

Use of Hydrogen Reduction Method for Steel Plant to Produce Green Steel

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ABSTRACT:- The main focus of this paper on Oxygen quantity improvement. The utilization of Hydrogen reduction process in steel plant for enhance the production rate of green steel manufacturing. For iron ore to steel production use $CO + H_2$, which is replace by H_2 only. H_2 is produce from water electrolysis. In this way carbon compound are eliminate.

Keywords: Green Steel Plant, Oxygen, Carbon, Hydrogen, Hospital.

1. INTRODUCTION: - For the Production of Fe and green steel releases seven percent of the global greenhouse gas emissions. Lot of changes in existing primary steel production system would not be work out to meet the emission reduction targets. Replacing coke, used in the blast furnaces as a reducing agent, with hydrogen produced from water electrolysis has the potential to reduce emissions from Fe and steel production sustainable.

2. REVIEW & LITERATURE POINT OF VIEW: - All ready visited in numbers of Hospital in different cities, Maharashtra on 2021 April. It is observed that the quantity of oxygen through tube, mishandling in oxygen plant & no planning for Oxygen. Without confirmation demand of more oxygen. But some quantity of need of oxygen to fulfil the requirement oxygen called from different country, region. Through this point of view to save the oxygen from steel production industry. Reduce the global warming effect through more carbon quantity. Hydrogen also produce from the water collect in this research. Regarding the oxygen shortage in Hospital as discussed in research paper [6]. The empty Oxygen Cylinder in Hospital as shown in fig. 1.



Fig. 1: Empty Oxygen Cylinder in Hospital

In Fig. 2 shows the filled Oxygen Cylinder in Hospital with layout arrangement. This is the actual oxygen supply system connecting nozzles to main pipeline.



Fig. 2: Filled Oxygen Cylinder in Hospital with layout arrangement

3. OBJECT:-

- 1] H_2 . can be produced by electrolysis of water and power for electrolysis is given by solar & wind energy.
- 2] Oxygen is produced from steel plant in large quantity.

4. ADVANTAGES:-

- 1] It reduces carbon foot print & carbon pollution. This is Green house effect.
- 2] Reduce Global warming.
- 3] Steel plants are converted to hydrogen reduction rather than $CO + H_2$.
- 4] This produces oxygen from iron.reduction for medical purpose in large quantity.

5. HISTORY: - The critical situation some times coming on world, but this is the cycle running generally every 100th of year. In 1920 same situation on world for pal age. Lots of people dead that time & same situation right now. Patient require. In first war 1914-20, second war 1939-45 same situation faced the people. Now third war is raise. This is the biological war. Any virus can float in environment & population will control or becomes a power country. This concept utilizing here. In future may be numbers of virus will raised in whether for destroy the human being is the strategy of opposite to human being. But strong tool need of in our hand to control it. How to control the biological war purpose medical science should be ready for that. Only technology not sufficient. One virology laboratory available in America to clarify these problems. No. Of vaccine come in market also.

6. EXPERIMENTATION: - In BSP, three LD (Linz- Donawitz) converters (process developed in Austria in 1949) (capacity, 130 ton each) are installed. Steel is made in LD converters by lancing pure oxygen, which converts the carbon present in pig iron into carbon mono-oxide. Oxygen is blown through lances into the converter charged with hot metal, iron scrap, Ferraro alloys, lime and iron ore. Iron ore is used as a coolant,

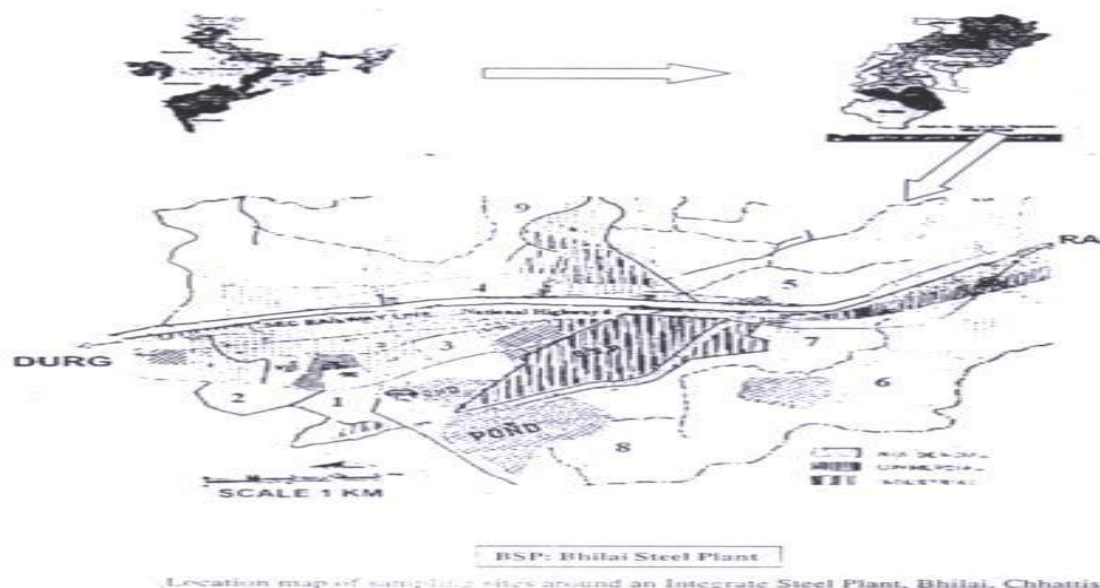
which adjusts hot metal scrap ratio to large extent. High purity oxygen blown into the furnace removes carbon and silicon in the molten iron mainly by oxidation. The basic oxide furnace is fed with fluxes to remove siliceous impurities. Certain alloying materials may also be added to enhance the characteristics of the steel. During oxygen blowing process, a large amount of fumes and gases are generated, which contain fine particles of the charged materials and carbon mono- oxide (CO) gas.

7. CASE STUDY:-

7.1 BHILAI STEEL PLANT - BHILAI (CHHATTISGARH) INDIA

Bhilai Steel Plant one of the world largest steel producing industry under the central government of India. Basically Bhilai is one of the small village behind the Raipur Capital but due to the Bhilai Steel Plant it denoted as Steel City. Shortly known as B.S.P. (Chhattisgarh).

Throughout world numbers of steel plant are available but exactly the same this plant. After lot of reviewing research paper number of same plant in other country. So exactly whatever the plant details, accessories, dimensions, features, parameters, photographs, manpower, technical skill, mathematical modeling, simulation, analysis is there that available hear. Same way heat energy loss in that plants, oxygen saving from Bhilai steel Plant. Fig. 3 indicates the Bhilai Steel City map, where the the B. S. P. Bhilai Steel Plant established in 1956.



Location map of sampling sites around an Integrate Steel Plant, Bhilai, Chhattis

Fig.3 : Bhilai Steel City Map India [C.G.]

7.2 MATHEMATICAL MODELING OF CONTINUES CASTING PROCESSES:-

Fig. 4 shows the different regions of the C.C. [Continuous Casting] machine and the model considered for physical simulation of the caster at the same time collect oxygen from plant. A typical method of modeling the strand thermal condition shown in figure. The mathematical model is applied to slices of strand that start at the meniscus and travel through the machine at the casting steel. The new slices are generated periodically. A sufficient number of slices exist in each condition zone to give an accurate representation of the thermal condition in each zone.

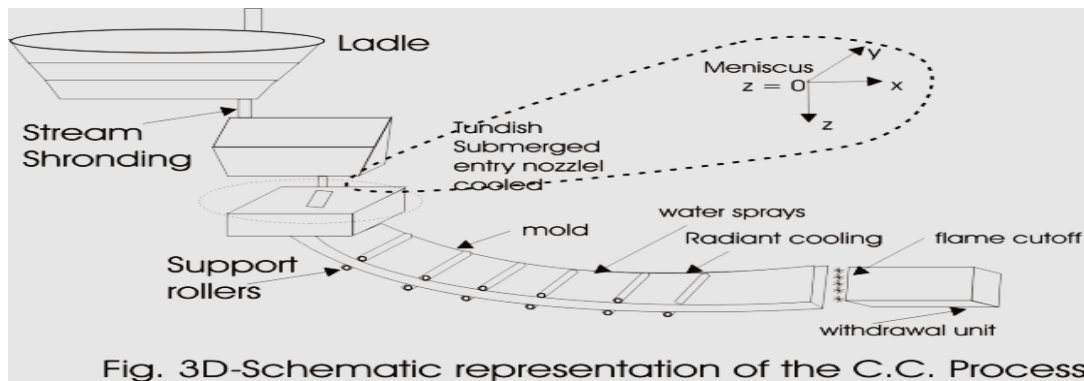


Fig. 3D-Schematic representation of the C.C. Process

Fig.4 : Continuous Casting Unit of Steel Plant

8. CONCLUSION & RESULT: - After using all above method, the research success & financially losses saving in the firm of coal, oxygen, electricity which directly help to government. Hence parametric analysis result also success & objectives also clear, (1) H_2 . can be produced by electrolysis of water and power for electrolysis is given by solar & wind energy. (2) Oxygen is produced from steel plant in large quantity.

9. RECOMMENDATION WORK FOR FUTURER:-

Heat Energy loss remain study, in lots of industries such as Textile industry, paper industry, chemical industry, workshop & collect the oxygen.

I) Carbon reduction in cast iron plant.

II) Carbon reduction in copper manufacturer plant.

III) Carbon reduction in Aluminum.

IV) Carbon reduction in alloy industry.

COMPETING INT REST: The authors declare that they have no Competing Interest.

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10. BIBLIOGRAPHY:-

- [1] Raj Kumar Agrawal, Piyush Kant Pandey, "Productive recycling of basic oxygen furnace sludge in integrated steel plant", Journal of Scientific & Industrial Research, Vol. 64, September 2005, PP. 702-706.
- [2] Cherish Paul, John Paul, Akhil Babu, Hospital Oxygen Supply: A Survey of Disaster Preparedness of Indian Hospitals. Indian Journal of Respiratory Care, Volume 9, Issue 2, July-December 2020, PP. 216-220, DOI:10.4103/ijrc.ijrc_31_20.
- [3] Raj Kumar Agrawal, Piyush Kant Pandey, "Productive recycling of basic oxygen furnace sludge in integrated steel plant ", Journal of Scientific & Industrial Research, Vol. 64, September 2005, PP. 702-706.
- [4] Jonathan W. Dauncey, Peter Olupot - Olupot, Kathryn Maitland, Dauncey et al. "Healthcare-provider perceptions of barriersto oxygen therapy for paediatric patients in three government-funded eastern Ugandan hospitals; a qualitative study", BMC Health Services Research (2019), 4129-7, PP. 1-9, 19:335 <https://doi.org/10.1186/s12913-019>.
- [5] Hajed M., Al-Otaibi, "Current practice of prescription and administration of oxygen therapy : An observational study at a single teaching hospital", PhD Department of Respiratory Therapy, Faculty of Medical Rehabilitation Sciences, King Abdulaziz University, Jeddah, Saudi Arabia, Taibah University, Journal of Taibah University Medical Sciences, [2019] 14[4], PP. 357-362.
- [6] M. S. Dhande, V. M. Nanoti, S. S. Khandare, P. V. Rekhade, "Hospital Survey with for Oxygen Shortage" International Journal of Latest Engineering Science, E-ISSN: 2581-6659, DOI: 10.51386/25816659/ijles-v4i4p102, Volume: 04 Issue: 04, July to August 2021. PP. 7-11.