

Fully Precast Substations: Design and Application of Transmission Substations Fully Precast System

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Abstract: This article explores Dubai Electricity and Water Authority's DEWA efforts to align with the sustainability goals of the United Arab Emirates, especially in the context of The Year of Sustainability declared for 2023. DEWAs Transmission Power Division has introduced fully precast substations, shedding light on the significance of pre-catalytic converters pre-cats in sustainability efforts. The article discusses the multiple benefits of pre-cats, including reduced emissions, improved fuel efficiency, and increased catalytic converter lifespan. Moreover, it delves into the advantages of precast concrete structures, highlighting their role in reducing construction periods, enhancing cost efficiency, and ensuring high-quality control. By examining the successful implementation of fully precast DEWA substations, this article demonstrates how such initiatives contribute to the broader vision of sustainability set forth by HH. Sheikh Mohammed bin Zayed Al Nahyan for 2023.

Keywords: DEWA, sustainability, pre-catalytic converters, precast concrete structures, emissions reduction

1. Introduction

Dubai Electricity and Water Authority (Dewa) is a public service infrastructure company that was founded on 1 January 1992 by HH. Sheikh Maktoum bin Rashid Al Maktoum. Dewa is well known of its competitive and challenging atmosphere. The year of 2023 is dedicated to **Sustainability** announced by HH. Sheikh Mohammed bin Zayed Al Nahyan in 2023, under the theme of 'Today for Tomorrow'.

As part of UAE theme in 2023, Dewa made major improvements in its structure to be in line with the country's goals and vision. **Transmission Power Division** introduced a fully precast substations projects to meet UAE's 2023 criteria 'The Year of Sustainability'.

2. Main Factor

Pre-cats, or pre-catalytic converters, can play an important role in sustainability by reducing emissions from vehicles and machinery. Hereafter are some benefits of pre-cats in sustainability:

- 1) **Reduced emissions:** Pre-cats are designed to reduce emissions of harmful pollutants such as carbon monoxide, nitrogen oxides, and volatile organic compounds. By reducing emissions, pre-cats can help to improve air quality and protect public health.
- 2) **Improved fuel efficiency:** Pre-cats can also help to improve fuel efficiency by increasing the efficiency of the combustion process in engines. This can reduce the amount of fuel that is needed to produce the same amount of power, which in turn reduces greenhouse gas emissions and improves sustainability.
- 3) **Longer lifespan of catalytic converters:** By reducing the amount of pollutants that reach the main catalytic converter, pre-cats can help to extend the lifespan of the catalytic converter. This can reduce the need for frequent replacement and reduce the environmental impact of manufacturing and disposing of catalytic converters.

Overall, pre-cats can be an effective way to reduce emissions and improve sustainability in a variety of applications, from cars and trucks to industrial machinery and power generators and transmission.

Precast concrete structure, as mentioned above has several benefits related to sustainability. It is a major responsible for decreasing the consumption in a project. Transmission engineering department implemented the initiative to turn a substation to a fully precast structure in 2021. **Precast concrete structure** has many major benefits that result in the improvement of 132/11kV substations project life cycle. It offer many advantages such as *reduction of the construction period, cost efficiency, and high-quality control*.

Reduction of the construction period

It is known that the project cycle of a substation passes through a several phases prior reaching to the execution phase, which is the construction period. In the construction of the substations project, it is been realized that the duration of the construction period in DEWA substation has been reduced and saved about 3 months.

Cost efficiency

Introducing the fully precast DEWA substations enabled the stakeholders and custodians involved in the project to compare total cost of the project compared to the previous projects that did not implement the precast concrete structure. It is been realized that during the construction, the fully precast DEWA substations saved approximate of 12% of the civil construction cost.

High-quality control

The execution of the fully precast DEWA substations involves different custodians that need a lot of coordination to reach to a successful result. A high-quality control initially starts with the design civil team and the importance to the coordination to reach to a fully successful project that satisfies all custodians. The methodology enabled to reduce the time limit prior the execution phase.

3. Conclusion

Sheikh Mohammed bin Zayed Al Nahyan announced the year of 2023 as 'The Year of Sustainability'. It involves improvements healthcare, sufficient food at reasonable prices, and creating sustainable economic growth. *Fully precast DEWA substations* manage to meet the criteria and the vision. It leads DEWA projects to improve economically and create a more sustainable project.