



Recycle
Energy



5D ZERO EMISSION / ZERO WASTE / ZERO EMISSION / MORE ENERGY



We are on a different and more environmentally friendly way than known energy sources. This allows us to produce more energy.

5D RECYCLE & ENERGY



PLASTIC WASTE TO **ENERGY**

ENERGY AND PYROLYCTIC
OIL PRODUCTION FROM
PLASTIC WASTE
(By Pyrolysis process)



INDEX

- 1- **Plastic Waste** Problem
- 2- **Environmental Pollution**
- 3- Plastic Waste **Disposal** Problem
- 4- What is **Pyrolysis**?
- 5- Pyrolysis **Process**
- 6- Energy Production from Plastic Waste **Plant Field**
- 7- Pyrolysis Process **Flow Chart**
- 8- **Energy** from Waste
- 9- **Type of Productions by Pyrolysis process**
- 10- Pyrolytic **Oil**
- 11- The Use of **Pyrolytic Oil**
- 12- Charcoal +**Parain**
- 13- Gas **LPG**
- 15- Pyrolysis **Process** vs. Other Technologies
- 16- Process **Effectiveness**
- 17- About the **Company**
- 19- **Calculation of** Investment and Income
- 22- **Analyses Result** of Pyrolytic Oil





Plastic Waste Problem



Plastic waste problem is very serious concern to the natural World. Waste problem is becoming more threatening to Environment, Finance and especially to Public Health.



Environment



Plastic Waste Disposal Problem



Dangerous Gas Leakage



Fire and Explosion



Hazard of Public Health



Environmental Pollution



144 TON

Plastic waste being disposed to sea everyday in Turkey

As per specialists, The harm to sea eco-system by plastic waste is around **13 billion** **usd**.



31 MILLION TON

domestic waste being produces in Turkey in every year.

12%

Plastic waste is 12% of the domestic wastes.



Plastic Waste Disposal Problem



Very limited part of plastic waste can be recycled, however, rest of plastic wastes being end up in landfill.



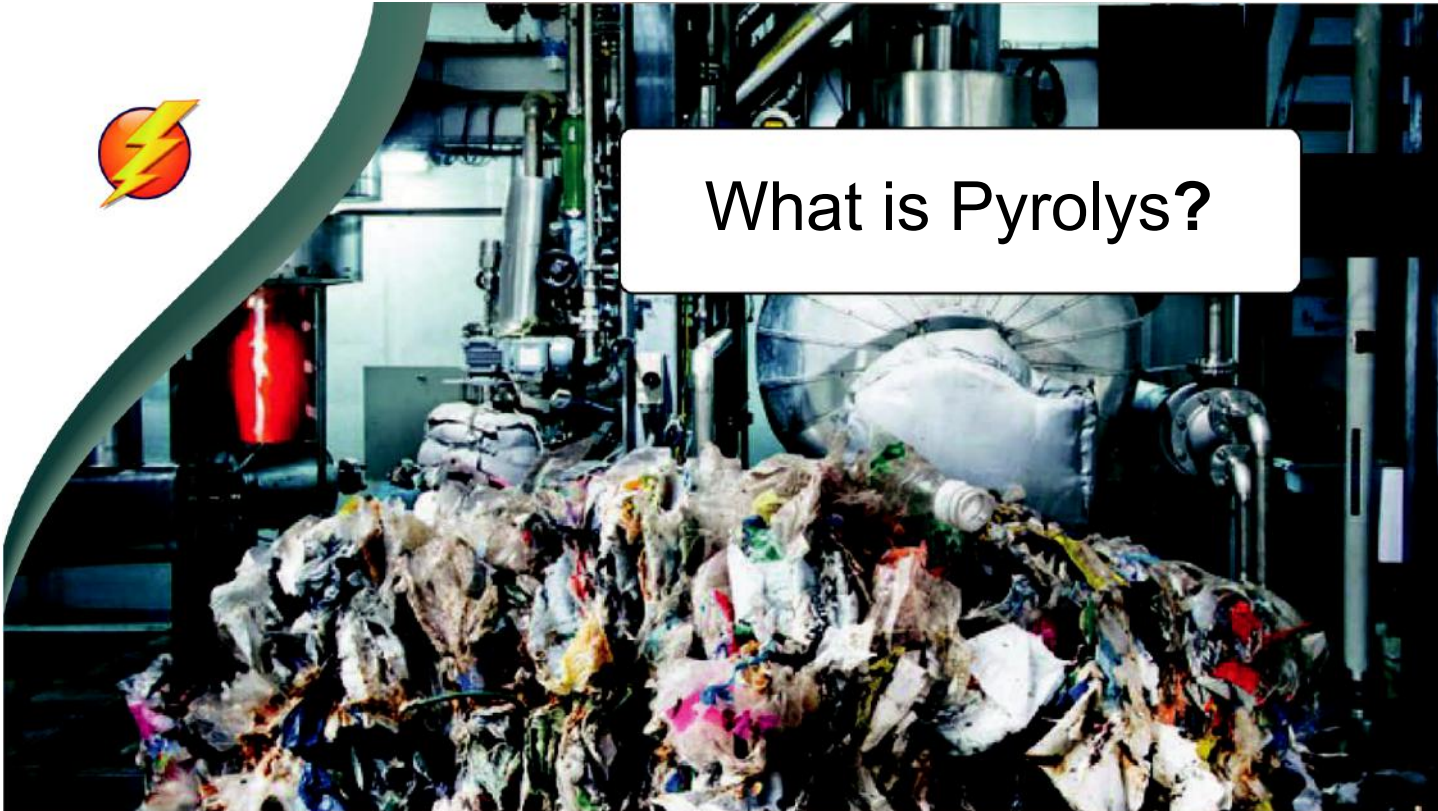
Plastic wastes are not organic and being dumped in landfill with other wastes.



This process is causing environmental pollution and serious harm to the environment.



What is Pyrolysis?



1

Organic and
Plastic wastes



2

Being heated upto
1000 °C



“pyro”
Heat

3

In an oxygen
Free atmosphere



“lyse”

Decomposing

4

Decomposing in
solid, liquid and gas form

4

“pyrolyse”



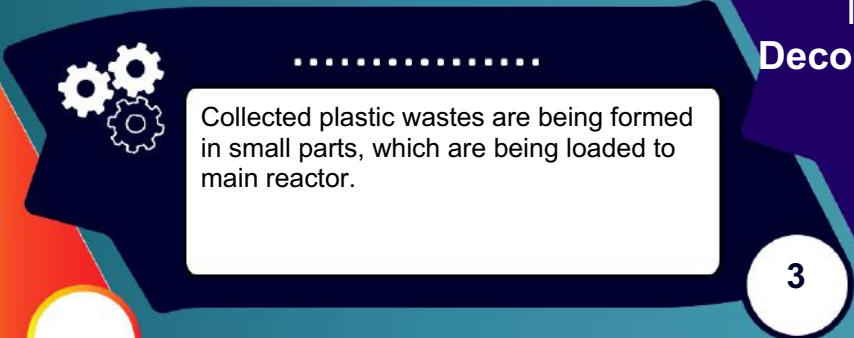
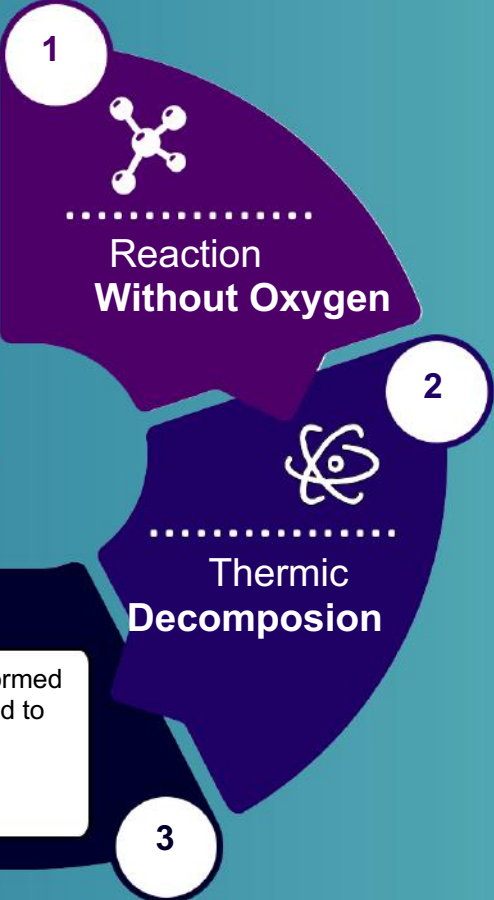
PYROLYSE PROCESS



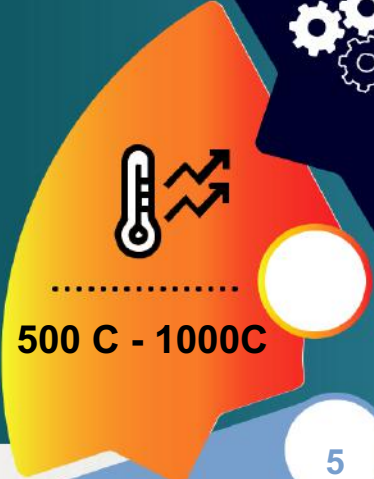
Solid Plastic Waste



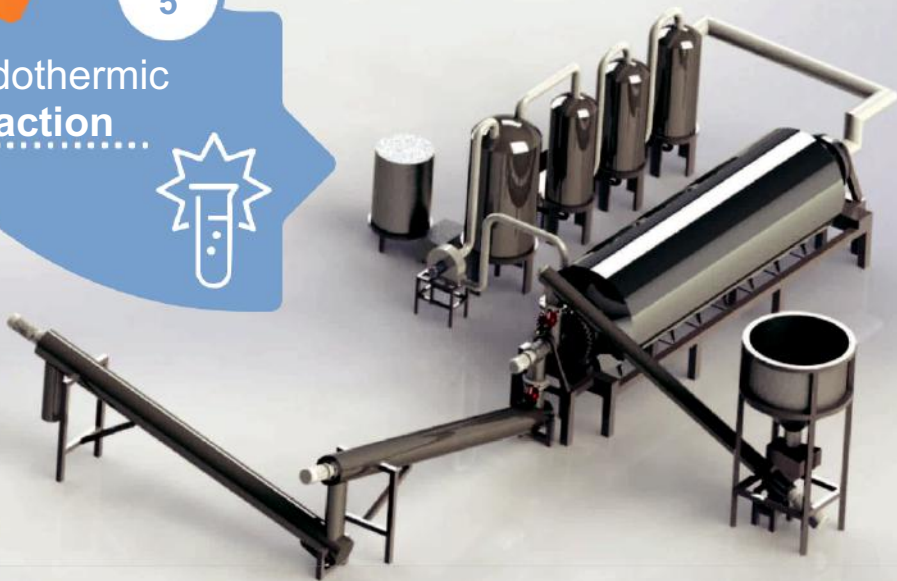
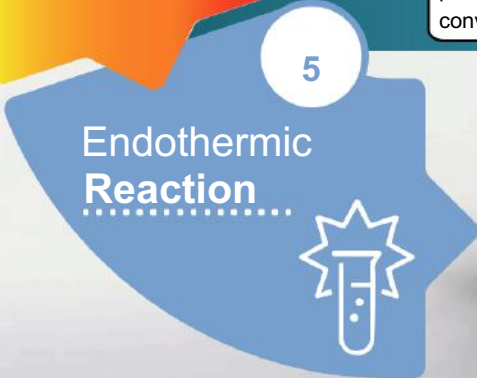
Plastic wastes, which not being recycled and to be dumped in landfill, are being used as raw material of the process.



Collected plastic wastes are being formed in small parts, which are being loaded to main reactor.

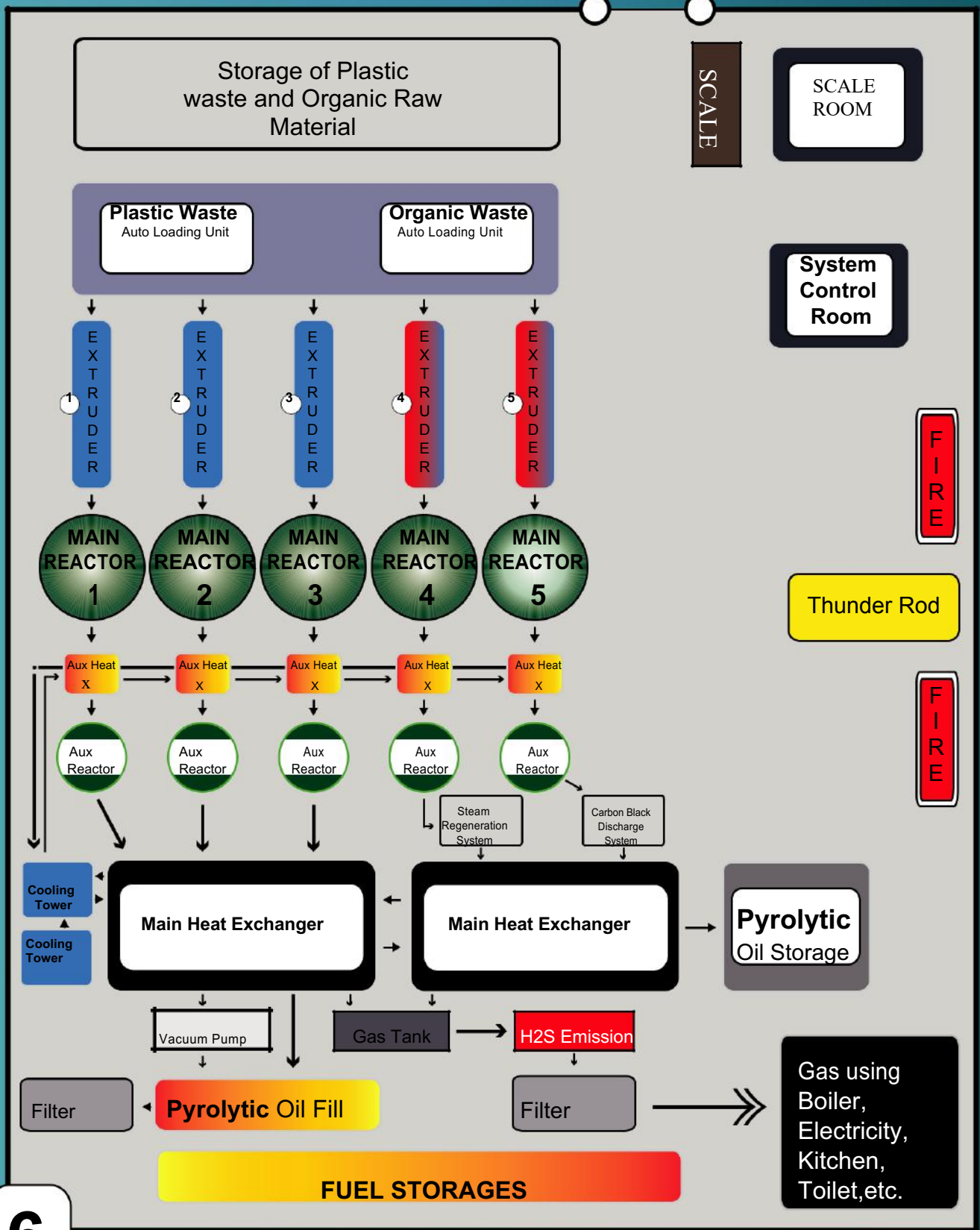


Electrical energy is being used to heat up to **500-1000 celsius** in order to thermal decomposition of plastic wastes in the main reactor. The process getting speed once gas reach from main reactor to catalytic converter.



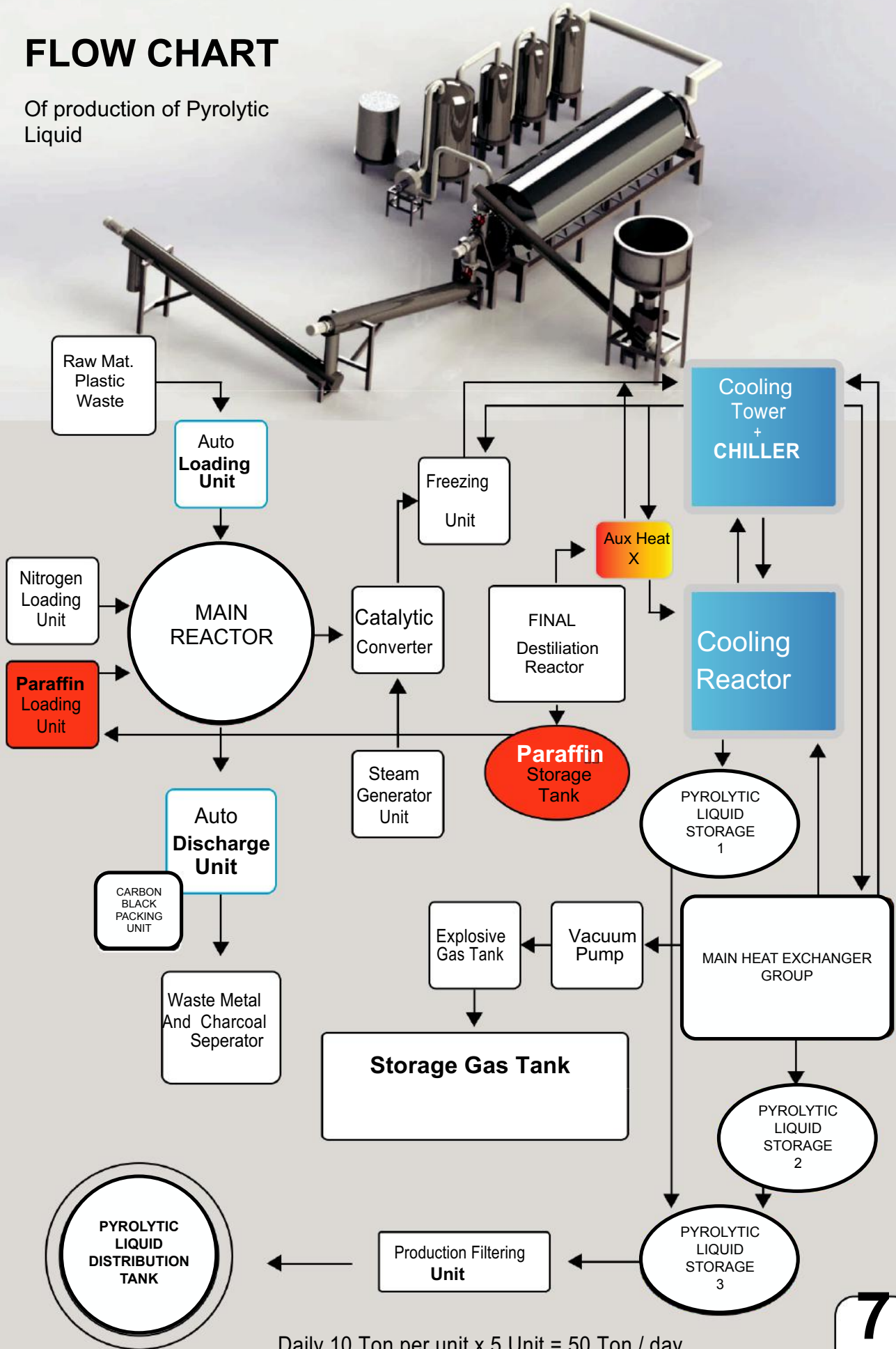
At ambient temperature, the gases is being condensed to Pyrol Carbon black and Paraffin by the auxiliary reactor.

Energy Production from Plastic Waste Plant Field



FLOW CHART

Of production of Pyrolytic Liquid



Daily 10 Ton per unit x 5 Unit = 50 Ton / day

WASTE TO ENERGY

Energy can be produced from plastic waste by **Pyrolysis Process**;

- Plastic bags
- Polypropylen plastics (PP)
- Polyethylen plastics (PE)
- Polystyrens (PS)
- Bags, Packing
- Mixed Plastics
- Plastics dumped in Landfill



* Decomposed elements are to be recycled and re-used by the industry base on types.

• **Organic Pyrolysis Process;**

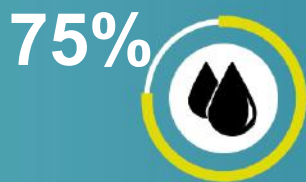
Additionally;

It is possible to install a process to pyrolysis organic, inorganic and used lube oils which can not be recycled.

TYPE OF PRODUCTION BY PYROLYSES PROCESS



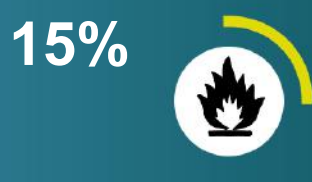
Type Of Productions | Percentage %



Pyrolytic Liquid.



Carbon Black.



Gas and Paraffin



PYROLYTIC OIL

Pyrolytic oil samples as below,
produced from Plastic and tyres
10500-10700 kcal/kg



Produced Pyrolytic Oil has high calorific value (min 10.500 kcal) and the least emission values.

<u>Fuel Type</u>	<u>Calorific Value</u>
Liquified Petroleum Products →	8.300 - 9.000 kcal/kg
Clean Petroleum Products →	10.000 - 10.200 kcal/kg
PYROLYTIC OIL →	10.500-11.000 kcal/kg



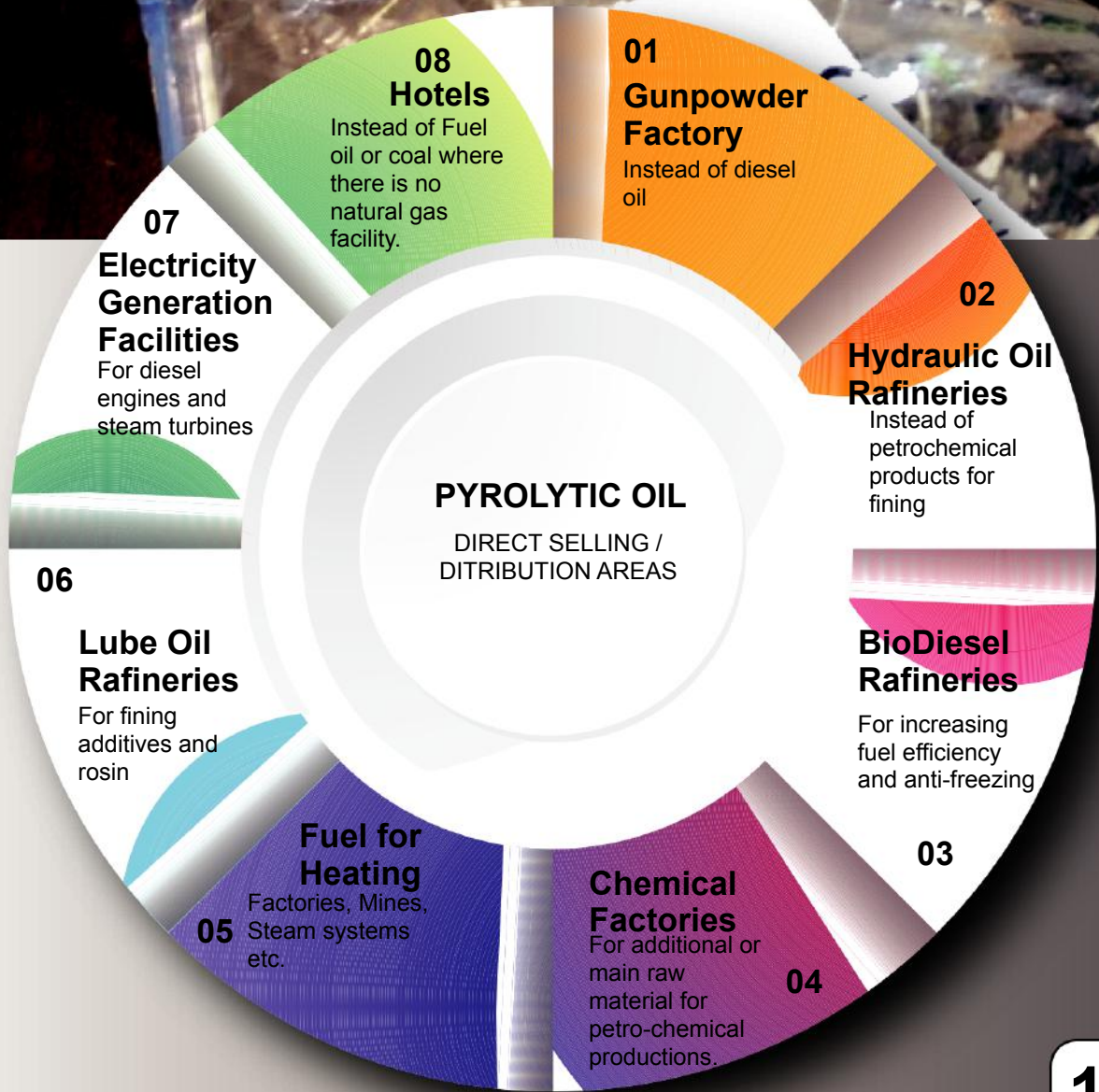
10

Final distillation rate is %95 and K1 Pyrolysis Oil



PYROLYTIC OIL

Where to use





CARBON BLACK

Pyrolytic Liquid samples as below,
produced from Plastic and tyres
10500-10700 kcal/kg

Solid Product (**char**) is being used as fuel and also used for chemical industry and metallurgic purposes. During pyrolytic process, certain amount of char is being produced by the main reactor unit.



Produces carbon black (Char) can be used for colouring black, hose production and organic fertilizer production.



PARAFFIN

50 °C liquid
10.500 – 10.700 kcal/kg

Paraffin is being used in very common areas.

Where to use Paraffin?

There is common areas such that pharmacy, textile, cosmetic factories, packing and storing of foods, farming, production of electrical equipments etc.

Paraffin has benefit for isolation by its passivity and not reacting with other materials.





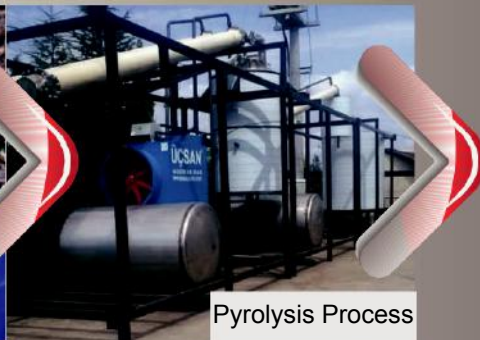
GAS - LPG

There is apx %10-15 gas can be produced by the pyrolytic process.

The pyrolytic gas, which is not condensed during the process, is have better calorific value than natural gas.



Solid Waste



Pyrolysis Process



Gas (LPG)

Pyrolytic process have capacity to accumulate pyrolytic gas by %10-15 (1.000 - 1.500 m³/day), which is considerable energy potential.



Non-condensed gas is being cooled and stored in waste gas storage tank.

Once reached up to required volume, gas is storing by compressors in liquid form to use for facility requirements.





WASTE TO ENERGY



01



Plastic wastes, which are not recycled or re-used are being dumped in landfill.

This is very serious loss for nature and economy.

02



Pyrolytic oil have advantageous calorific values, that appropriate to produce electricity.

Despite to common fossil wastes such as LPG, LNG, CNG etc; Energy production by pyrolytic process (from plastic wastes) is very simple and efficient solution for industries to produce electricity and power.

**SOLUTION
IS
PYROLYTIC
PROCESS**

The Advantages of Pyrolytic Process



In pyrolytic process, there is no hazardous gases such as Dioxin and Furan.

Therefore, there is no requirement for expensive emission control systems.



Process is self-sufficient.

Therefore, process is not required any fuel but only start up.



Pyrolytic process is developed to provide zero waste. Each output material can be used and sold on demand.



Process can use any raw material which require low or high temperatures.



Efficient and faster to produce energy.



Process is faster such that production in minutes despite to other system which can take apx 35 days.



Process require less space and can produce more production comparing to other systems.



Profit of the process is higher than any alternative method.



PROCESS EFFECTIVENESS IN MODULAR STRUCTURE

Planned process structure is base on capacity of 10 tonnes per day. Capacity can be improved as long as process facility is made in modular structure.



Pyrolytic process is developed in order to avoid any loss of efficiency during production. In case of any unit failure / trouble; production can be maintained at same level by increasing of capacity of other two units by %12.

Pyrolytic process have the least emission values and environmental friendly.



About the Company

Leader in the Recycling



Best Engineering



Domestic Production

New Generation Reactor



Innovative



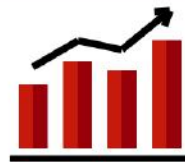


The supplied materials (Organic wastes) of BIOGAS technology is %65 of solid wastes.



The rate of plastic wastes which can not be recycled by the BIOGAS Tehcnology is %35.


%35



Pyrolytic process is very important for environmental protection and saving for country economy.



Daily
30 Tonnes
Plastic Wastes

 If using Pyrolytic oil for electricity generation

 25.000 liters Oil

by 1 liter fuel, producing 5 Kw/h electricity 

Daily
25.000 liters
x
5 Kw/h
≡ 125.000 Kw/h

4 Million Kw/h Monthly

Yearly 48.000 Mw/h





Analyses Result of Pyrolytic Oil

TUBITAK ENERJI Print Date : 08.11.2016 10:02
Herzog MP 626 - HDA 627/628 Unit Number : 1 - 6271063-1
 Software - Version : HDA 1.0K

Sample number : k-1 parvina 95Kam
 Sample Description : CRM 1002 TMG 020778
 Date of Measurement : 07.11.2016 09:20:06

Dist. Standard : ASTM D 96 - 02
 Dist. Group : 2
 Thermometer : TC/TF
 Measurement Program : KSB

Condition	Result	Value	Heat Temperature 1 : 180 °C
Temperature Start :	5 °C	18 °C	Initial Heat Temperature 2 : 420 °C
Temperature Delta :	5 °C	0 °C	Initial Heat Distillation : 300 s
Temperature End :	5 °C	18 °C	Distillation Rate : (4.5) ml/min

Distillation end detection : max. Temperature and Dropout
 DE temperature decrease : 2 °C
 Dry point detection : without
 Dry point delay : 0 s
 Last correction at : 93 vol %
 Last correction - value : 0 %
 Max. Time after FBP : 5 min

Corrections of temperatures : automatic corr. acc. D-86 / Evap. corr.
 Barometric Pressure : 999.9 mPa
 Distillation Residue : 0.6 ml
 Recovery : 99.9 vol % (observed 99.9 vol %)
 Distillation Loss : 0.4 ml (observed 0.4 ml)
 Stop Point : - 99.7 °C
 DI Value : 453.7
 Boiling Range : 112.9 °C

Corrected Volume	Temperature	Observed Volume	Temperature
BP	41.3 °C	BP	40.7 °C
Distillation point	22.8 ml	22.8 ml	70.0 °C
Distillation point	79.0 ml	79.4 ml	70.0 °C
Distillation point	96.8 ml	96.3 ml	150.0 °C
Distillation point	99.9 ml	99.9 ml	152.8 °C
Distillation point	100.0 ml	100.0 ml	162.7 °C
Distillation point	100.0 ml	100.0 ml	181.0 °C
Distillation point	100.0 ml	100.0 ml	113.0 °C
Distillation point	100.0 ml	100.0 ml	123.5 °C

TUBITAK ENERJI Print Date : 08.11.2016 10:03
Herzog MP 626 - HDA 627/628 Unit Number : 1 - 6271063-1
 Software - Version : HDA 1.0K

Sample number : k-1 parvina
 Sample Description : CRM 1002 TMG 020778
 Date of Measurement : 07.11.2016 13:57:47

Dist. Standard : ASTM D 96 - 04
 Dist. Group : 4
 Thermometer : BC/SP
 Measurement Program : CRM 1002

Condition	Result	Value	Heat Temperature 1 : 420 °C
Temperature Start :	40 °C	23 °C	Initial Heat Temperature 2 : 520 °C
Temperature Delta :	0 °C	0 °C	Initial Heat Distillation : 300 s
Temperature End :	40 °C	23 °C	Distillation Rate : 4.5 ml/min

Distillation end detection : max. Temperature
 DE temperature decrease : 2 °C
 Dry point detection : without
 Dry point delay : 0 s
 Last correction at : 93 vol %
 Last correction - value : 5 %
 Max. Time after FBP : 5 min

Corrections of temperatures : automatic corr. acc. D-86 / Evap. corr.
 Barometric Pressure : 996.9 mPa
 Distillation Residue : 4.0 ml
 Recovery : 97.0 vol % (observed 1.0 vol %)
 Distillation Loss : 0.0 ml (observed 0.0 ml)
 Stop Point : 106.2 ml / 177.8 °C
 DI Value : 484.3
 Boiling Range : 214.45/388.3 °C

Corrected Volume	Temperature	Observed Volume	Temperature
BP	40.8 °C	BP	40.3 °C
Distillation point	16.8 ml	16.8 ml	50.0 °C
Distillation point	71.9 ml	72.0 ml	100.0 °C
Distillation point	81.9 ml	82.0 ml	100.0 °C
Distillation point	93.0 ml	93.0 ml	150.0 °C
Distillation point	93.0 ml	93.0 ml	150.0 °C
Distillation point	93.0 ml	93.0 ml	150.0 °C
Distillation point	93.0 ml	93.0 ml	150.0 °C
Distillation point	93.0 ml	93.0 ml	150.0 °C

TUBITAK ENERJI Print Date : 08.11.2016 10:03
Herzog MP 626 - HDA 627/628 Unit Number : 1 - 6271063-1
 Software - Version : HDA 1.0K

Sample number : k-1 parvina
 Sample Description : CRM 1002 TMG 020778
 Date of Measurement : 07.11.2016 13:57:47

Time	Dist. rate	Dist. temp.	Barom. corr.	Evap. corr.
0%	116.0 s	40.3 °C	46.8 °C	46.8 °C
1%	0.6 ml/min	52.1 °C	52.6 °C	52.6 °C
2%	2.4 ml/min	55.2 °C	55.7 °C	55.7 °C
3%	3.9 ml/min	56.9 °C	57.4 °C	57.4 °C
4%	4.9 ml/min	58.5 °C	59.1 °C	59.1 °C
5%	67.0 s	59.0 °C	60.1 °C	60.1 °C
6%	4.2 ml/min	60.5 °C	61.1 °C	61.1 °C
7%	5.4 ml/min	61.4 °C	61.9 °C	61.9 °C
8%	6.3 ml/min	62.3 °C	62.8 °C	62.8 °C
9%	5.9 ml/min	63.0 °C	63.5 °C	63.5 °C
10%	5.9 ml/min	63.9 °C	64.3 °C	64.3 °C
11%	5.5 ml/min	64.5 °C	65.0 °C	65.0 °C
12%	5.8 ml/min	65.2 °C	65.7 °C	65.7 °C
13%	5.7 ml/min	65.8 °C	66.3 °C	66.3 °C
14%	5.5 ml/min	66.3 °C	66.8 °C	66.8 °C
15%	5.2 ml/min	67.0 °C	67.5 °C	67.5 °C
16%	4.8 ml/min	67.4 °C	67.9 °C	67.9 °C
17%	4.9 ml/min	68.0 °C	68.5 °C	68.5 °C
18%	4.9 ml/min	68.6 °C	69.1 °C	69.1 °C
19%	5.3 ml/min	69.0 °C	69.5 °C	69.5 °C
20%	5.4 ml/min	69.6 °C	70.1 °C	70.1 °C
21%	5.4 ml/min	70.2 °C	70.7 °C	70.7 °C
22%	5.6 ml/min	70.7 °C	71.2 °C	71.2 °C
23%	5.8 ml/min	71.1 °C	71.6 °C	71.6 °C
24%	5.1 ml/min	71.6 °C	72.1 °C	72.1 °C
25%	4.9 ml/min	72.1 °C	72.6 °C	72.6 °C
26%	4.7 ml/min	72.7 °C	73.2 °C	73.2 °C
27%	5.1 ml/min	73.1 °C	73.8 °C	73.8 °C
28%	5.4 ml/min	73.4 °C	73.9 °C	73.9 °C
29%	4.9 ml/min	73.8 °C	74.3 °C	74.3 °C
30%	4.6 ml/min	74.4 °C	74.9 °C	74.9 °C
31%	4.9 ml/min	74.9 °C	75.4 °C	75.4 °C
32%	5.1 ml/min	75.3 °C	75.8 °C	75.8 °C
33%	4.7 ml/min	75.7 °C	76.2 °C	76.2 °C
34%	4.1 ml/min	76.2 °C	76.7 °C	76.7 °C
35%	4.0 ml/min	76.6 °C	77.1 °C	77.1 °C
36%	3.9 ml/min	76.9 °C	77.4 °C	77.4 °C
37%	3.9 ml/min	77.5 °C	78.0 °C	78.0 °C
38%	4.2 ml/min	78.2 °C	78.7 °C	78.7 °C
39%	4.9 ml/min	78.7 °C	79.2 °C	79.2 °C
40%	5.2 ml/min	79.2 °C	79.7 °C	79.7 °C
41%	5.3 ml/min	79.7 °C	80.2 °C	80.2 °C
42%	5.1 ml/min	80.2 °C	80.7 °C	80.7 °C
43%	4.7 ml/min	80.8 °C	81.3 °C	81.3 °C
44%	4.7 ml/min	81.3 °C	81.8 °C	81.8 °C

TUBITAK ENERJI Print Date : 08.11.2016 10:02
Herzog MP 626 - HDA 627/628 Unit Number : 1 - 6271063-1
 Software - Version : HDA 1.0K

Sample number : k-1 parvina 95Kam
 Sample Description : CRM 1002 TMG 020778
 Date of Measurement : 08.11.2016 09:20:06

Time	Dist. rate	Dist. temp.	Barom. corr.	Evap. corr.
0%	473.0 s	40.7 °C	41.3 °C	41.3 °C
1%	0.8 ml/min	51.8 °C	52.4 °C	47.8 °C
2%	2.4 ml/min	54.8 °C	55.0 °C	53.8 °C
3%	4.0 ml/min	58.2 °C	58.1 °C	56.1 °C
4%	4.9 ml/min	57.7 °C	58.3 °C	57.7 °C
5%	76.0 s	58.8 °C	58.4 °C	58.4 °C
6%	5.1 ml/min	59.7 °C	60.3 °C	59.8 °C
7%	5.0 ml/min	60.6 °C	61.2 °C	60.8 °C
8%	5.0 ml/min	61.4 °C	62.0 °C	61.7 °C
9%	4.9 ml/min	62.1 °C	62.7 °C	62.4 °C
10%	4.9 ml/min	62.7 °C	63.3 °C	63.1 °C
11%	4.8 ml/min	63.3 °C	63.9 °C	63.7 °C
12%	4.9 ml/min	64.0 °C	64.6 °C	64.3 °C
13%	4.9 ml/min	64.5 °C	65.1 °C	64.9 °C
14%	4.9 ml/min	65.1 °C	65.7 °C	65.5 °C
15%	4.8 ml/min	65.6 °C	66.2 °C	66.0 °C
16%	4.8 ml/min	66.2 °C	66.8 °C	66.6 °C
17%	4.9 ml/min	66.8 °C	67.4 °C	67.2 °C
18%	4.9 ml/min	67.4 °C	68.0 °C	67.8 °C
19%	5.0 ml/min	67.8 °C	68.4 °C	68.3 °C
20%	4.9 ml/min	68.2 °C	68.8 °C	68.7 °C
21%	4.8 ml/min	68.7 °C	69.3 °C	69.3 °C
22%	4.8 ml/min	69.2 °C	69.8 °C	69.8 °C
23%	4.9 ml/min	69.8 °C	70.3 °C	70.1 °C
24%	4.9 ml/min	70.1 °C	70.7 °C	70.5 °C
25%	4.8 ml/min	70.5 °C	71.0 °C	71.0 °C
26%	4.8 ml/min	70.9 °C	71.4 °C	71.4 °C
27%	4.8 ml/min	71.4 °C	71.8 °C	71.8 °C
28%	4.8 ml/min	71.8 °C	72.4 °C	72.3 °C
29%	4.7 ml/min	72.3 °C	72.9 °C	72.7 °C
30%	4.6 ml/min	72.7 °C	73.3 °C	73.2 °C
31%	4.6 ml/min	73.2 °C	73.8 °C	73.8 °C
32%	4.7 ml/min	73.5 °C	74.1 °C	74.0 °C
33%	4.7 ml/min	74.0 °C	74.6 °C	74.4 °C
34%	4.6 ml/min	74.5 °C	75.1 °C	74.9 °C
35%	4.6 ml/min	74.9 °C	75.4 °C	75.3 °C
36%	4.6 ml/min	75.3 °C	75.9 °C	75.7 °C
37%	4.6 ml/min	75.7 °C	76.3 °C	76.2 °C
38%	4.6 ml/min	76.2 °C	76.8 °C	76.8 °C
39%	4.6 ml/min	76.6 °C	77.2 °C	77.1 °C
40%	4.6 ml/min	77.1 °C	77.7 °C	77.5 °C
41%	4.6 ml/min	77.5 °C	78.1 °C	78.0 °C
42%	4.5 ml/min	77.6 °C	78.5 °C	78.4 °C
43%	4.5 ml/min	78.4 °C	79.0 °C	78.8 °C
44%	4.6 ml/min	78.7 °C	79.3 °C	79.2 °C



IT IS OUR CHOICE...



Recycle
Energy



www.5drecycle.com
info@5drecycle.com

+90 532 684 3701

Kanlıca Mah. Hacı Muhittin Sok. No: 10
Beykoz / İstanbul - TÜRKİYE

thanks for your attention