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A Review on IRSM-41/91 Steel on Indian Railways

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ABSTRACT: This paper presents a clear idea of life expansion of materials using in the base of bogie. Corrosion is the most common phenomena that we observe in the CBR section, corrosion occurs due to the water which is stagnating on the base of bogie and also due to the train travels in the coastal areas. Non corrosive paints Epoxy and red oxide to prevent the corrosion of materials. The materials get corroded easily within in the life span of 5 years. This paper brought out the prevent the corrosion on IRSM-41/91.

KEYWORDS: - corrosion, epoxy, red-oxide, epoxy with silicon carbide immersion test.

I. INTRODUCTION

Corten steel is also known as weathering steel is a type of steel alloy that is designed to have improve corrosion resistance properties. It is primarily composed of iron, copper, nickel, and chromium, along with other elements that provide its unique properties. The name COR-TEN refers to the two distinguishing properties of this type of steel: corrosion resistance and tensile strength. It was developed and introduced in the year 1930 by the U.S Steel Corporation (USS) to assist in the development of railroad coal wagons.

Actually two types of corten steel available one is CORTEN-A and CORTEN-B. Corten-A is not recommended for heavy load bearing applications as the added phosphorus reduces its tensile strength. Corten-B is the more common of the two kinds, it is the one that forms the protective rust coating and maintains a high degree of tensile strength along with enough malleability for welding. Corten-B is especially useful for steel parts needed for heavy, load bearing structures situated in harsh outdoor environments.

Corten steel gets its name from its ability to withstand exposure to the elements and resist corrosion. When exposed to the environment, the steel develops a rust like appearance that serves as a protective layer. Preventing further corrosion and erosion.

While corten steel is already resistant to corrosion, it can be further improved by using epoxy resin with Silicon Carbide (SiC). Epoxy resin is a type of thermosetting polymer that is commonly used as a coating or adhesive due to its excellent adhesion, chemical resistance and durability. When applied to corten steel, it forms a protective barrier that helps to prevent the steel from coming into contact with moisture and other corrosive elements.

In addition of SiC particles to the epoxy resin further enhances its resistance to wear and corrosion. SiC is a very hard and durable material that is often used on abrasive applications, such as cutting tools and grinding wheels. When combined with epoxy resin, it can help to create a coating that is resistant to both mechanical and chemical damage. The epoxy resin and SiC coating can be done through spray or brush, and it can be applied to both new and existing corten steel structures. The coating provides a protective layer that shields the steel from the environment and extends its lifespan. One of the benefits of using corten steel is its low maintenance requirements. Corten steel is a type of steel alloy with improved corrosion resistance properties that can be further enhanced by using epoxy resin with SiC. The resulting coating provides superior protection against corrosion, abrasion and erosion. The unique properties of corten steel make it an ideal material for use in the railway industry. Railway engineers and designers are turning to corten steel to create durable and aesthetically pleasing structures.



II. APPLICATIONS OF CORTEN STEEL

Building facades: In building exteriors the corten steel is used to prevent from corrosion.

Sculpture: The material unique texture and finish make it a popular choice for sculptures and other artistic works.

Landscaping: Corten steel is used in landscaping projects such as retaining walls, planter boxes, and garden edging. Its weathered appearance complements the natural beauty of outdoor spaces creating a cohesive design that blends with the environment.

Bridges: Corten steel is often used in bridge construction due to its durability and resistance to corrosion.

Railway Cars: Corten steel is often used in the construction of railway cars due to its strength and durability.

Industrial Machinery: Corten steel is often used in industrial machinery due to its resistance to corrosion and wear. It is often used to manufacture shipping containers, railway cars and other heavy-duty equipment that can withstand harsh outdoor conditions.

Marine Applications: Corten steel is used in marine applications due to its resistance to saltwater corrosion. Corrosion resistant properties make it an ideal material for marine applications such as shipbuilding and offshore drilling rigs.

Even though the corten steel material had some disadvantages, Corten steel is more expensive than traditional carbon steel. This can make it a less attractive option for railway projects that are operating on tight budgets. As well as the maintenance also, the Corten steel is resistant to corrosion, it still requires regular maintenance to ensure its longevity. This can be time consuming and expensive especially in areas with high levels of exposure to weather and other environmental factors. In Corten steel can be difficult to weld, which can make it more challenging to use in railway projects that require a high degree of precision and accuracy.

Corten steel is not as widely available as other types of steel, which can make it more difficult to source and may result in longer lead times for railway projects. Corten steel is heavier than other types of steel, which can make it more difficult to transport and handle during railway construction. Corten steel can stain adjacent surfaces such as concrete or masonry due to the run off of rust and other contaminants.

When corten steel is cut or welded it releases dust and fumes that can be harmful to workers.

Appropriate safety measures are not taken.

To overcome this drawback of corten steel we additionally blended silicon carbide with epoxy resin to improve the corrosion resistance. Silicon carbide is a hard, wear resistant material that can withstand harsh environments, including high temperatures, abrasion, and corrosion. Epoxy resin is durable adhesive material that can bond well with different substrates. This composite then applied to the corten steel surface, forming a protective layer also enhances the durability and longevity of the corten steel.

By blending silicon carbide with epoxy resin, the corrosion resistance of corten steel can be significantly improved, overcoming some of its disadvantages. This technique is an effective solution for protecting corten steel in harsh environments, making it a more reliable and long-lasting material for various applications.

III. LITERATURE REVIEW

Sajeeb (2022) done project on "Investigation of Corrosion Behaviour of Silicon Carbide Filled Epoxy Composite Coating on Corten Steel in Marine Environment. Investigated the effect of SiC with an epoxy composite coating on corten steel in a marine environment. The researchers used different weight percentages of SiC (0%, 2%, 4%, and 6%) with an epoxy composite coating and evaluated the corrosion resistance using salt spray testing, EIS, and PDP techniques. The results showed that the addition of SiC improved the corrosion resistance of the corten steel samples, with the highest improvement observed at 6% weight percentage of SiC.

G. V. Nagesh Kumar et al. (2021) titled "Study on the Effect of Silicon Carbide (SiC) Particles on the Corrosion Behavior of Epoxy-Coated Corten Steel" explored the use of SiC with an epoxy coating on corten steel. The researchers used different weight percentages of SiC (0%, 1%, 3%, and 5%) with an epoxy coating and evaluated the corrosion resistance using salt spray testing and EIS. The results showed that the addition of SiC improved the corrosion resistance of the corten steel samples, with the highest improvement observed at 5% weight percentage of SiC.

Venkatachalapathy (2021) done project on "Corrosion behaviour of SiC reinforced epoxy composites on Corten steel". The researchers used different weight percentages of SiC (0%, 1%, 3%, and 5%) with an epoxy resin coating on corten steel samples. The corrosion resistance was evaluated using electrochemical impedance spectroscopy (EIS) and



potentiodynamic polarization (PDP) techniques. The results showed that the addition of SiC improved the corrosion resistance of the corten steel samples, with the highest improvement observed at 5% weight percentage of SiC.

IV. CONCLUSION

In conclusion, Corten steel has several advantages in railway applications due to its corrosion resistance, high strength, aesthetic appeal, cost-effectiveness, and sustainability. Its unique rusted appearance makes it an attractive option for structures that are visible to the public, while its high durability and low maintenance requirements make it a cost-effective choice in the long run. Furthermore, the ability to recycle and reuse Corten steel makes it a sustainable material for railway construction and maintenance. Overall, Corten steel is an excellent option for railway structures that need to withstand harsh environmental conditions and heavy loads.

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