

# COAL BENEFICIATION TO INCREASE EFFICIENCY AND LOWER EMISSIONS PANEL

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# HEAD LINES

- \* **Fine Coal Beneficiation**
- \* **De-Sulfurization and de-ashing by Thermal Treatment and Magnetic Separation**
- \* **Beneficiation of Turkish Low-rank coal by semi coking**

# FINE COAL BENEFICIATION

Beneficiation of fine coal (slimes) by using MGS (Multi Gravity Separator) representative fine coal contains about 67 % ash. By using MGS two types clean coal can be obtained.

A super quality clean coal having 9.69 % ash content was obtained as 7.3 % by weight.

Second quality clean coal having 28.48 % ash content can be produced as 14.2 by weight.

Final tailings can be discarded with 78.5 % weight fraction and 78.10 % ash content.

Super quality clean coals can be used as a pulverized coal.

Second quality clean coal can be evaluated in power plant or domestic uses after briquetting.



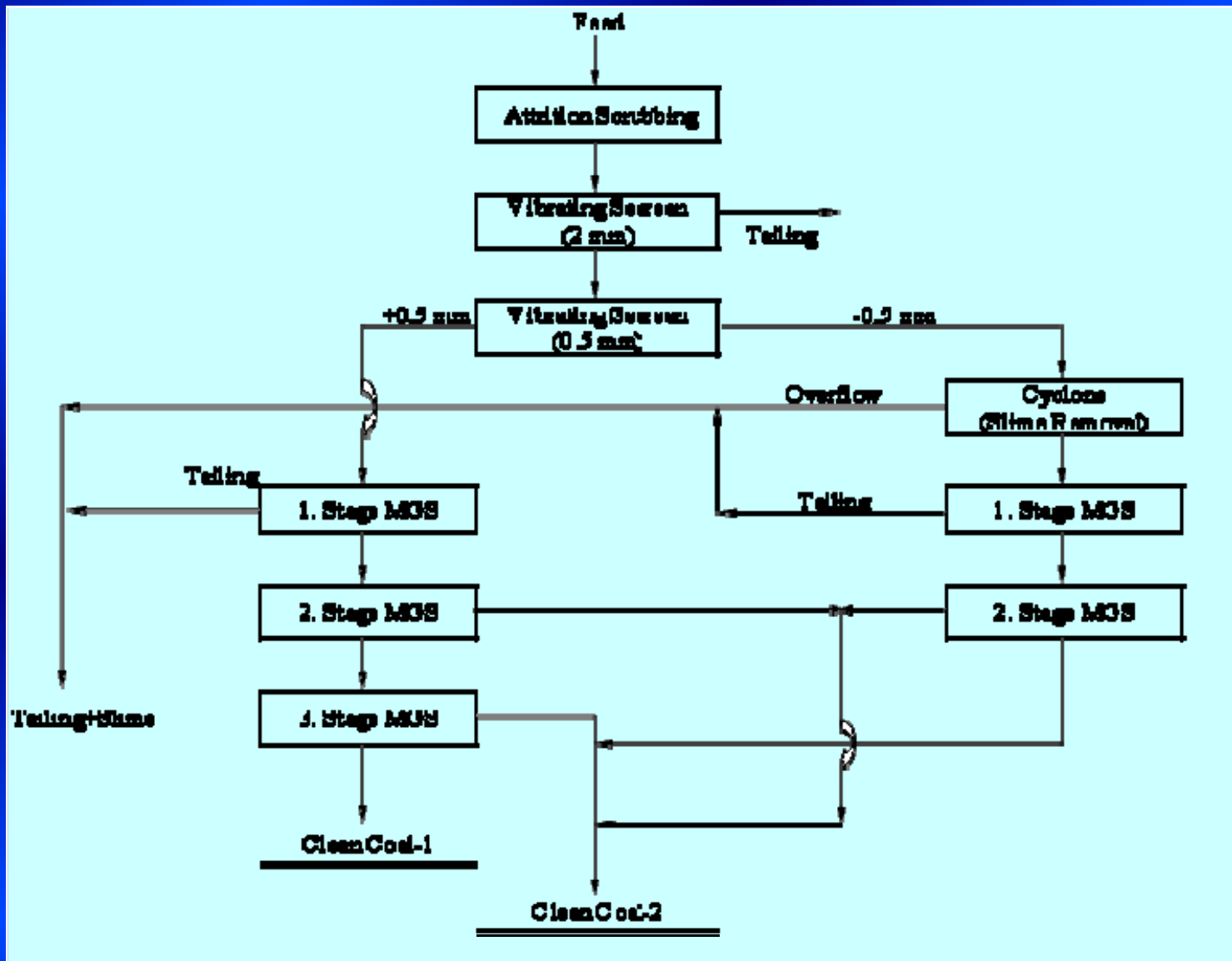
# MGS Tests

Test conditions for C900 type MGS were fixed as follows;

- \* Feed : 21/min
- \* Pulp density : 10 %
- \* Amplitude : 15 mm
- \* Slope : 20
- \* Drum speed : 240 rpm

## The MGS Results of Fine Coals

Products	Weight, %	Ash		
		%Content	% Distribution	%Combustible Recovery
Clean Coal-1	7.3	9.69	1.1	19.6
Clean Coal-2	14.2	28.48	6.1	33.0
Tailings (-0.038mm)	78.5	78.10	92.8	47.4
Feed	100.0	66.28	100.0	100.0



## The Flowsheet of MGS Tests by Using Soma Slimes

# DE-SULFURIZATION AND DE-ASHING BY THERMAL TREATMENT AND MAGNETIC SEPARATION

Thermal treatments of lignites were conducted in a horizontal rotary kiln with volume  $V= 13$  l, allowing the treatment of samples in vacuum and high pressure.

High Intensity Magnetic separator REMS (Rare-earth magnetic separator 21000Ga) was used for separation of samples.

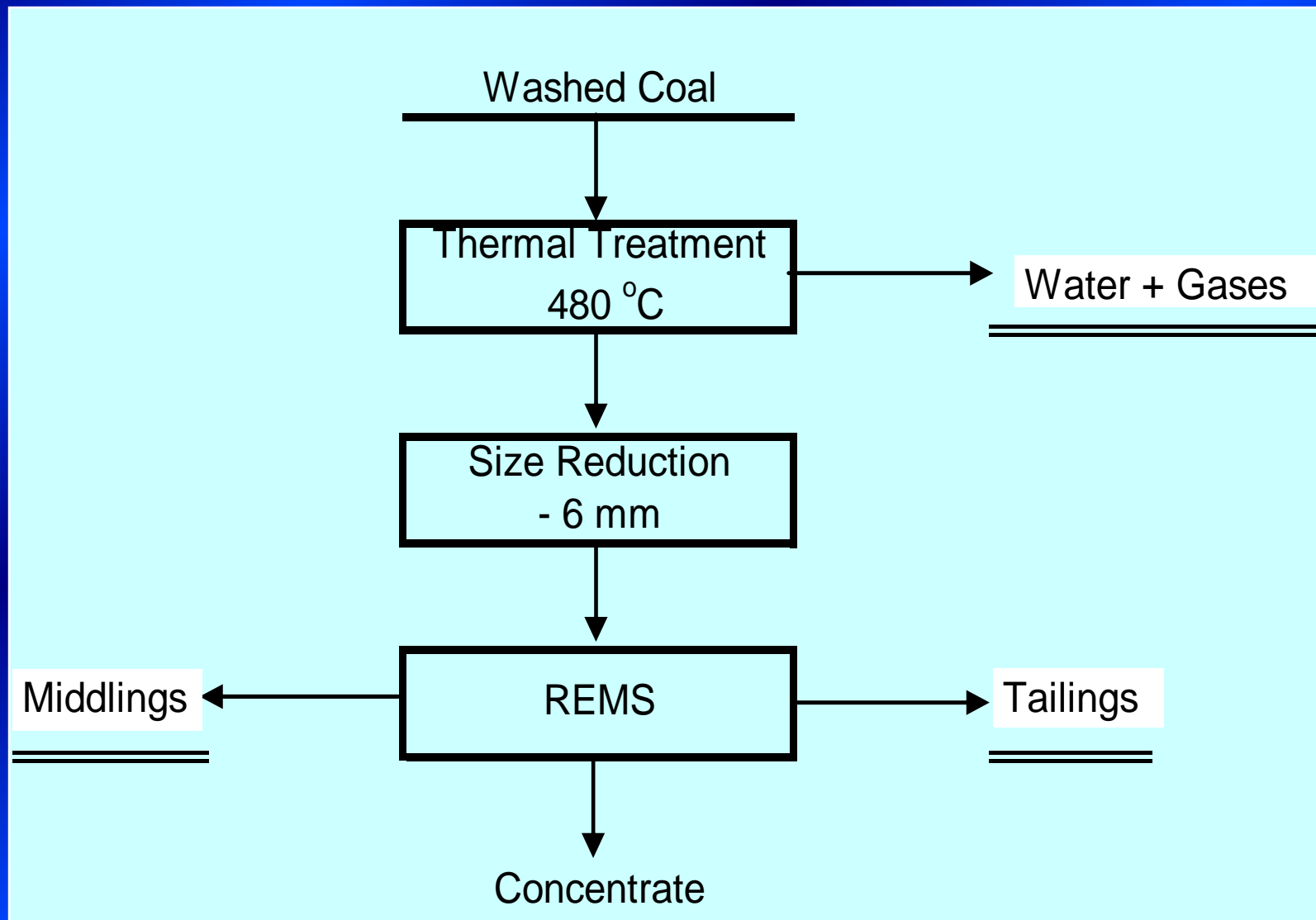


## Properties of washed Tavşanlı-Ömerler Lignites (on dry basis)

<b>Elements</b>	<b>%</b>	<b>Kcal/kg</b>
Ash	15.16	---
Total Sulphur	3.98	---
Volatile matter	39.37	---
Fixed Carbon	41.49	---
Upper Cal. Value	---	5877
Lower Cal. Value	---	5620

# Analysis results of semi coke and REMS magnetic separation products.

Products	Semi coke	Concentrate	Middlings	Tailings
Weight, %	63.87	9.9	41.3	48.8
Total Sulphur, %	3.45	1.27	2.37	4.85
Ash, %	19.23	8.50	17.28	24.56
Volatile Matter, %	20.45	22.08	21.13	20.35
Fixed Carbon, %	56.87	68.15	59.22	50.24
Upper Calorific Value, Kcal/Kg	6396	6727	6099	5445



## Thermal Treatment and Magnetic Separation

# BENEFICIATION OF TURKISH LOW-RANK COAL BY SEMI COKING

The technical analysis of the low temperature carbonization process have been conducted. A flowsheet for a 1000 t/h ROM coal and mass balance calculations have been performed based on the experimental results.

Under the optimum conditions, 1.914.000 tpy semicoke, 363.000 tpy tar and 452.000 tpy gas are produced from the cleaned coal.



## Chemical Analysis of Washed Coal

Moisture %	35.0
Ash % (dry)	11.4
Volatile matter % (dry)	42.0
Total Sulphur % (dry)	2.55
Lower Heat Value Kcal/kg (dry)	4387

## Chemical Analysis of Semi Coke

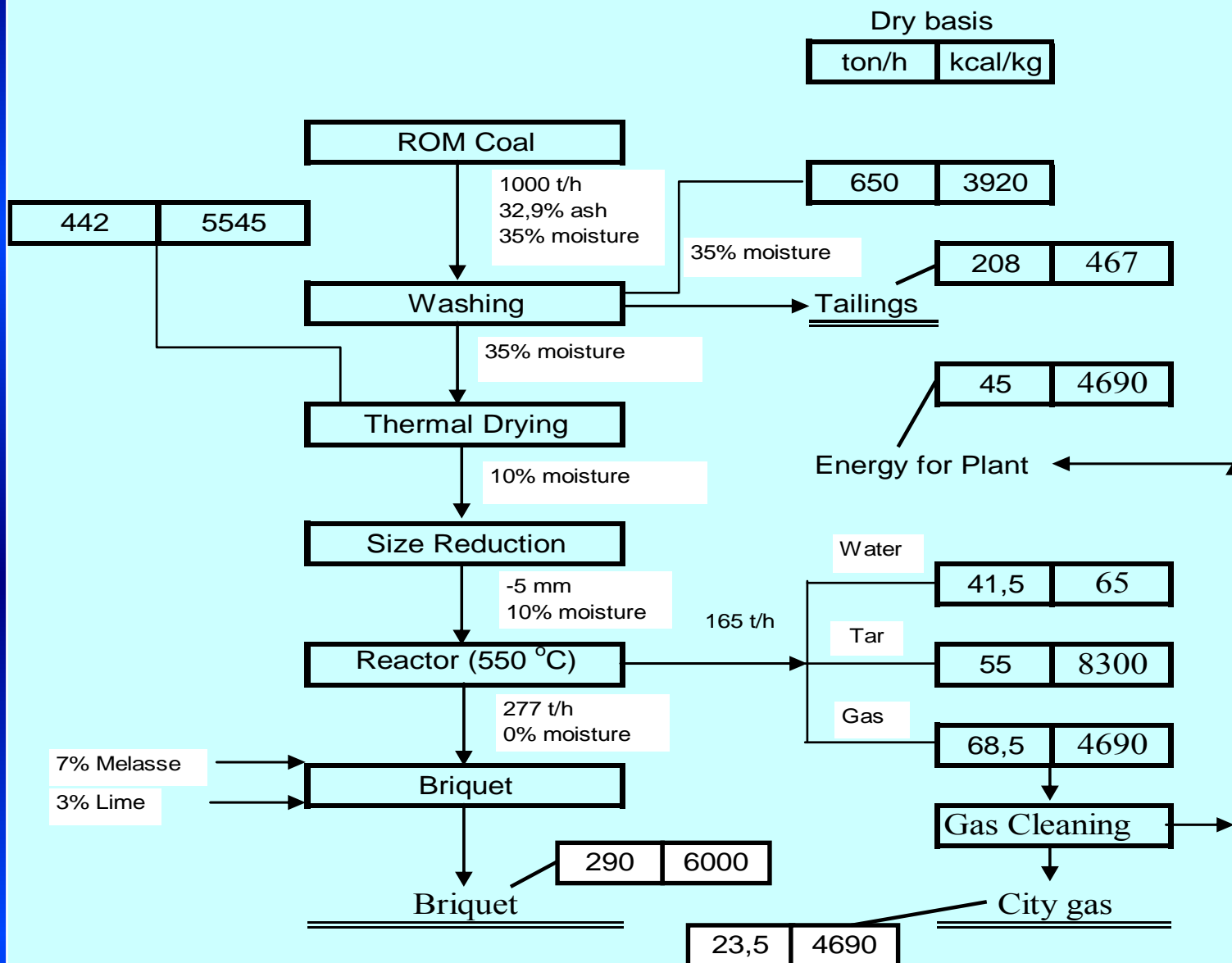
Moisture %	0.0
Ash %	19.1
Volatile matter %	15.0
Total Sulphur %	1.59
Upper Heat Value Kcal/kg	6030

## Material Balance of Semi Coking at 550 oC

Products	%
Semi coke	62.7
Gases	15.5
Tar	12.4
Water	9.4

# Chemical Analysis of Gases Depending on Temperature

Temperature °C	450	550	650
Amount of Gases ml/g	43.2	150.2	204.5
Content of Gases by Volume (%)			
H <sub>2</sub>	3.6	10.4	20.0
CO	33.4	24.04	16.2
CK	37.7	43.56	43.3
C <sub>2</sub> H <sub>4</sub>	1.0	0.56	0.35
C <sub>2</sub> H <sub>«</sub>	2.3	1.69	1.3
CO <sub>j</sub>	17.8	18.1	16.3
H <sub>2</sub> S	4.43	2.1	2.1



## Process Flow-Sheet and Material Balance of Semi Coking

*Thank you for your attention...*