**Monsanto**

FROM (NAME – LOCATION – PHONE) R. L. Sandstedt (4-6486) Corporate Engineering - CS7N

DATE : April 30, 1984 CC:

SUBJECT : TRANSFORMER FIRES

REFERENCE :

TO : P. R. Michael - N1E

I have been with Monsanto thirty-three years and during this time I have been closely affiliated with electrical utility systems in many of the Monsanto plants. I have never heard of a transformer fire within a Monsanto facility, but we have had transformer failures.

Some of those that come to mind are as follows:

In the 1970's the tap changer compartment of the regulating transformer for the DeNora cell line at Krummrich exploded twice, no fire.

The tap changer compartment of a brand new Westinghouse regulating transformer in the main substation at Queeny plant blew open in the mid-1950's. Large quantities of oil came out, but there was no fire.

In the 1950's we had two PCB transformers at Queeny plant fail. Their tops were ripped off. One was a 3,000 KVA transformer feeding maleic anhydride and the other was a 500 KVA transformer feeding the "K" Street boiler, no fires.

Attached are some recent Incident Reports from the Texas City plant. Three of these show transformer failures.

The transformer failures we have had were due to moisture related insulation failures or to mechanical stress insulation failures. There is no reason ever to have a transformer fire if there is coordinated protection on the feeders supplying the transformer's primary. Large transformers should have a sudden pressure relay. The slightest pressure ripple in a transformer will cause this relay to function and to trip the circuit breaker for the circuit supplying power to the transformer. Of course, all transformers are not protected by circuit breakers and a sudden pressure relay cannot be used, but where fuses are used they should clear the transformer before a serious fire occurs.

The utility companies on their downtown distribution networks use current limiters or in some cases practically no protection. When a transformer fails, all the energy in the system rushes to the point of the short circuit. This terrific concentration of energy is going to cause significant destruction unless the damaged equipment is cut off from the system quickly by the protective devices. Instead of OSHA coming up with additional requirements on everybody, they should make the electrical utilities comply with the National Electrical Code. Their coordinating practices on all their distribution systems overhead and underground are poor. Their high voltage systems do have quality protection.

PCB filled transformers are much more subject to failure than are oil filled transformers. In oil filled transformers moisture accumulates at the bottom of the tank below the electrical winding. For PCB transformers, the moisture floats on top of the PCB, and the electrical windings have to go through this moisture interface to exit the transformer. Also, this top moisture promotes rust which falls into the electrical components and cause shorts. (This was the case of the two PCB transformers which failed at Queeny.) PCB needs a much higher degree of maintenance. It is rare that transformer bushings fail and it is very rare that thru faults on equipment down stream cause transformer failures if the transformers and feeders are properly protected.

For maintenance, most of the Monsanto foremen walk their facilities and make a visual inspection of the transformers once a week. They also take oil tests on a six-month or yearly basis and have contract companies come in to filter the oil or PCBs, when necessary. An important factor is that in industry we keep track of the loads on our transformers and we do not indiscriminately add blocks of load which can overload the equipment. This can occur in a high-rise building quite easily when a fuse blows and they put in a fuse of larger capacity. Utilities usually keep track of their loading also. If a customer already had a large service entrance in his facility, he could conceivably add load without consulting the utility company and there could be a potential problem.

In summary, within Monsanto we consider a transformer a very reliable piece of equipment. We have had oil and PCB filled units in operation for twenty years with minimal maintenance or expense. There was a transformer bank (oil) in the Anniston plant that ran twenty-five years with no maintenance and no problems. I do not think that any additional restrictions should be put on industry for PCB or oil filled transformers. The restrictions should be put on the poor performers - the utility and commercial facilities. Our track record is excellent, we do a quality job now and any additional regulations will not change our practices, but may result in additional paperwork.

Roger L. Sandstedt

R. L. Sandstedt

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PCB-ARCH0755279

# INCIDENT LOSS REPORT

SAFETY AND PROPERTY PROTECTION
MANUFACTURING COORDINATION DEPARTMENT • MONSANTO COMPANY

Complete form for each incident with Estimated Loss Total of $25,000 or over, or having loss Potential in excess of $100,000. Forward within 10 days to Mgr., Property Protection, S&PP, St. Louis. Submit revised report for important new facts or major change in loss estimate. For Europe/Africa, send copy of report to Mgr., Insurance, London. See S&PP Procedure 601 for further explanation.

LOCATION: Texas City | CITY: Texas City, Tx. | STATE - COUNTRY: USA

REPORTED BY: SAM GRAVES | DATE: 5-24-82 | ☐ NO LOSS FOR MONTH OF Rev. 8/11/82

☐ TELEPHONE REPORT ☐ INITIAL REPORT ☑ REVISED REPORT ☐ SUPPLEMENTAL REPORT TO FOLLOW

DATE OF LOSS Day, Date, Time: THURS. MAY 13, 5:27 PM | LOCATION Yard, Building, Level, Tank Farm, Plant Sub-Station, Off Premise Utility, Etc.: IDA ELEC. SUBSTATION | PERSONNEL INJURY: ~~YES~~ NO

OCCUPANCY State Process, Material Stored, or Non-Manufacturing Occupancy: ELECTRICAL DISTRIBUTION: TS-77(IDA), 69KV STA. TS66-5 | Number Major Injuries: | Number Recordable:

EQUIPMENT Machine(s), Device, or Equipment Initially Involved: 4160 VOLT SWITCHGEAR IN TS-77

DAMAGE TO — Building: NONE

Contents and Equipment: TS-77: 4KV SWGR. TS66-5 & 10,000 KVA TRANSFORMER

CAUSE (Or Probable Cause): TS-77: Water in GEAR. TS66-5: OVER STRESSED

DISCOVERY: Prompt ☑ Delayed ☐ By Whom: Employe ☑ Watchman ☐ Outsider ☐ Automatic Alarm & Factor ~~Yes~~ No

EMERGENCY ACTION (Check If Responded): Employe ☑ Plant Emerg. Organiz. ☐ Public Fire Dept. ☐ Operations Attended At Time of Loss ~~Yes~~ No

CONSTRUCTION: GENERAL TYPE (Roof & Floor) Fire Resistive ☐ Non-combustible ☐ Comb. or Part Comb. ☐ Outdoor (No bldg. involved) ☐

SPECIAL FEATURES: Open Structure ☐ Expl. Venting ☐ Fire Proofed Steel ☐ Heat & Smoke Vents ☐ Cutoffs ☐

SPRINKLERS IN AREA: None Wet Dry Deluge No. Opened | DURATION OF SPRINKLER OPERATION:

LARGE HOSE (2½") NUMBER STREAMS USED | DURATION OF FIRE:

OTHER APPARATUS USED: Extinguishers Small Hose Fixed Syst. (Type): | Control: Auto. ☐ Manual ☐

PROTECTION RESTORED | Effective: Yes ☐ No ☐

Date and Time When Sprinklers were Replaced and Full Fire Protection Restored | FIRE PUMP STARTED: Yes No None

DEFICIENCIES Rate up to three most applicable items 1, 2, 3, in order of importance for each of two categories below, Describe each briefly.

| DEFICIENCIES RESPONSBILE FOR OCCURRENCE: | | DEFICIENCIES CONTRIBUTING TO EXTENT OF DAMAGE | |
|---|---|---|---|
| Training | ☐ | Fire Protection | ☐ |
| Housekeeping | ☐ | Other Protection | ☐ |
| Design | ☐ | Emergency Action | ☐ |
| Equipment | ☑ 4KV GEAR INSULATION | Construction | ☑ INCOMPLETE |
| Personnel | ☐ | Occupancy | ☐ |
| Other (Describe) | ☑ CONST. NEGLIGENCE | Other (Describe) | ☐ |

DESCRIPTION OF INCIDENT: SEE ATTACHED DESCRIPTION

0655421

(See Reverse)

TYPE OF INCIDENT (Circle One): 01. Fire 02. Explosion 03. Runaway Reaction 04. Spill 05. Other Process 06. Mechanical Failure 07. Electrical Failure 08. Collision 09. Wind 10. Lightning 11. Other (Identify)

CED USE ONLY Trans Code 1 2 3 4

FUNCTION: 1F, 2P, 3M, 4E, 5

DATE OF INCIDENT Mo. Day Yr. | LOCATION CODE

INSURABLE? 1 YES 2 NO | DIVISION CODE

IND. CODE 1 B&M 2 FIRE | BOTH 3 | CED REPORT NO. —

ESTIMATED LOSS

| | |
|---|---|
| Total Property (Bldg., Contents, Cleanup) | $ 135,000 |
| Business Interruption (Profit & Cont. Expense) | $ NONE |
| TOTAL | $ 135,000 |

Does Business Interruption Represent Actual Sales Loss? 1 YES (2 NO)

ESTIMATED MAXIMUM LOSS POTENTIAL IN DOLLARS

1. ☐ - N/A
2. ☐ 100 – 500M
3. ☐ 500 – 1000M
4. ☐ Over 1000M

EX P-3394
Page 3 of 4

Q-1485 (REV. 1/79)

PCB-ARCH0755280

THE INCIDENT (CON'T) 4

THE DAMAGE AND SALVAGE IDA SUBSTATION: $10,000 REPAIRS
TS66-5 TRANSFORMER: $125,000 REPLACEMENT COST

INTERRUPTION TO PRODUCTION DEPT. 33, APPROX. 2 HRS.

THE CAUSE WATER IN 4160V OLT GEAR IN IDA SUBSTATION #TS-77

CONCLUSIONS AND RECOMMENDATIONS Disposition of 10,000 KVA transformer undecided at this time. Insulate 90 degree bends in 4KV bus bars in TS-77. Supply 4160V ola to IDA from TS66-2

BASIS FOR ESTIMATED MAXIMUM LOSS POTENTIAL Production losses, IDA losses plus loss of 10,000 KVA transformer

EX P-3391
Page 4 of 4

0655422

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