Vertical Direct Chilled Casting Facilities (VDC) Reliability Improvement at EGA

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https://doi.org/10.71659/icsoba2024-ch006

Abstract

EGA's Casthouse in Al Taweelah is equipped with multiple large size hydraulic cylinders that are installed in Vertical Direct Chilled (VDC) casting facilities. These facilities are used for batch casting of billets and sheet ingots. The cylinder size varies between 10 to 12 meters of stroke length with a rod diameter of 800 mm. The function of these cylinders is to control the casting speed and provides support for the casting equipment weight. The casting batch weight varies between 80 to 120 tonnes.

The casting machine was taken up for major maintenance that involved pit repair and coating, cylinder inspection and overhaul work along with other associated tasks. This was the first intervention since the initial installation.

The following observations were made from the cylinder casing and the protection enclosure (caisson). The cylinder protective enclosure (caisson) was corroded and punctured, which exposed the cylinder casing to saline groundwater. The cylinder coating was also damaged with surface pitting and wall thinning due to corrosion.

The Casthouse operation and maintenance team implemented the best alternative solution for life extension of VDC hydraulic cylinder by providing innovative solutions. A double layer corrosion protection technique was applied in combination with an Impressed Current Cathodic Protection (ICCP) and a Sacrificial Anode Cathodic Protection (SACP). The combined approach contributes to eliminate unwanted production downtime and frequent hydraulic oil replacements.

In addition, this work also contributed to improving the following:

- EHS: Unwanted hydraulic oil replacements for a sustainable operation.
- Productivity: A reduction from 45 to 12 days of unplanned downtime to planned shutdown on all VDC facilities.
- Quality: Improved service life of the hydraulic cylinder and associated structures according to design values by providing an innovative corrosion protection system.
- Customer Satisfaction: Recognised by Al Taweelah casthouse operation teams due to machine uptime and improved hydraulic cylinder reliability.

In conclusion, this innovative approach provides improvements that have resulted in an audited annual savings of 2.2 MUSD.

Keywords: Vertical Direct Chill (VDC) casting, Corrosion protection, Productivity improvement, Sustainability, Environmental improvement, Reliability improvement.

1. Introduction

The objective of this study was to establish the failure mechanism and progression, identify contributory factors, development of a protection and monitoring system with a desired engineering life. As the buried structure is completely inaccessible for inspection and maintenance, a system with multiple layers of protection was envisaged and applied.

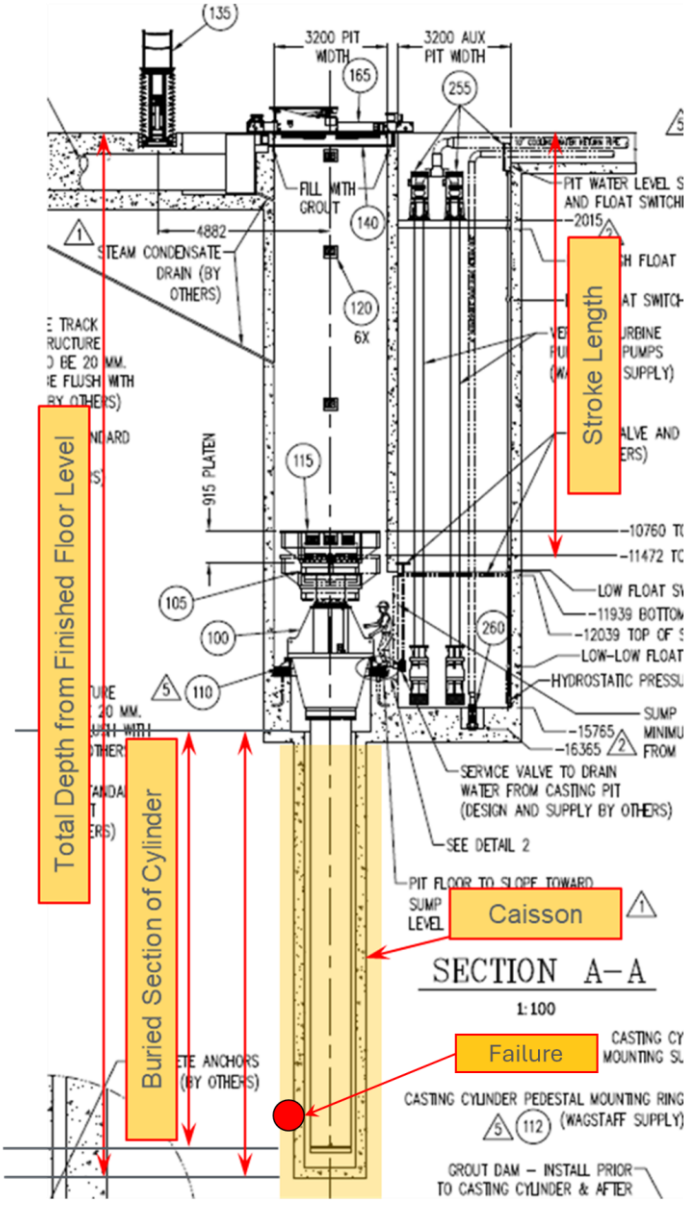

Figure 1. General arrangement of Vertical Direct Chilled Casting (VDC) facilities.

6. Reference

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