EN-1029

E. I. DU PONT DE NEMOURS & COMPANY
INCORPORATED

WILMINGTON, DELAWARE 19898

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May 6, 1976

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PLAINTIFF'S EXHIBIT
DUP-490

H. P. POPE
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SABINE RIVER WORKS

WR-437169 - SABINE - SPECIAL PROBLEMS ASSISTANCE
WET INSULATION AND STAINLESS STEEL

Confirming the attached ESD recommendations, current Sabine PID projects should be started up without removing wet insulation on stainless steel pipe and equipment. As indicated, wet insulation which was in place but not covered by jackets during the strike should be replaced. Also, after start-up, the insulation should be checked to be sure that it has dried and is effective.

DESIGN DIVISION
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* For your information - Sabine Study

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cc: A. A. Gruber - Design
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May 3, 1976

TO: G. E. BUCHWALD
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FROM: W. E. ELLIS
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POLYMER INTERMEDIATES DEPARTMENT - SABINE RIVER WORKS
MATERIALS ENGINEERING
WET INHIBITED CALCIUM SILICATE INSULATION IN CONTACT WITH
300 SERIES STAINLESS STEEL

A review by several members of the ESD Materials Engineering Group of chloride stress-corrosion cracking of stainless steel under wet inhibited calcium silicate insulation suggests that we can start up a plant with the wet insulation and have reasonable assurance that no failures will occur. Stainless steel pipelines and equipment which will operate below 40°C do not have sufficient heat to concentrate chlorides to a level where they will be harmful and cause chloride stress-corrosion cracking. Stainless steel equipment operating above 40°C does have this ability but can concentrate only those chlorides available in the insulation. To cause failure of the stainless steel equipment operating above 40°C, in the presence of silicate inhibitor, we believe that it is necessary to add chloride-bearing water by continuous wetting of the insulation by rain (may contain 30 to 50 ppm chloride) or by washing the equipment or the adjacent floor areas with a brackish water (high chlorides 1,500 to 10,000 ppm). Time to cause cracking under these conditions is related to the temperature and the chloride content of the water being added to the insulation.

Based on this, we believe that even though some insulation may have become wet in the construction of these plants, they can be started up without removing the wet insulation. However, we do recommend that any of the insulation which was in place but not covered by aluminum jackets during strike should be replaced. After start-up, the insulation should be checked to be sure that it has dried and is effective.

Many tests have been conducted at the Engineering Test Center which support our thoughts on this subject. Some of these test results and information are included below.

Standard Wick Test Using Stainless Steel U-Bends

Fifty U-bend specimens were exposed to the standard wick test and only one failure occurred when new stock material was used in the test. We have had no failures from insulation supplied by Papco. One specimen

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cracked when it was tested with a stock sample supplied by Keane. Several wet insulation specimens were gathered from various pieces of pipe and equipment and used in the wick test. Of 35 U-bend specimens tested in contact with wet insulation, several showed pits and one group of five specimens showed three cracked specimens. This particular test was run from wet insulation obtained from a pipe, and sections generally are small. It is questionable whether we had a standard block of insulation from this pipe; therefore, abnormal wicking may have occurred.

Chloride and Sodium Silicate Analysis

The Engineering Test Center has had several samples submitted for a soluble chloride and soluble silicate analysis. In some cases they were dry samples from stock and in others they were wet samples from the equipment. In all cases, the soluble sodium silicate ranged from 8,000 to 14,000 ppm. The chloride content of the dry specimens from stock showed chlorides less than 400 ppm. The wet samples taken from pipe or equipment showed the chloride to range between 600 and 800 ppm. In all cases the pH of the insulation was 9.7 or higher. The chemical analysis of the soluble silicates indicates they are present in wet insulation is sufficient quantities to prevent cracking in the wick test.

Military Specification

We know that all of the insulating materials we have used on stainless steel equipment will pass the chloride stress-corrosion cracking test required by the Government in their Military Specification, I24244. This military specification describes a chemical analysis to determine silicate to chloride levels present and their ratios. In addition, a wick test is required which will not chloride stress-corrosion crack a stainless steel U-bend when distilled water is used as the wetting solution.

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WEE:scc