NATIONAL INSTITUTE OF TECHNOLOGY DURGAPUR

DEPARTMENT OF Metallurgical & Materials Engineering

REPORT

TITLE To manufacture iron ore fines pellets in a disc pelletizer

Name Deep Narayan

Semester 7th Roll No. 20MM8051

Section – Year 4th year (2023)

Signature Deep

Date of Experiment 4/10/2023

Title:

To manufacture iron ore fines pellets in a disc pelletizer

Aim:

To produce iron ore fine pellets using a disc pelletizer

Introduction:

To use iron ore fines and make it in the form of agglomerate that can be charged in blast furnace for protection of hot metal

Materials Required:

Iron ore fines
Binder (bentonite)
Water

Experimental Procedure:

Crushing & grinding to fine size (100-200μm)
Add binder and mix it thoroughly
Put prepared material in disc pelletizer. Due to capilary action of water and disc motion nuclei grows to form desired size pellets
Green pellets made are taken to hardening and strengthening

Pellets are first ~~charged at~~ dryed at 150°C to remove moisture

Then hardened at 900°C for getting sufficient strength

Observations (for Set 1)

Experiment set -1

RPM - 27 RPM (fixed)

Bentonite - 2.5% (fixed)

Moisture - variable

Moisture - 7%

Average diameter of green pellet = 17.2 mm

Green strength of pellet = 1000g

Moisture - 3%.

Average diameter of green pellet = 15.7 mm

Green strength of pellet = 1300g

Moisture - 10%.

Average diameter of green pellet = 19.6 mm

Green strength of pellet = 900g

Conclusions:

Based on above set of experiments when the binder content is fixed and variable parameter is only moisture content we can conclude following

As the moisture content increases the growth of

pellet nuclei increases, and hence the average diameter

As moisture content increases the pellet strength decreases, this could be because of water present in void

Observations (Experiment set 2)

Experiment set - 2

Moisture - 7% (fixed)

Iron ore fines - 230 g

Bentonite - 2.5% to 5%.

Bentonite - 2.5%

Average diameter of green pellet was 12.7 mm

green strength of pellet = 1100 g

Bentonite - 5%.

Average diameter of green pellet was 10.2 mm

green strength of pellet = 1300 g

conclusions

with increase in bentonite content the green strength of pellet increases but the average diameter decreases since the moisture content remains same

Hardening of pellet

Heating at 900°C for 30 mins

Initial
Weight : 4.4184 5g
Diameter : 15.25 mm

Final
Weight : 4.1826 g
Diameter : 16.3 mm

Swelling index $= \frac{V_f - V_0}{V_0} \times 100 = \frac{d_f^3 - d_0^3}{d_0^3} \times 100$

$= 14.24\%$

% Reduction $= \frac{W_0 - W_f}{W_0} \times 100$

$= 12.47\%$

Heating at 900°C for 45 mins

Initial:
Weight : 4.725 g
Diameter : 14.24 mm

Final :
Weight : 4.3405 g
Diameter : 15.8562 mm

Swelling index $= \frac{V_f - V_0}{V_0} \times 100$

$= \frac{d_f^3 - d_0^3}{d_0^3} \times 100 = 37.89\%$

% Reduction $= \frac{W_0 - W_f}{W_0} \times 100$

$= 19.28\%$

Heating at 900°C for 1 hour

Initial:

Weight: 3.184g

Diameter: 13.82mm

Final:

Weight: 2.8295g

Diameter: 15.73mm

$$\% \text{ Swelling index} = \frac{V_f - V_0}{V_0} \times 100$$

$$= \frac{d_f^3 - d_0^3}{d_0^3} \times 100 = 47.74\%$$

$$\% \text{ Reduction} = \frac{W_0 - W_f}{W_0} \times 100$$

$$= 26\%$$

Fe_2O_3

$W_0 = \frac{48}{112} \times$ initial wt of pallet

Swelling & % reduction table of pellets at 900°C

Time of heating	% Swelling index	% Reduction
30 min	14.24	12.47
45 min	37.89	19.28
60 min	47.74	26

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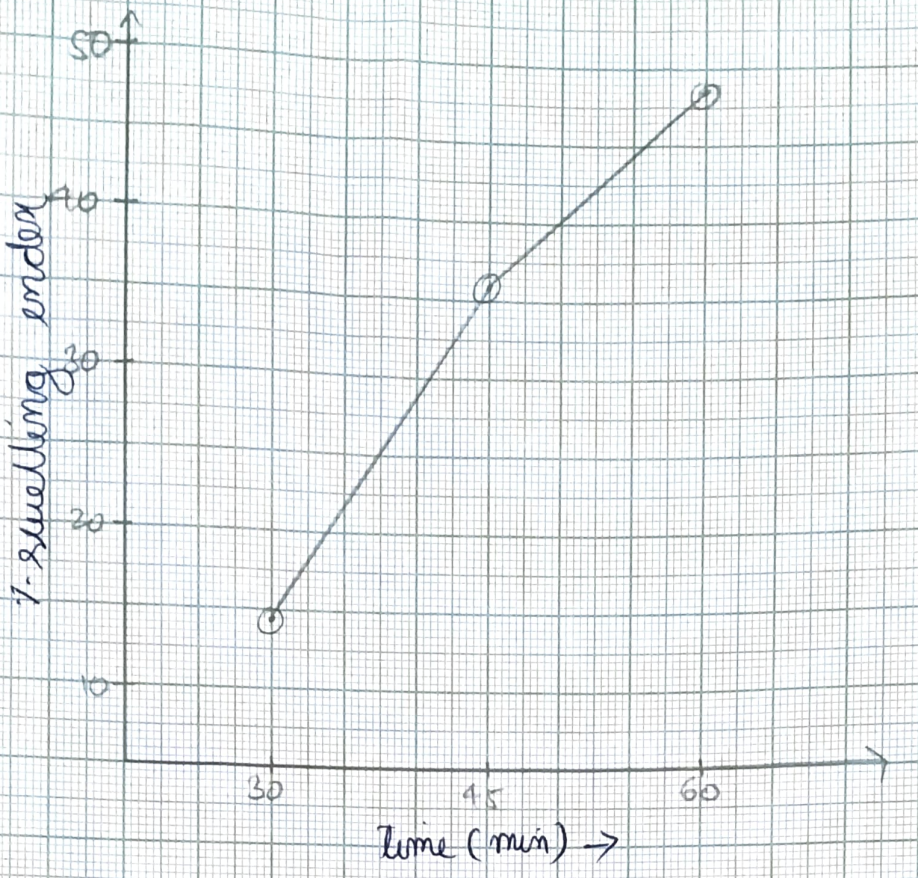
Conclusions:

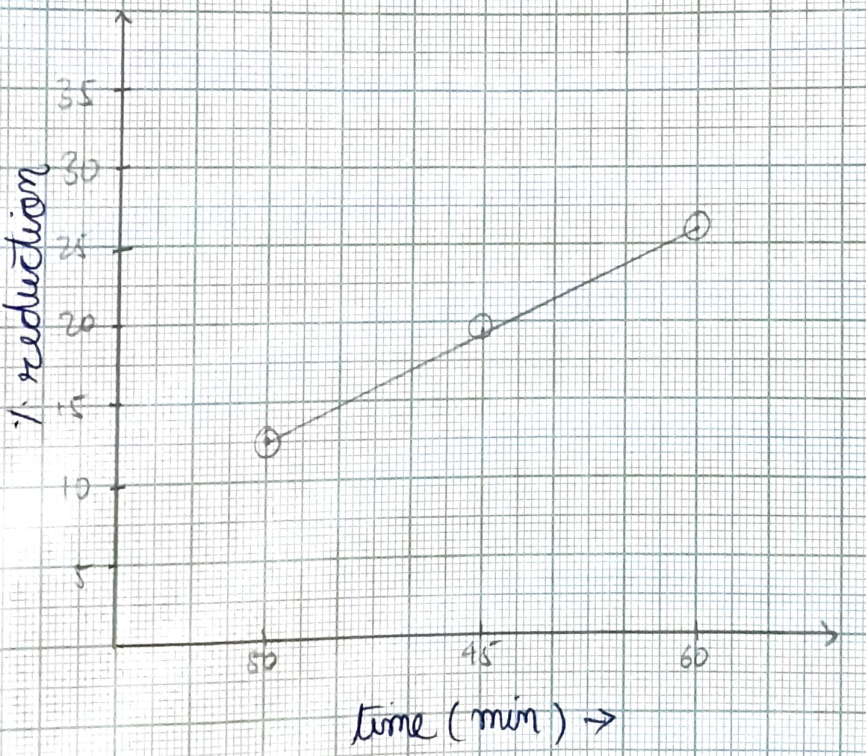
From the whole experiment we can conclude that:

As heating duration increases reducibility index also increases

As heating time increases the porosity increases which results in increase in swelling index

On the lab scale the experiment was performed at 900°C for maximum duration of heating (60 min)


50
40
30
20
10
% swelling endox
30
45
60
time (min) →


35
30
25
20
15
10
5
% reduction
30
45
60
time (min) →