

# pH in Water tank of the Waste water and Gas cleaning plant

## Introduction

Integrated steel plants usually consist of five main units, Viz; Coal washery, Coke oven blast furnace, steel melting shop and rolling mills. In addition to the above the plants may have auxiliary units like oxygen plant and power plant for their own uses.

## Application Information

### Coal Washer and its Wastewater

The coal needs some processing to make it suitable for use in coke ovens. The main objective of such treatment is the removal of solid foreign matter present in the coal. Generally the process in a coal washer includes crushing, screening and wet washing of coal. In the wet process the coal is separated from the impurities using the principle of differential settling. Water used for washing is recycled and reused after sedimentation. But in spite of all care taken to ensure maximum reuse, appreciable quantity of wash water containing coal fines, and other impurities like clay and small amounts of other minerals like calcite, gypsum, pyrite etc, comes out as waste, normally in a thickened form as the under-flow of the sedimentation tank.

### Blast Furnace and its Wastewater

Blast furnace is a basic unit in an integrated steel plant. Essentially the blast furnace process consists of charging iron ore and coke as fuel limestone and dolomite as fluxing material into the top of the furnace and blowing heated air (blast) into the bottom. Pig iron is the metallic product of this unit. Appreciable quantity of water is used in blast furnace for the purpose of cooling and gas cleaning operations. However, the cooling water normally remains un-contaminated and is reused after cooling.

The entire quantum of wastewater originates from the gas cleaning operations. The blast furnace gas, which is heavily loaded with flue dust, is cleaned in a three stage process.

The major portion of the flue dust which comes out along with blast furnace gas is recovered by the dry dust catchers. The remaining is removed by washing with water by "Wet Scrubbing". The portion which escapes wet scrubber may be removed by electrostatic precipitator. In wet scrubber the down flow water sprays clean the dust from the up flowing gases and the wastewater contains 1000-10000 mg/l of suspended solids.

### Characteristics of Typical Blast Furnace Waste

Parameter	Value
Total Dissolved Solids	346 - 500 mg/l
Total Suspended Solids	1000 - 10500 mg/l
Dissolved Solids	80 - 118 mg/l as CaCO <sub>3</sub>
Total Hardness	230 mg/l as CaCO <sub>3</sub>
Total Alkalinity	380 mg/l as CaCO <sub>3</sub>
Chlorides	210 - 250 mg/l
pH	7.3 - 8.2

## Treatment of Blast Furnace Waste

The blast furnace waste contains about 40% of the total dust coming out of the blast furnace along with the flue gas. Iron oxide and silica comprise about 70% and 12% respectively of the flue dust content. The waste can be treated in a clariflocculator even without the addition of coagulant. However the flocculation time can be reduced to a great extent when certain coagulants like alum or lime is added. The efficiency of the clariflocculator can be increased alternatively by a judicious mixing of this waste with the other wastes of the steel plant. The oxygen plant waste containing sodium hydroxide, may be used for this purpose.

## Typical Process Details

Process: sticky nature of the slurry.

Slurry quality - Solid blast furnace GCP (Gas Cleaning Plant) containing fine particles of iron oxide, dust, coal dust.

- Solid density: 1600 kg/m<sup>3</sup>,
- Slurry temperature: 65°(Maximum)
- Density of slurry water: 1-1.2 ton/m<sup>3</sup>
- Total suspended solids: 50 – 250 gram/liter

Tentative range of particle size distribution as below:

Particle size (in micron)	% by weight
0 - 5	13 - 33
5 - 10	13 - 17
10 - 20	15 - 18
20 - 40	17 - 21
40 - 60	10 - 40
60 - 100	6 - 15
> 100	4 - 10

The slurry has high deposition rate while it is not flowing.

Location	Inlet to pH correction tank
Fluid	GCP Slurry, BF application
Flow in m <sup>3</sup> hour	1150
Velocity in m/sec	1.5
Temperature	60 to 70 degC
Inlet pressure in Bar (g)	open to atmosphere
pH value	3.0 to 9.0
Specific gravity of sludge	1-1.5
Bulk density of solid (kg/m <sup>3</sup> )	
Suspended solid material	Sinter, ore, flux, coke, coal at difference
Fluid density in kg/m <sup>3</sup>	990-1078
TSS (ppm)	500 - 30000
Nature	Fluid is very sticky in nature

## Typical problems

- Coating on the sensor.
- Frequent cleaning

## Remedies

- Coating can be cleaned off by diluted acid
- Use appropriate sensor with suitable fitting.

## Tangible benefit

More reliable and accurate analysis of pH which helps to improve end product quality.

## Product Recommendations Measurement System

### *Process Liquid Analyzer:*

- 2-Wire Analyzer FLXA202

#### Features

- Dual sensor measurement on 2-wire type analyzer
- Indication of sensor wellness



- 4-Wire Converter FLXA402

#### Features

- Connectable to up to five sensor
- Easily viewable color LCD
- Touch screen operation



### **Sensor Selection:**

FU20 all-in-one pH sensor with dome shaped membrane.



### **Features**

- With the body made of Ryton, a strong engineering plastic, which is comparable to Teflon in terms of corrosion resistance and heat resistance, it allows for a wide range of applications.
- The integrated-sensor design simplifies calibration with standard solutions and maintenance.
- Alternatively, SENCOM sensor can be used. (FU20+SA11)

Note: For additional information on this application contact the local Yokogawa Process Liquid Analyzer Department

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