



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

*Central Files*

February 20, 1997

Mr. Mark Woltering  
Executive Vice President  
AMOT Controls Corporation  
401 First Street  
Richmond, California 94801-2906

Subject: NRC INFORMATION NOTICE 91-85, "POTENTIAL FAILURES OF  
THERMOSTATIC CONTROL VALVES FOR DIESEL GENERATOR JACKET  
COOLING WATER"

Dear Mr. Woltering:

In your September 19, 1996, letter to me, you requested the NRC to re-examine Information Notice (IN), 91-85, "Potential Failure of Thermostatic Valves for Diesel Generator Jacket Cooling Water," for misleading and perhaps damaging information regarding AMOT thermostatic valves. The Events Assessment and Generic Communication Branch which is responsible for issuing INs looked into your concerns. The NRC is issuing a revision to IN 91-85 to clarify that the failure of the AMOT thermostatic control valve for the diesel generator jacket cooling water at Catawba Nuclear Station occurred beyond its normal service life. The IN also provides your latest recommendation for the expected shelf life of the internal elements associated with these valves. Below is a restatement of your four concerns and how they were resolved.

**CONCERN**

1. The information indicates the AMOT thermostatic valve elements were original equipment supplied with the engine in 1979. The engine was removed from service on September 10, 1991, for minor corrective and preventive service, which suggests the AMOT product had been in service for 12 years, not on the shelf in storage. The report does not indicate whether the AMOT product was inspected or maintained per our published manuals. The notice identifies "slow growing intergranular stress cracking" as the root cause of the engine failure and subsequent damage. However, it does not identify what factors caused the intergranular stress cracking.

**RESOLUTION**

The revision to IN 91-85 clearly states that the failed elements had not been inspected or replaced since they were originally provided with the engine in 1979.

The licensee did not identify what factors caused the intergranular stress corrosion cracking (IGSCC). This fact is stated in the IN. Since the factors that caused the IGSCC are unknown, we do not believe the IN should speculate as to what may or may not have been the contributing factors.

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PDR

### CONCERN

2. According to the report, the licensee's metallurgical laboratory "attributed the root cause of the failure to slow growing intergranular stress corrosion cracking." There are number of factors outside of our control which may have caused the intergranular stress corrosion cracking.
  - Ammonia or ammonium compounds are usually responsible for causing stressed copper alloys to crack. Sometimes these compounds are found in the atmosphere or cleaning compounds. Was the licensee properly monitoring the quality of the cooling water system and/or using cleaning compounds containing ammonia?
  - Mercury compounds can also cause the cracking of copper alloys. Did the cooling system have mercury type pressure measuring devices? Abrupt pressure changes can cause mercury from these devices to enter the system.

### RESOLUTION

See resolution to concern 1.

### CONCERN

3. Maintenance: **AMOT Instruction Form 757 states the normal service life is 6-10 years and the element should be inspected every 2-3 years. The shelf life of elements is 1-2 years, depending on storage conditions.** Please note the last revision of Form 757 was in June 1979. All previous versions of Form 757 states a 6-10 year service life. AMOT maintains a document library of all literature and instruction manuals dating back to the inception of the company, 1947. **The information in the NRC notice regarding shelf life is inaccurate.**

The report indicates the thermostatic valve was 12 years old at the time the failure occurred. The report does not state that the thermostatic element was inspected every 2-3 years per AMOT's maintenance manual. It appears proper preventative maintenance may not have been performed.

### RESOLUTION

See resolution to concern 4.

### CONCERN

4. The NRC notice states the vendor's documentation indicates the thermostatic valve power elements have a 15 year shelf life but does not state "in-service life." AMOT's stated in service life is 6-10 years. Shelf and service life are distinctively different,

and shelf life must not be used to define service life of a product. The industry standard of "shelf life" is defined as un-installed not in-service, and only when the material is properly packaged for storage.

The NRC information notice may lead some licensee's to believe the 15 year shelf life is the service life of the product, and AMOT's products are inferior or unacceptable because they did not meet this stated 15 year shelf life when in fact the thermostatic element exceeded our stated in-service life. At Catawba Nuclear Station, the AMOT valve was reportedly in service for 12 years, far exceeding the recommended in-service life of 6-10 years. "Shelf life" must not be confused with "service life."

## RESOLUTION

The AMOT thermostatic control valve that failed at Catawba was not sold directly to Catawba. It was supplied by the diesel generator (DG) manufacturer, Transamerica Delaval, as part of their DG package. Transamerica Delaval is no longer in business, but was taken over by Cooper Energy Services which is now Cooper Bessemer. We checked with Cooper Bessemer and were told that when they purchase components from vendors, the vendor documents that are provided with components are not normally included with their DG package. Therefore, AMOT Form 757 was probably not given to Catawba, and hence, it was not available at the plant for NRC to examine. We checked with one of the contributors to IN 91-85 and were told that at the time of the failure there was a letter from AMOT that stated that the shelf life of the elements was 15-years. The statement seems to be confirmed by Duke Power Company, the licensee for Catawba, which provided us with a AMOT's letter dated September 18, 1990, to Cooper Energy which states that the shelf-life of the elements is 15-years (Enclosure 1). Hence, we do not believe that IN 91-85 was inaccurate regarding the element shelf life, but was based on information at Catawba indicating a 15-year shelf life.

We have discussed with you the apparent discrepancy between the element shelf life of 1-2 year stated in AMOT Form 757 and the 15 year shelf life recommended by AMOT's September 18, 1990 letter to Cooper Energy. The outcome of those discussions resulted in AMOT reevaluating the element shelf life and providing NRC, by letter dated January 6, 1997, AMOT's current expectation of 5-10 years for the element shelf life. We have included this information in the revision to IN 91-85.

The revision to IN 91-85 now makes a distinction between shelf life and service life which should eliminate any confusion. The recommended service life of 5-7 years for critical installation is based on an AMOT letter dated May 18, 1993 to Cooper Energy Services provided to NRC by Cooper Bessemer (Enclosure 2). This service life has been reconfirmed by you.

Mr. M. Woltering

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If you have any question about this letter or the revision to IN 91-85, please contact Mr. Thomas Greene at (301) 415-1175.

Sincerely,

original signed by

Thomas T. Martin, Director  
Division of Reactor Program Management  
Office of Nuclear Reactor Regulation

Enclosures: As stated

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Enclosure 1

# AMOT CONTROLS

AMOT Controls Corporation

O Box 1312, First Street & Nevin Avenue, Richmond, California 94802 U.S.A. Tel: (415) 236-8300. Tlx: 33-5442 Fax: (415) 234-9950

September 18, 1990

Cooper Energy  
Enterprise Engine Service  
P. O. Box 1837  
San Leandro, CA 94577

Attn: Steve Chaubuck

Re: Shelf-Life of Element Assemblies and Power Elements

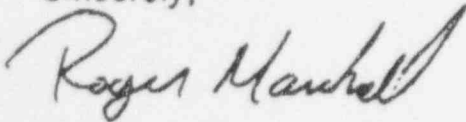
Regarding the storage life of AMOT element assemblies and power elements. These units have a shelf-life of 15 years from the date of shipment when stored at ar. ambient temperature not to exceed 100°F.

While the element assemblies and power elements do not require special storage conditions, they must be exercised a minimum of 3 cycles once every 5 years. Before installing them in the valve, it is recommended that they be exercised again and then installed in the valve.

To exercise the element assemblies and power elements, place the temperature sensing end into hot water. The hot water should be between 10° to 30°F above nominal temperature rating. After 5 minutes place them in cold water. The cold water should be at least 20°F below the nominal temperature rating. Repeat the above procedure a minimum of 2 more times.

If you have any questions, please contact me.

Sincerely,



Roger Marshall  
Sr. Applications Engineer

RMbmr

Amot control-

Enclosure 2

**AMOT  
CONTROLS**

AMOT Controls Corporation

P. O. Box 1312, First Street & Nevin Avenue, Richmond, California 94802, Tel: (510) 236-8300 Fax: (510) 234-9950

May 18, 1993

Cooper Energy Services  
150 Lincoln Ave  
Grove City, PA 16127

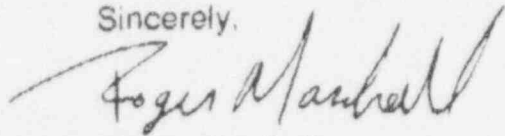
Attn: Mr. Andy Steffan  
Mr. Mike A. Schleigh

Subj: Element Assembly Change Out Recommendation

The Amot Thermostatic valves generally require very little maintenance and can operate satisfactorily for 20 years or more. In many long term installations, the internal element assemblies are never changed out. However, our valves very often will control the temperature of critical machinery. In critical installations, we would recommend that element assemblies be changed out every 5 to 7 years.

If you have any questions, please call me.

Sincerely,



Roger Marshall  
Product Manager

cc: Mr. David Cammack