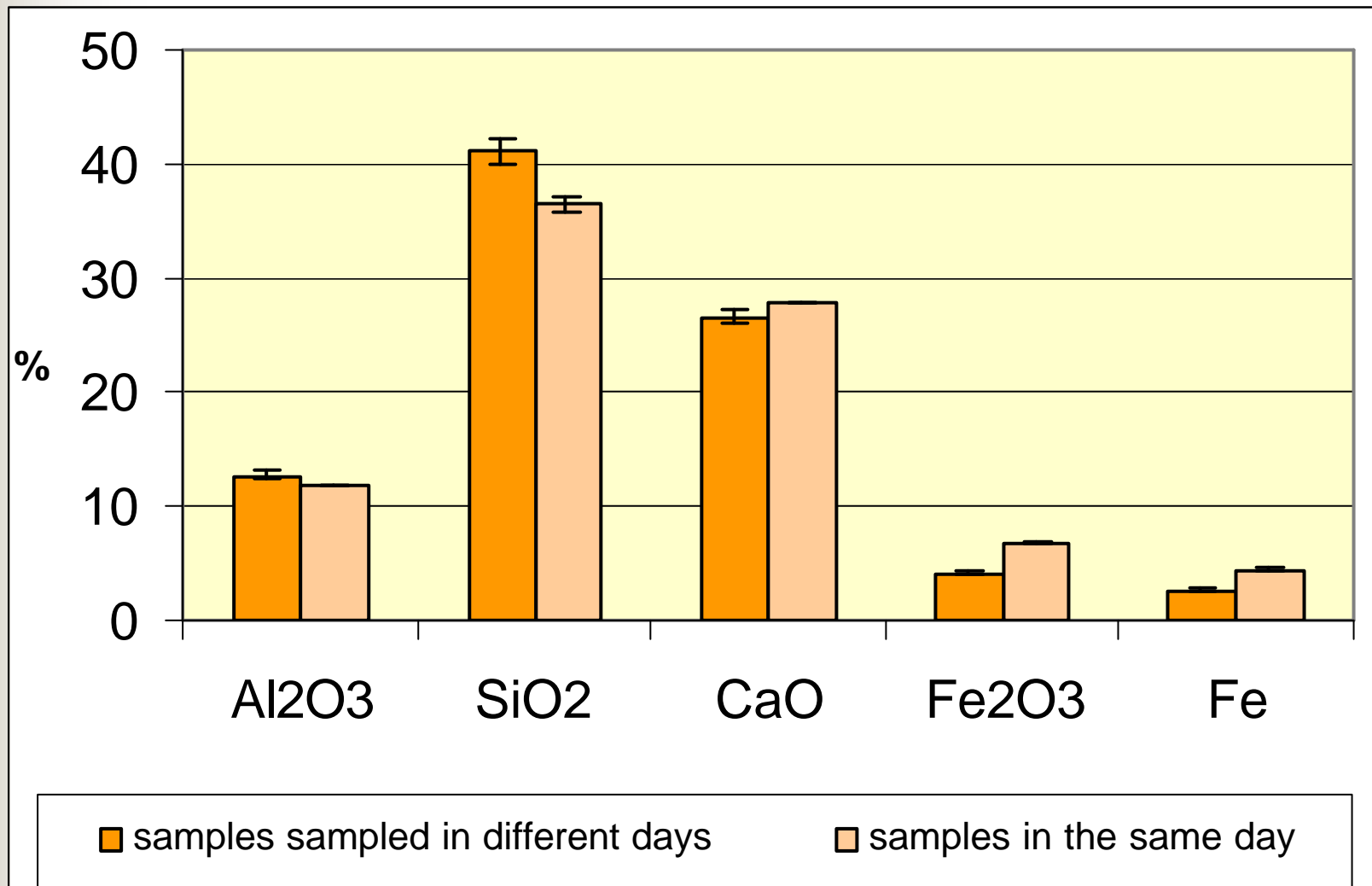
# MSWI bottom ash in a grate incinerator



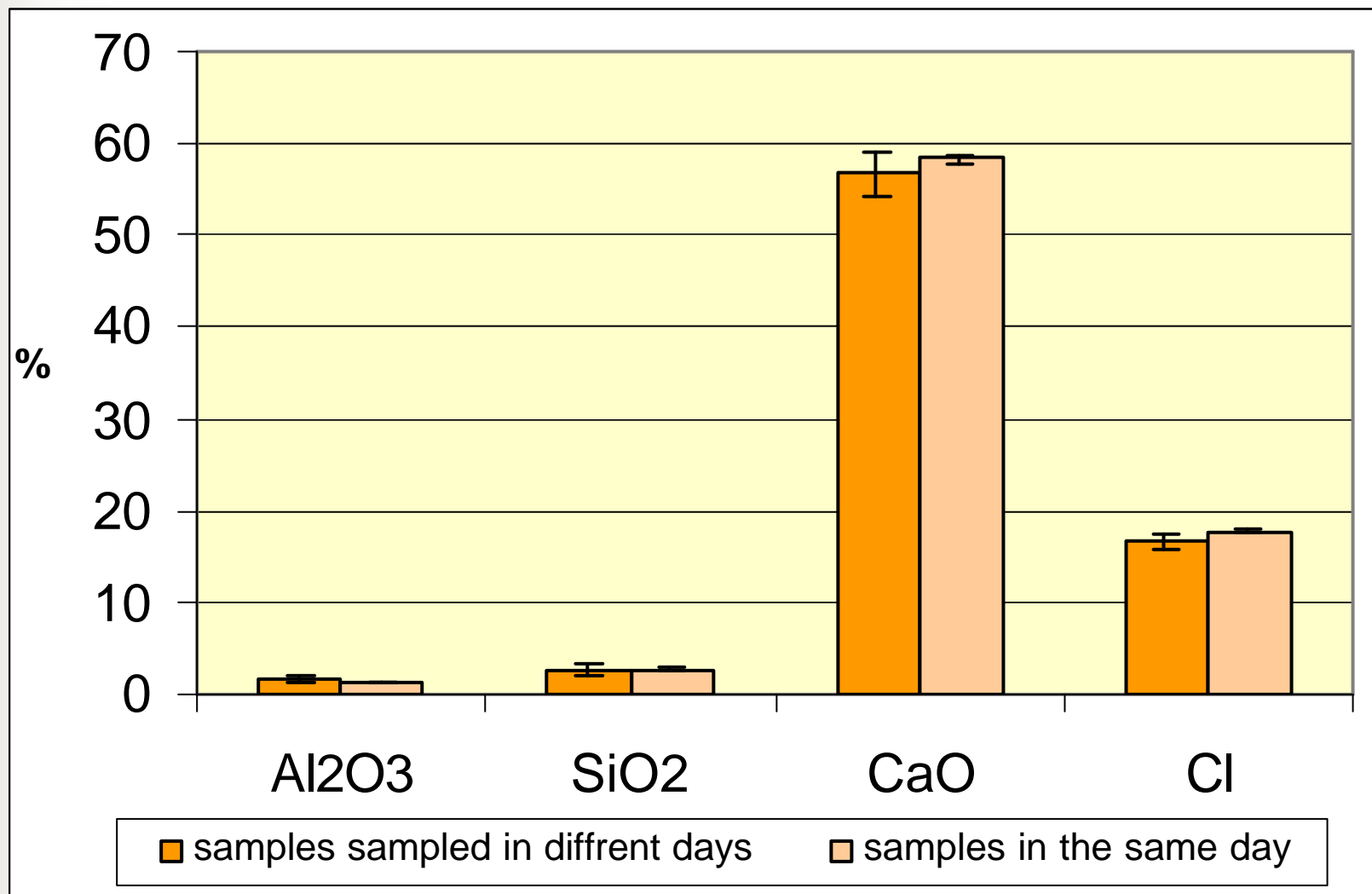
# MSWI fly ash in a grate incinerator



# SRF bottom ash in a grate incinerator



# SRF fly ash in a grate incinerator





# Conclusions

At the end of the project APAT will provide Institutional Italian laboratories with:

- Complete information on the basic characterization of incineration wastes
- RMs with different matrices depending from different incineration processes for the basic characterization of bottom and fly ashes
- RMs for the characterization of SRF
- APAT will start round robin tests on total content and leaching behaviour of the produced RMs

