



Rebuilding a Fin/Fan Structure

with Five Star® DP Epoxy Grout

Five Star® DP Epoxy Grout

Advantages:

- Permanent support for machinery requiring precision alignment
- Low exotherm with early strength development
- Long working time
- 95% effective bearing area
- Expansive, nonshrink per ASTM C 827
- Superior creep resistance
- Chemical resistance
- Excellent adhesion to steel
- Solvent-free clean up
- Adjustable flow for various conditions

Applications:

- Large volume applications
- Foundation rebuilds and skid mounted equipment
- Precision alignment under dynamic load conditions
- Vibration dampening for rotating equipment
- Aggressive chemical environments
- Support of chemical tanks, vessels, and rotating equipment
- Installation of anchors and dowels
- Wind turbine baseplates

Refineries represent some of the most demanding and challenging environments for process equipment, concrete foundations, and support structures. Maintaining and maximizing production often requires operating under extreme stresses and poses unique challenges, particularly when concrete repair is involved. That's where Five Star comes in.

Fin/fan units are critical to the refining process and often impart excessive vibration into the concrete support structure. These stresses can result in severe cracking and spalling of existing concrete and lead to failure.

The engineering staff of a major West Coast refinery had been attempting to deal with exactly this issue when they turned to Five Star Products for a solution. The concrete support structure for a crude cooling unit had significant problems as evidenced from spalling.

Sections of the concrete initially exhibited severe cracking, allowing the penetration of contaminants, such as chlorides, into the concrete. This, coupled with the excessive vibration, led to further degradation of the concrete support structure.

Five Star provided technical support and knowledgeable field personnel at no cost to the customer. Five Star's engineers initially met with concrete specialists from the refinery to review drawings, site photographs, and to develop a repair strategy that included the following:

1. Utilize one high-performance product for the various repair depths and geometries.
2. Develop an on-site test program to ensure proper material selection and measure material performance.
3. Generate detailed repair specifications.



Fin/Fan structure in Hawaii

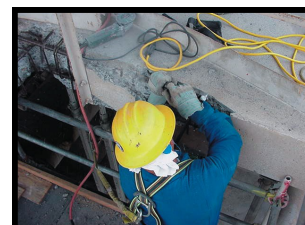
4. Restore structural integrity to the fin/fan support structure in 24 hours or less.

During this process, the customer outlined one critical and challenging requirement: *due to major cost considerations often associated with downtime, the structure could not be shut down during the repair.* Therefore, any product considered for the repair had to be able to withstand vibration within the base concrete during placement.

Vibration analysis data taken on the fin/fan structure was reviewed by Five Star. A determination was made to develop a repair strategy for the customer utilizing a high performance, low exotherm, aggregate loaded epoxy-based material called **Five Star DP Epoxy Grout.**



Surface preparation



Removing damaged concrete

Unlike cementitious materials, **Five Star DP Epoxy Grout** has excellent vibration resistance capabilities, even when vibration is present during placement. Because **Five Star DP Epoxy Grout** is formulated with a unique expansion mechanism, the problems often associated with drying shrinkage of cementitious repair materials were not a concern.

A detailed repair procedure was developed by Five Star. In conjunction with the customer, a test protocol was initiated to determine whether or not **Five Star DP Epoxy Grout** could be placed during vibration, develop excellent bond strength, and result in a permanent repair. The test was run on selected areas within the fin/fan structure, representing the “worst-case” locations, based upon vibration amplitudes measured previously by the customer. The areas to be repaired were chipped to sound concrete, and clear Plexiglas forms were installed for visual observation of the product both during and after placement.

The **Five Star DP Epoxy Grout** was mixed in a mortar mixer and placed in varying thicknesses – from 2 to 8 inches in depth in a single pour. The unique low-exotherm characteristics of **Five Star DP Epoxy Grout** allowed thick pours without the potential problem of stress cracking.

Visual observations along with core samples were taken 7 days later to determine actual bond strength development. The test repairs were also monitored for any cracking. The test repairs were deemed a complete success based upon physical observations and excellent bond strength results from the cores taken.

The next step was to ensure that the actual repairs carried out on a much larger scale were done properly and in accordance with good construction practices. Five Star assisted the customer in finding a well qualified, experienced repair contractor, who was trained on working with **Five Star DP Epoxy Grout** during the test protocol.

Five Star Products, Inc. provided technical field personnel for the repairs at no cost to the customer. The fin/fan structure retains its structural integrity and remains fully operational to this day. This West Coast Refinery was extremely pleased with Five Star’s performance and superior technical on-hand support, as well as the quality of its **DP Epoxy Grout**. Five Star provided quality products, technical know-how, and quick turnaround to the owner, making this a true Five Star solution.



Pouring columns with Five Star DP Epoxy Grout



Concrete pour forms before removal



Columns before and after repairs

Five Star® Services:

- Design-A-Spec™ engineering specification assistance
- Technical on-call center with field and project experienced staff
- Field support representatives for on-site consultation
- Corporate research laboratory available to customize products for unique applications



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