Coolant Thermal Decomposition Procedure - Triton Test Systems

1.0 Introduction

The Triton systems and testers use Fluorinert dielectric coolant, FC-74, manufactured by 3M to cool the electronic modules while they are under test. 3M animal toxicity studies show the dielectric coolant in its normal state to be non-irritating to the eyes and skin, and practically non-toxic orally with a very low inhalation toxicity. See attached 3M Material Safety Data Sheet.

Thermal decomposition of the dielectric coolant can generate highly toxic by-products including perfluoroisobutylene (PFIB) and hydrogen fluoride (HF). Thermal decomposition occurs from exposure of the coolant to; open flames, glowing electric heating elements, electric arcs, or elevated temperatures above 200° C. The 3M medical department and the professional society ACGIH (American Conference of Governmental Industrial Hygienists) have established an eight-hour worker exposure ceiling value of 10 parts per billion for PFIB. HF has an established exposure limit of 3 parts per million.

The possibility of thermal decomposition of the dielectric coolant in the test system does exist, because of this, a 3M Fluid Conditioning System (FCS) capable of neutralizing the PFIB and HF into a nontoxic by-product, has been provided as an integral part of the test system.

2.0 When to Suspect the Occurence of Decomposition

Decomposition should be expected whenever the control system shuts down the system power on its own due to a fault after the system power and cooling has come up normally. When the system shuts down, the operator must reach a person from the contact list to determine the nature of the fault as defined in the attached procedures. Decomposition will not occur under normal operating conditions. The presence of boiling does not necessarily indicate that decomposition is occurring.

3.0 Causes of Coolant Decomposition

Possible causes of coolant decomposition within the test system include but are not limited to the following:

a) A power to ground short on the output of the low voltage DC power supply.
b) A damaged or internally shorted printed circuit module.
c) Any short caused by foreign material being carried through the test system by the dielectric coolant and being deposited on a module.
d) Extreme high temperature conditions (temperature of above 200°C or 392°F) due to component failures.
e) Arcing conditions due to component failure.

All of the above mentioned conditions will cause thermal decomposition of the dielectric coolant. The rate of decomposition is affected by many variables and will increase with higher surface temperatures and larger affected surface areas. All of the above conditions should be taken seriously no matter how short or minor the event may appear, the attached procedure should be followed in all cases.

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CAUTION: Do not breathe the decomposition vapors generated by the dielectric coolant when exposed to; elevated temperatures beyond 200°C (392°F), open flame, glowing electronic heating elements, or electric arcing.

Smoking is strictly prohibited when using the dielectric coolant. See also CRI specification HR-0306 Safe Use and Handling of Fluorinert® Liquid.

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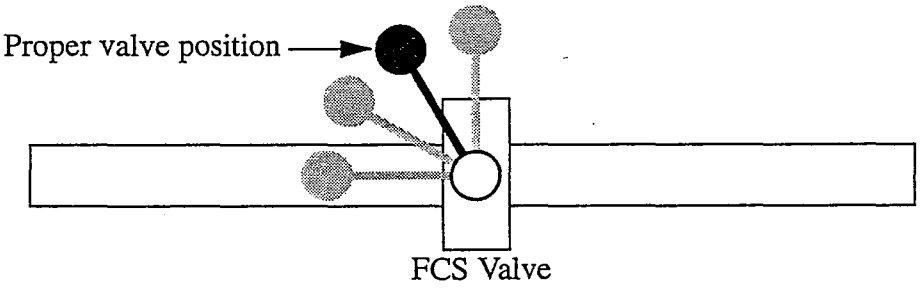
TRITON TESTERS:

Coolant (Fluorinert Liquid, FC-74) thermal decomposition is capable of producing perfluoroisobutylene (PFIB), a highly toxic, colorless gas. This procedure utilizes a 3M Fluid Conditioning System (FCS) to chemically alter the PFIB into a nontoxic substance.

In the event of suspected coolant decomposition, under no circumstances should the system be opened or vented to the room until this entire procedure is successfully completed.

1] Select "Circulate" through the MWS control system or by depressing the switch labeled "Circulate" at the control panel of tester. This will disable all power supplies and continue to pump fluid through the system.
2] Remove panel on support pod labeled "ACCESS TO FCS VALVE".
3] Close valve labeled "FCS Valve" to 30° open (see below), this will force the fluid flow to be diverted through the FCS filter, neutralizing the PFIB. Allow the fluid to continue to circulate. Do not drain the test system.



4] A Fluorinert liquid sample should be taken if a sample bottle is available, if one is not available, continue with this procedure and have a sample drawn as soon as possible.
5] The system coolant must continue to circulate at a minimum rate of 8.0 gpm.
6] Contact appropriate person from contact list posted on door of test bay.

NOTE:
Local ventilation at vent of reservoir is to be on at all times.

Bottle Ref #
Label Ref #

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TRITON SYSTEMS:

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In the event of suspected coolant decomposition, under no circumstances should the system be opened or vented to the room until this entire procedure is successfully completed.

1] If the system has been opened, it must be sealed as soon as possible by replacing and securing all panels.
2] Circuit breaker on HEU must be in the "1" position.
3] Select "Circulate" through the MWS control system or by depressing the switch labeled "Circulate" at the control panel of system located on HEU. This will disable all power supplies and continue to pump fluid through the system.
4] A Fluorinert liquid sample should be taken if a sample bottle is available, if one is not available, continue with this procedure and have a sample drawn as soon as possible.
5] The system coolant must continue to circulate at a minimum rate of 80 gpm.
6] Contact appropriate person from contact list posted on door of test bay.

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CONTACT PERSONNEL INFORMATION:

Coolant (Fluorinert Liquid, FC-74) thermal decomposition is capable of producing perfluoroisobutylene (PFIB), a highly toxic, odorless, colorless gas. This procedure utilizes a 3M Fluid Conditioning System (FCS) to chemically alter the PFIB into a nontoxic substance.

In the event of suspected coolant decomposition, under no circumstances should the systems be opened or vented to the room until this entire procedure is successfully completed.

General Information:

1] Familiarize yourself with the emergency procedures and the contact list for the test bay which is attached and is posted at each exit door of the test bay and the mechanical room.
2] Familiarize yourself with the procedures for both the testers and the systems which are attached and are posted on each of the testers and the HEUs of each Triton system.
3] Keys to the mechanical bay (G26) are located at the front desk, on top of the file cabinet in the test bay, or under the in-basket in Mike Edwards office.
4] PFIB is an odorless gas. Odors in the room will be from other materials and are not an indication of the level of PFIB.
5] The first sign of PFIB poisoning is nausea. If anyone is feeling nauseous, move outside to fresh air. Leave the doors open in order to dilute the PFIB concentration in the air.
6] The cartridges are nontoxic even after being used, but they do have a fine dust and should be handled with care and covered as soon as possible.
7] Fluid samples are important to our understanding of the failure and should be taken as often as possible, but should not interfere the procedures. These samples should be sent to Lew Tousignant at 3M as soon as possible. Lew can be reached at his office at (612)736-5242 or his cellular phone at (612) 723-9552.

If you are contacted:

1] If the "EMERGENCY ELECTRICAL POWER SHUTDOWN" switch has been used to shut off power to the test bay, contact Jerry Kasper at x65003 (726-5003) or pager 631. The pager access number is x68300 (726-8300). The power must be restored in order to use the pumps which will be required for any procedure. The UPS which provides only HVDC will not reset. It is not needed for the following steps. To reset it contact Bob Mascia form the contact list.
2] The room should be ventilated as much as possible by opening all doors and the doors to

the mechanical room. If the odors are heavy, the doors to the loading dock and the exit door at the rear of the building near the stairs can be opened.

3] Follow the attached procedures given the tester or the Triton system. Record the time the circulate procedure was started.

4] The stated flow rates must be maintained for 90 minutes with good FCS cartridges. The cartridge is no longer acceptable, if the crystals visible through the sight glass are uniform in color. This should be checked every ten minutes. If the crystals are uniform in color then the cartridge must be replaced. A new cartridge can be obtained from inventory under part number 35166100. If no one is available, the key at the front desk will open the door. If a cartridge is not available in inventory, remove one from one of the other systems in the test bay. The pump does not need to be turned off to replace the cartridges. Remove the cartridge by closing the manual valves at each end of the cartridge housing. With a refrigeration hose from the upright cabinets against the back wall bleed liquid out of the cartridge by connecting the hose to the bottom brass Shraeder valve and depressing the stem of the Shraeder valve at the top of the cartridge to allow air into the cartridge. Capture the fluid with whatever container is available and cover when done draining fluid. Once the fluid is drained remove the entire housing by undoing the two clamps at both ends of the housing and removing the housing from the HEU. Remove the large clamp from the end of the housing and remove the cartridge. This cartridge is nontoxic, but should be handled with care and covered as soon as possible. Reattach the large clamp and return the housing to the HEU, attaching the two clamps. Open the manual valves and restart the pump if it has been turned off.

No.	Message	sible Actions
1	Cooling OK at %Time	
2	Supply Flow Fault of #	alves and verify that the g order.
3	Supply Temp Fault of #	valve.
5	Reservoir is full	olant from the reservoir.
6	Reservoir is empty	
7	Pump Over Temperature	s cooling and is wired
8	Contactor Overload	ge & pump wiring. Reset n.
9	Contactor Failure	nat look ok the contactor be replaced
10	No Flow @ %Time	rom the system and try
11	High Press. of #	l of the valves are open.
12	Low Press. of #	
13	Voltage on -?.? bus in of	f the power.
14	HVDC did not come up!	fuses or breakers.
15	Power turned on at %Tim	
16	Power turned off at %Tir	
17	-?.?V Hi Fault of #	the faulty supply(s).
18	-?.?V Lo Fault of #	r power has been up there there has been a burn, DO YSTEM.
19	Tank not full at %Time	aks in the system, there DO NOT OPEN THE
20	Supplies dry at %Time.	aks in the system, there DO NOT OPEN THE
21	Checking -?.?V buss for	
22	Buss Shorted to Ground	and ohm the busses.
23	Buss Shorted to -?.? Bus	and ohm the busses.
24	Continuity Circuit Fault a	module has the problem can.
25	Genius Bus Controller Fa	
26	Genius Block #1 has a fa	
27	Genius Block #? is Dead!	k has power. Check the
28	Check the penetrators!	roller cables.
29	Connections O.K.	