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NEW EQUIPMENT FOR OXYGEN STEELMAKING PLANTS 1/

by

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SUMMARY

1. Some aspects in the design and layout of oxygen steelmaking plant

The major factors governing the design and layout are as follows:

Required total production tonnage
Weight per heat or number of converters
Available raw materials and utility services
Grades of steel to be produced
Air and water pollution control requirements
Location relative to the blast furnace plant, rolling mills, etc.

These factors determine the sequence of operations and the flow of materials and thus govern the layout of a steelmaking plant. The major plant units are required in the following areas:

Hot metal and scrap handling
Storage and handling of fluxes and process alloys
Steelmaking vessels (converters) with oxygen lance equipment
Waste gas cooling and dust collecting plant
Instrumentation and controls
Provisions for the automation of the metallurgical process
Slag handling and disposal
Teeming and handling of ingots

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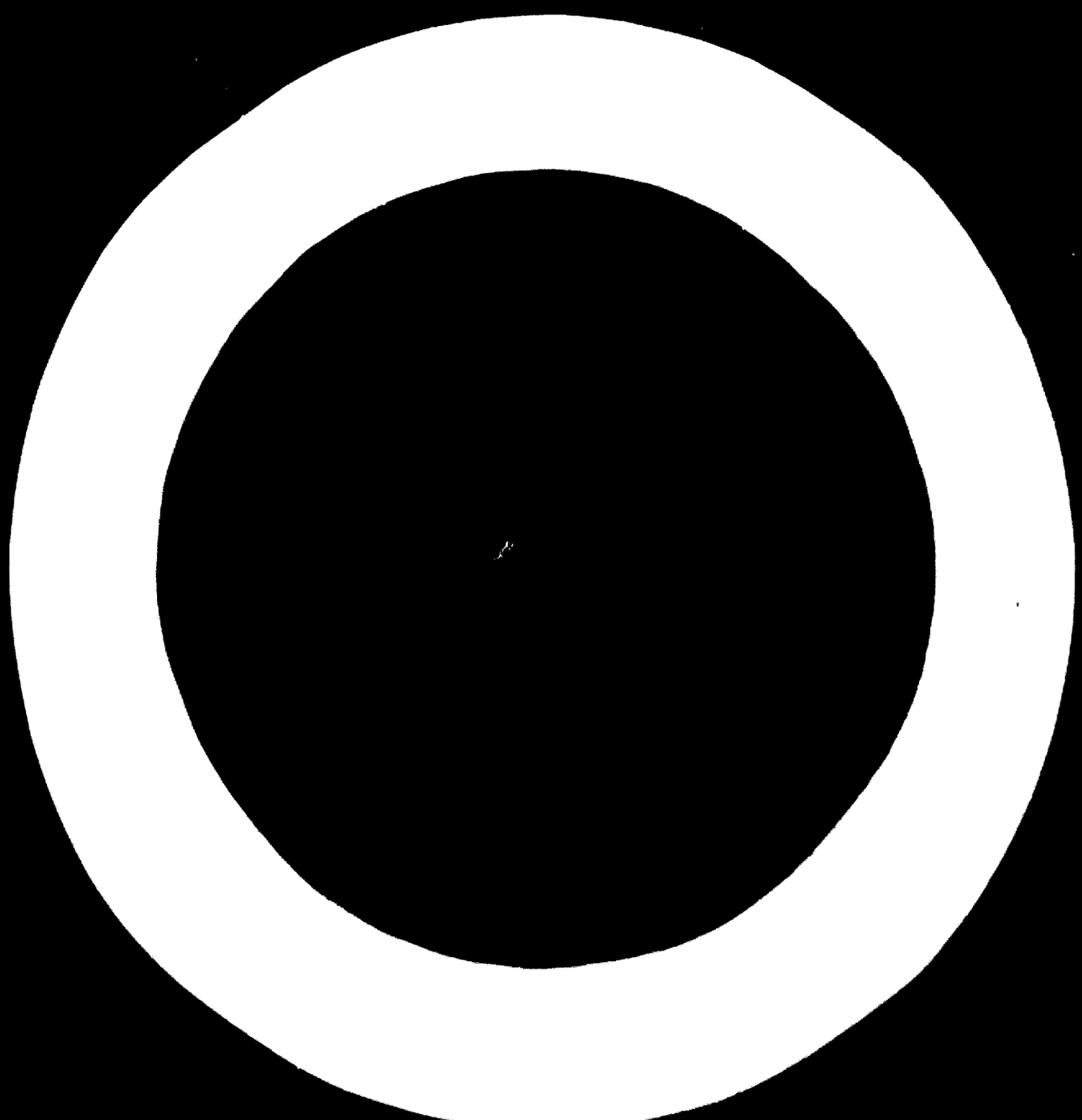


An oxygen steelmaking plant recently designed and engineered for a Spanish iron and steelworks on the basis of latest advances in this field is cited as an example. The fact that it is intended to expand this works later by including continuous casting plant, is of particular importance in this layout.

In this article, only the most important details of the basic facilities (underlined) of oxygen steelmaking plant will be discussed, as these undergo constant development.

2. Oxygen-blowing converters

2-1 Design of the vessel: Apart from basic design data, such as specific volume, diameter/height ratio, the shape of the converter vessel and the principal dimensions are fixed. Torque requirements are calculated by electronic computer. The cooled top section of the converter vessel, which consists of a cooled mouth ring and cooling boxes, can be regarded as an important design feature.

2-2 Trunnion rings and trunnion ring bearings: Trunnion rings built up of several parts; location of the joints; different ways of supporting the trunnion ring in roller bearings; novel designs of a trunnion ring with tilting wheels mounted on the sides, the wheels resting on rollers.

2-3 Tilting drives: Different arrangements of tilting drives attached to a bull wheel or to a tilting wheel are described.

2-4 Oxygen lances and lance equipment: Multi-hole lances and lance-holding gear allowing for simple adjustment of the lance.

3. Converter installations with rotating vessels

Kaldo-converter installations and LD-Kaldo installations for a combination process; similar rotary converters of special design for the non-ferrous metals industry.

4. Waste gas cooling and dust extracting plant

The factors to be considered in selecting such equipment are discussed. Dust collection problems and questions of cost are explained for the following cases:

4-1 Cleaning of converter fumes by the Krupp suppressed-combustion process using a saturator and a disc scrubber. The cleaned, largely air-containing gas from the auxiliary system is used as primary air in a flare where the fumes are burnt as they escape into the atmosphere.

4-2 Gas cleaning plant for oxygen top-blown converters using different dust colleotion methods:

1. Water-cooled stack for cooling the waste gas, dry precipitator followed by a spray cooler.
2. Waste-heat boiler for gas cooling in which only the radiant heat is utilized (semi-boiler), saturator-venturi and differential-pressure scrubbers.
3. Waste-heat semi-boiler for gas cooling, saturator-venturi and differential-pressure scrubbers (suppressed-combustion system)
4. Waste-heat semi-boiler for gas cooling, spray oooler, tubular dry precipitator.

5. Instrumentation and control and provisions for prooess automation

The following is a brief outline of the instrumentation, supervisory and automatio control gear required or recommendable for a modern steelworks:

1. Instrumentation and automatic control gear for the supply of oxygen and oooling water to the lance.
2. Supervision of the entire flow of materials from a central control room hooked up with several control panels.
3. Rapid-analysis laboratory.
4. Central data logging system.
5. Automation of the oxygen blowing prooess.

Most of the equipment used is of the commercial type. The adoption of automatio oontrol of the metallurgical process requires most of all

a) thorough breaking-in of the plant;
b) an operating crew with a good deal of experience in oxygen blowing;
c) suitable instruments and automatio control gear.

Although the requirements under a) and b) cannot be met when a new steel plant is built, provision should nevertheless be made for the subsequent installation of the equipment required for automatic control of the metallurgical process.

6. Other steel plant facilities

Only novel designs or equipment specially designed for oxygen-blowing practice are mentioned here.

6-1 Hot metal mixer: Compared with the conventional type of mixer having a horizontal, cylindrical vessel resting on tilting rollers or cradles, the new type of mixer with a shape similar to that of a converter offers advantages in relining (less time required for relining, bricks of the same type as used for the converters can be employed).

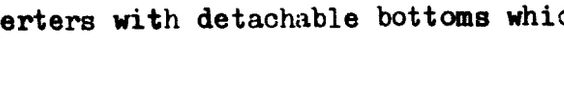
6-2 Scrap charging machines: The use of these machines eliminates the need of using overhead charging cranes.

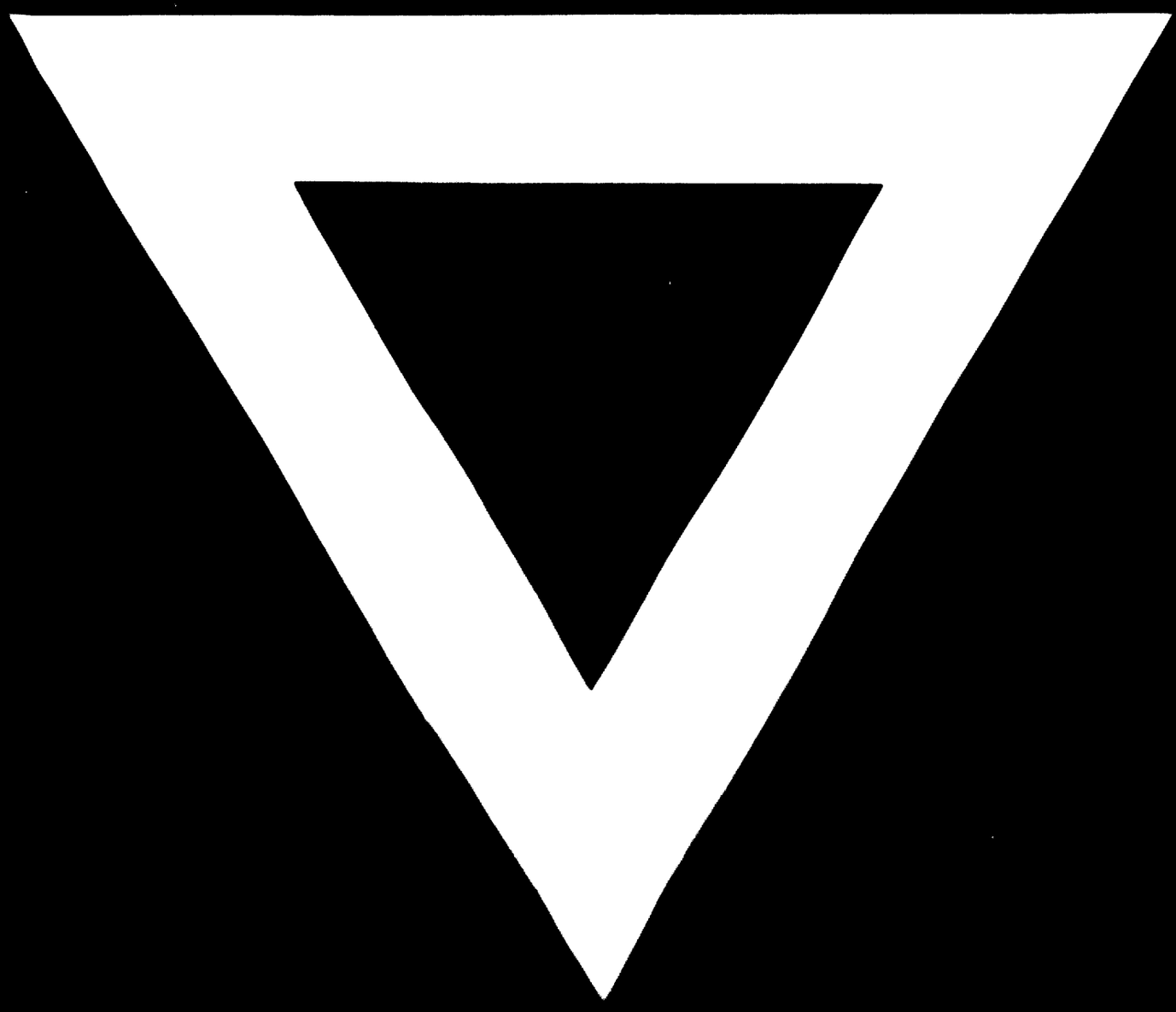
6-3 Ladle transfer cars: Slag ladle cars fitted with a scale must be used if the weight of the slag must be accurately determined (automation).

6-4 Relining stands: The use of relining stands offers advantages, particularly in the case of converters with detachable bottoms which are relined from below.

Prospects

The converter installations described here are in no way intended to show all the developments that have taken place nor to single out a specific, generally applicable design. They are merely intended to demonstrate that each of these layouts was the best solution for the particular application.





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