WASTE GENERATION IN PRIMARY AND SECONDARY ALUMINUM SECTOR IN TURKEY

ELIF KUCUK, DILARA DANACI, ULKU YETIS

MIDDLE EAST TECHNICAL UNIVERSITY
DEPARTMENT OF ENVIRONMENTAL ENGINEERING

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OUTLINE

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- Methods
- Results and Discussion
  - Determination of WGFs and Responsible Processes for Waste Generation
  - Development and Evaluation of Management Strategies
- Conclusion

INTRODUCTION

Aluminum

- the most produced and used metal following steel in the world
- commonly used in different industrial applications
  - Construction industry
  - Chemical industry
  - Metal industry
  - Transportation
  - Electrical and electronics
  - Manufacture of machinery and equipment

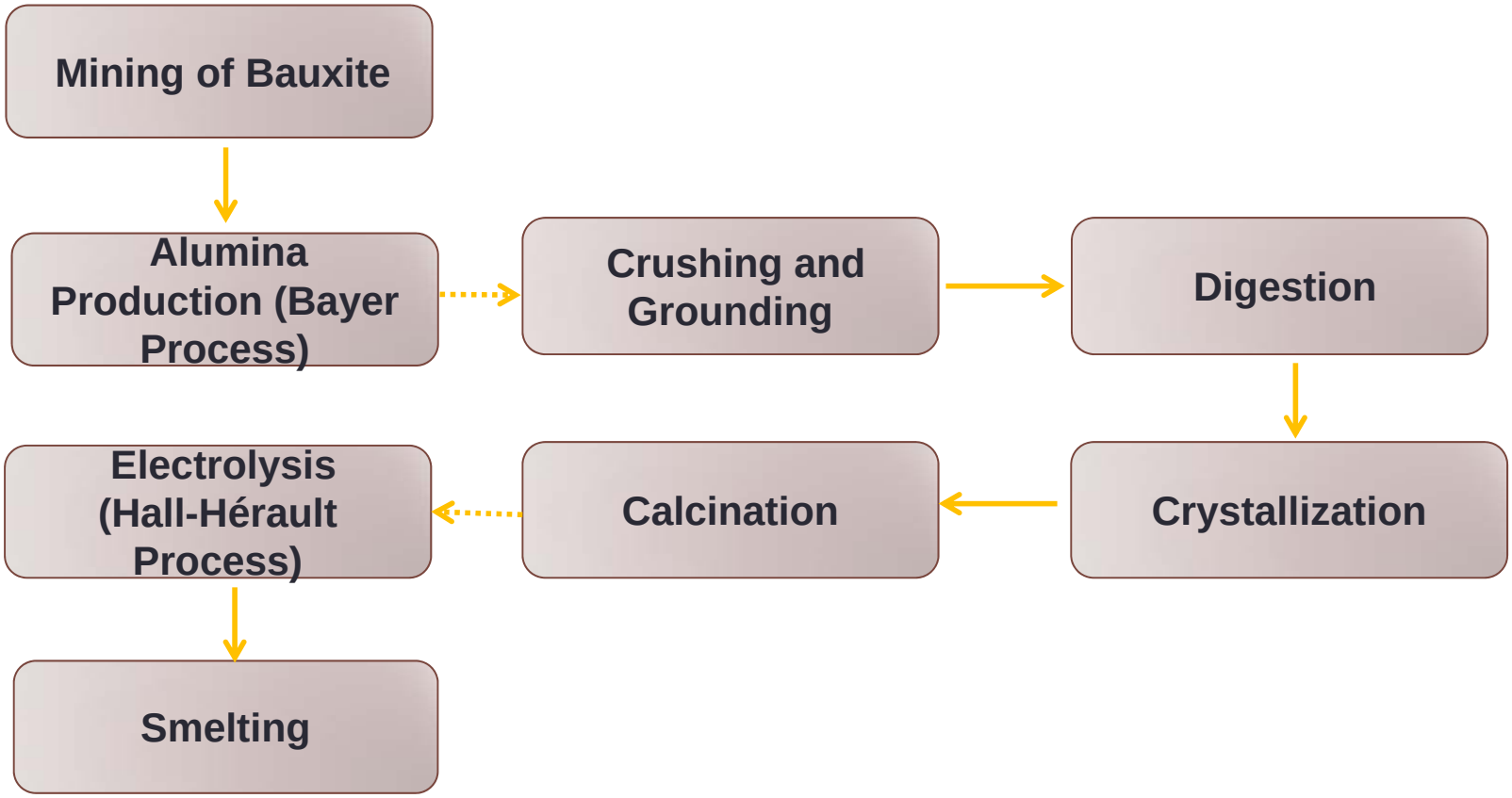



INTRODUCTION

Aluminum is produced in two ways;

- Primary aluminum production
- Secondary aluminum production

PRIMARY ALUMINUM PRODUCTION

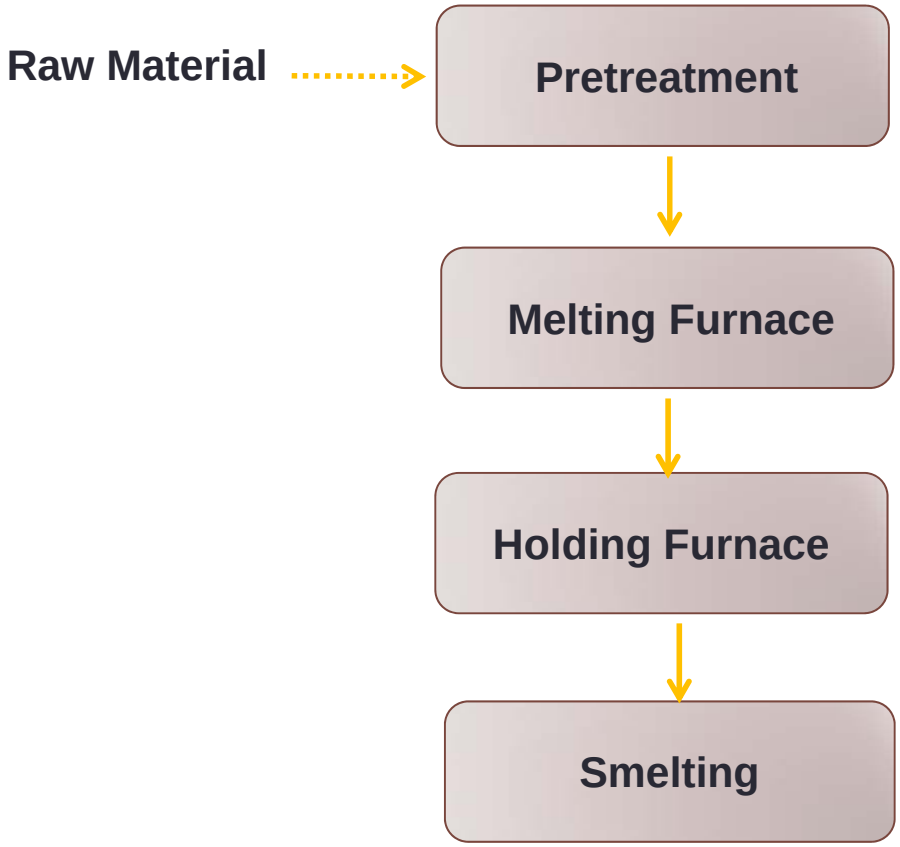


INTRODUCTION

Aluminum is produced in two ways;

- Primary aluminum production
- Secondary aluminum production

SECONDARY ALUMINUM PRODUCTION



PRIMARY VS SECONDARY ALUMINUM PRODUCTION

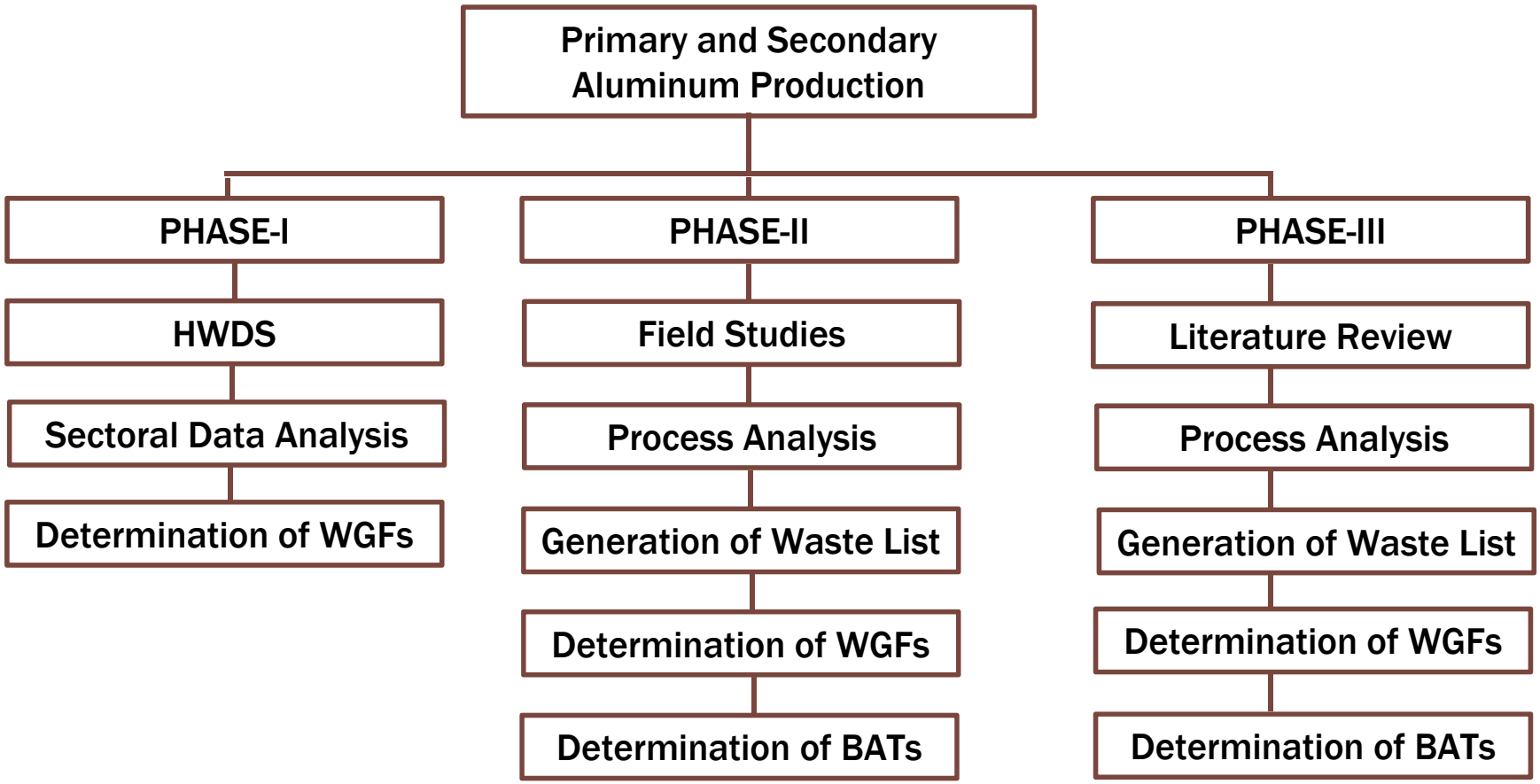
Primary Aluminum Industry	Secondary Aluminum Industry
High investment cost	Low investment cost
High energy consumption	Low energy consumption
Long start-up period	Short start-up period
Consumption of bauxite resources	Preservation of bauxite resources
High level emission	Low level emission

Secondary aluminum production can be categorized as more environmentally friendly than primary production

AIM

- To obtain a solid waste inventory for aluminum production
- To determine waste generation factors (WGFs, kg waste per ton of production)
- To develop and evaluate management strategies

METHODS


Primary and Secondary Aluminum Production
PHASE-I
HWDS
Sectoral Data Analysis
Determination of WGFs
PHASE-II
Field Studies
Process Analysis
Generation of Waste List
Determination of WGFs
Determination of BATs
PHASE-III
Literature Review
Process Analysis
Generation of Waste List
Determination of WGFs
Determination of BATs

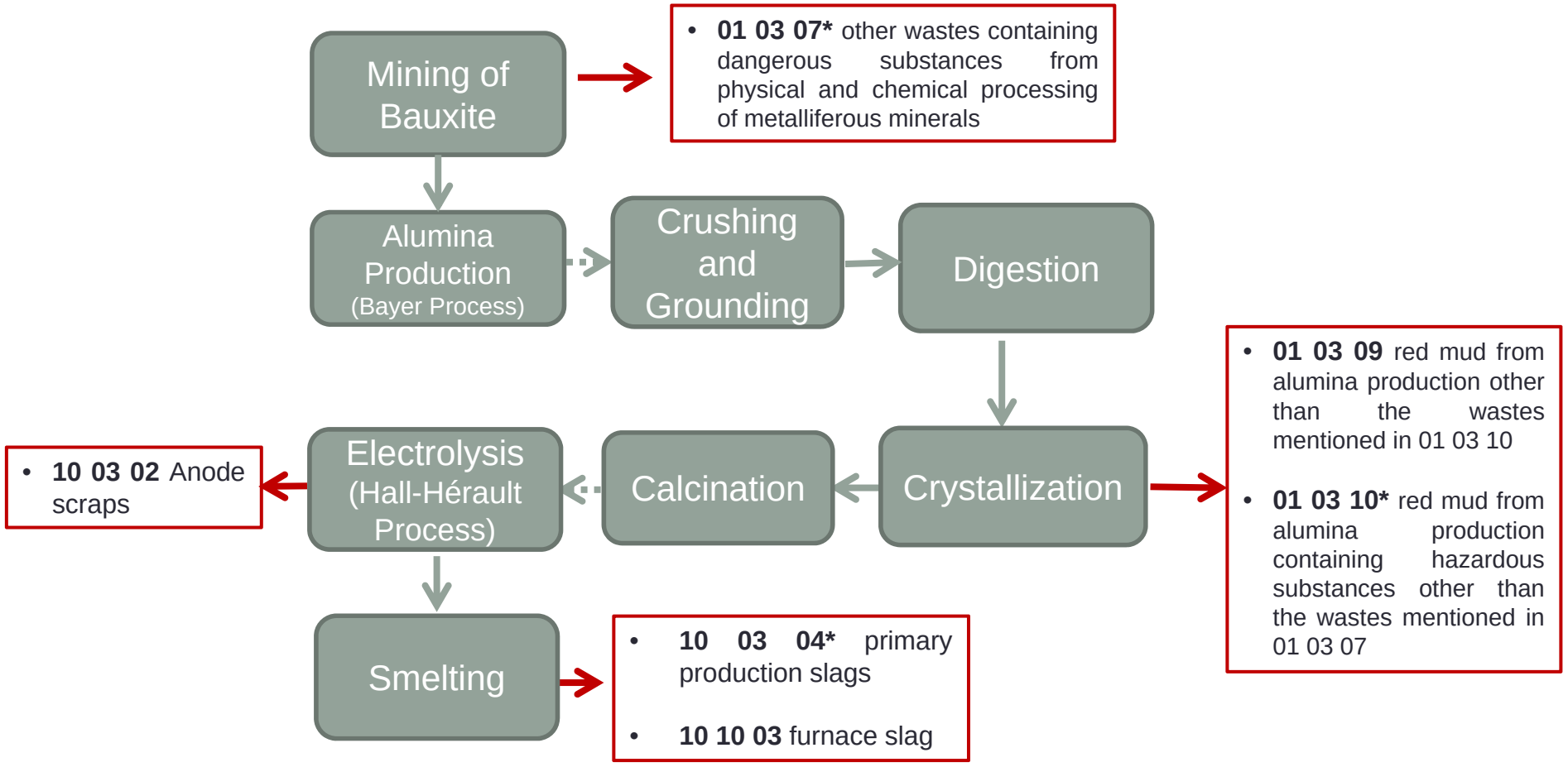
RESULTS AND DISCUSSION

1. Determination of WGFs and Responsible Processes for Waste Generation-**Primary Aluminum Production**

Code	Wastes from primary aluminum production	WGF (kg t^{-1})
01 03	wastes from physical and chemical processing of metalliferous minerals	
01 03 07*	other wastes containing dangerous substances from physical and chemical processing of metalliferous minerals	nd
01 03 09	red mud from alumina production other than the wastes mentioned in 01 03 10	300-2500
01 03 10*	red mud from alumina production containing hazardous substances other than the wastes mentioned in 01 03 07	nd
10 03	wastes from aluminum thermal metallurgy	
10 03 02	anode scraps	10-450
10 03 04*	primary production slags	0.20-20
10 10	wastes from casting of non-ferrous pieces	
10 10 03	furnace slag	nd
TOTAL		310.2-2970

RESULTS AND DISCUSSION

➢ Sources of waste generated in **primary aluminum production**



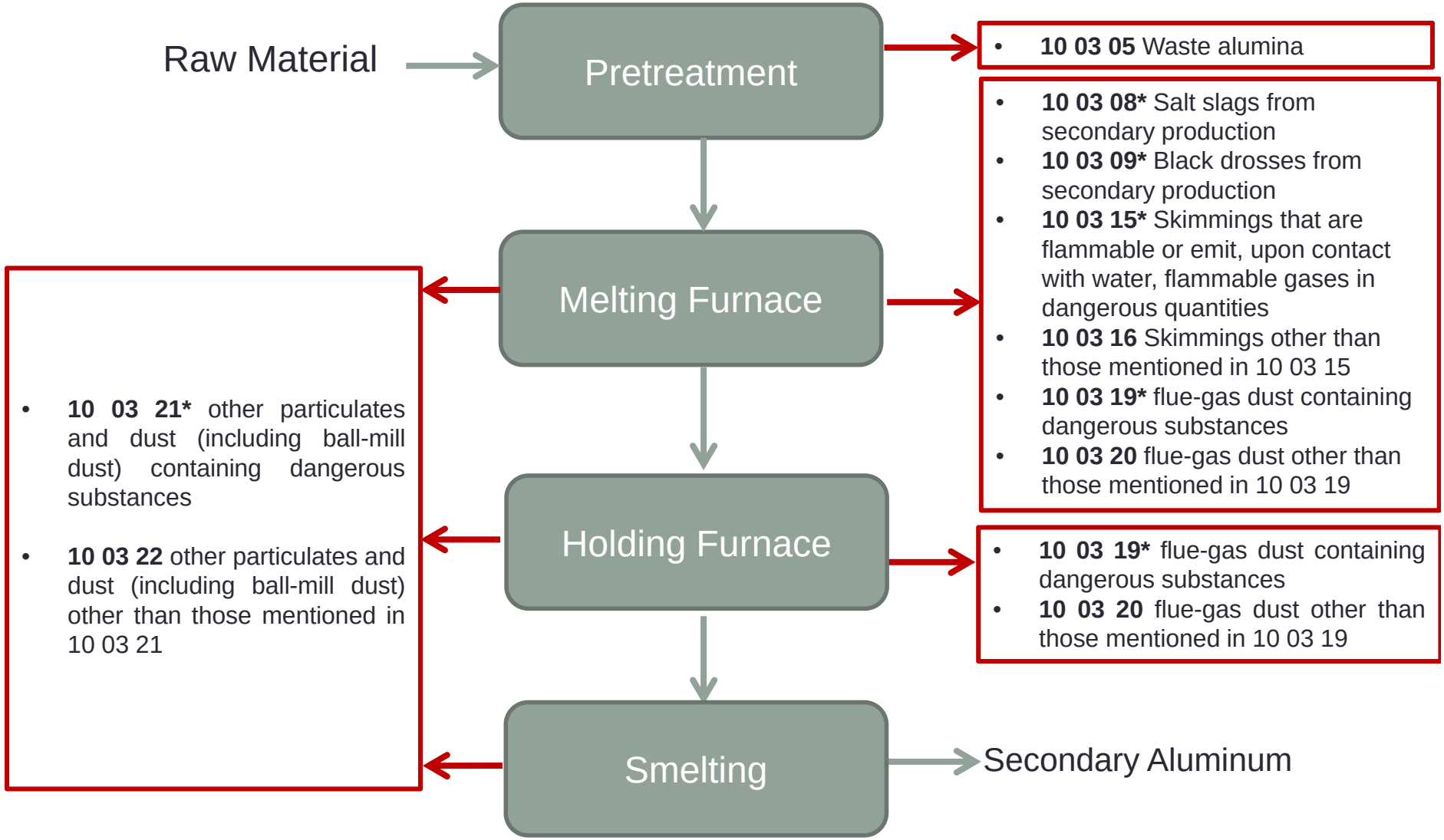
RESULTS AND DISCUSSION

Determination of WGFs and Responsible Processes for Waste Generation-
Secondary Aluminum Production

Code	Wastes from secondary aluminum production	WGF (kg t^{-1})
10 03	wastes from aluminum thermal metallurgy	
10 03 05	waste alumina	nd
10 03 08*	salt slags from secondary production	0.20-500
10 03 09*	black drosses from secondary production	5-676
10 03 15*	skimmings that are flammable or emit, upon contact with water, flammable gases in dangerous quantities	80-120
10 03 16	skimmings other than those mentioned in 10 03 15	
10 03 19*	flue-gas dust containing dangerous substances	0.1-80
10 03 20	flue-gas dust other than those mentioned in 10 03 19	
10 03 21*	other particulates and dust (including ball-mill dust) containing dangerous substances	0.2-1130
10 03 22	other particulates and dust (including ball-mill dust) other than those mentioned in 10 03 21	
TOTAL	**85.5-2506**	

RESULTS AND DISCUSSION

➢ Sources of waste generated in **secondary aluminum production**



RESULTS AND DISCUSSION

2. Development and Evaluation of Management Strategies

- The aim in this part of the study is to investigate the best available techniques (BATs) that can be adopted to the Turkish aluminum industry for a better management of the wastes generated.

- Both in-plant and end-of-pipe BAT alternatives were considered.

RESULTS AND DISCUSSION

Best Available Techniques (BAT)

BEST	AVAILABLE	TECHNIQUES
most effective in achieving a high level of protection of the environment as a whole	developed on a scale to be implemented in the relevant industrial sector, under economically and technically viable conditions, advantages balanced against costs	the technology used and the way the installation is designed, built, maintained, operated and decommissioned

BATs for Primary Aluminum Production

01 03 07* - other wastes containing dangerous substances from physical and chemical processing of metalliferous minerals

01 03 09 - red mud from alumina production other than the wastes mentioned in 01 03 10

01 03 10* - red mud from alumina production containing hazardous substances other than the wastes mentioned in 01 03 07

- Used as an alternative raw material in ceramic industry, building material,
- catalyst in chemical industry

10 03 02 - anode scraps

- Using inert anodes instead of anodes that include carbon

10 03 04* - primary production slags

10 10 03 - furnace slag

Used in;

- secondary alumina production
- cement industry as additive material
- iron and steel industry as synthetic slag maker.

BATs for Secondary Aluminum Production

10 03 08* - salt slags from secondary production

Used in;
- secondary alumina production,
- cement industry as additive material
- iron and steel industry as synthetic slag maker,
- as salt flux in aluminum industry
- catalyst production in chemical industry .

Use of metal pumping or a stirring system and use of a tilting rotary furnace to improve efficiency and reduce salt usage

10 03 05 - waste alumina

10 03 09* - black drosses from secondary production

10 03 15* - skimmings that are flammable or emit, upon contact with water, flammable gases in dangerous quantities

10 03 21* - other particulates and dust (including ball-mill dust) containing dangerous substances

10 03 22 - other particulates and dust (including ball-mill dust) other than those mentioned in 10 03 21

Used in;
- secondary alumina production
- cement industry as additive material
- iron and steel industry as synthetic slag maker
- aluminum industry as salt fluxes
- chemical industry for catalyst production

10 03 19 - flue-gas dust containing dangerous substances

The use of bag filters as in-plant BAT

CONCLUSIONS

- Three phase approach which considers literature review, field studies and waste declaration system was followed.
- Situation of both primary and secondary aluminum production sector in Turkey was revealed by providing a summary of their production processes and generated wastes from each process.
- Range for the amount of waste generated per unit aluminum production, WGFs, was identified.
- Although total amount of waste generated is substantially higher in primary production, secondary production is dominant sector in terms of hazardous waste generation.
- In-plant and end-of-pipe BAT alternatives can be applied to the aluminum production wastes.
- In cases where BATs cannot be applicable, metals can be recovered from waste because of its aluminum content.


thank you
danke
謝謝
ngiyabonga
рахмат
teşekkür ederim
спасибо
gracias
merci
obrigado
bedankt
dziękuję
go raibh maith agat
sukriya
kop khun krap
terima kasih
grazie
arigatô
dakujem
mochchakkeram
tapadh leat
mauruuru
hvala
sagolun
taiku
takk
merci
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najis tuke
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rahmet
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