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U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555-0001
Date: 8/28/18

Subject: Senasys Selector Switch P/N 910CMC-5240X, Part 21 notification

To Whom it may concern,

This letter serves as an official report in accordance with 10CFR Part 21.21 pertaining to post-installation test failure of Senasys Selector Switch P/N 910CMC-5240X.

Curtiss-Wright was notified by Exelon Calvert Cliffs Plant that a Senasys selector switch P/N 910CMC-5240X (previously provided by Curtiss-Wright under Exelon purchase order 00630804), had failed a post-installation test. Calvert Cliffs sent the suspect switch to Exelon Powerlabs where the failure was found to have been caused by an assembly screw that was 1/8 inch too long, allowing it to cut into the coil of the switch, causing an electrical short. Correspondence between Exelon and the manufacturer determined that an inventory error had occurred, as noted below by the manufacturer:

The root cause was determined in our inventory – it seems the ‘found’ screws had been dumped into an open box of screws for the CMC units and they were not correct. This created the issue you are seeing. This was reported as a handful of screws - After they first reported problem, our inventory was quarantined and all the screws were inspected. The time frame has been determined to be the end of 2017 (seems to be November and December).

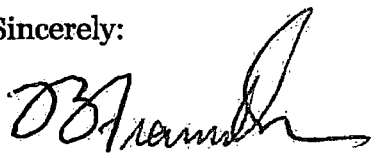
According to our records, only one customer and one plant received these defective switches. Exelon Generation's Calvert Cliffs received 5 switches on Exelon PO number 00630804 Rev. 2. Exelon Calvert Cliffs has been notified of this issue.

Curtiss Wright's dedication plan will be revised to include a note to ensure no selector switches, for this part number are manufactured with the November and December 2017 date codes.

The Exelon Powerlabs Failure Analysis Report is attached.

If you have any questions pertaining to this information, please contact Timothy Franchuk, Director of Quality Assurance, at 513-201-2176

Sincerely:

A handwritten signature in black ink, appearing to read 'T. Franchuk', with a stylized flourish at the end.

Timothy Franchuk
Director, Quality Assurance
Nuclear Division
Curtiss-Wright

cc: Regional Administrator, USNRC, Region II

To: Victor Sacket, Calvert Cliffs Station
From: Skip Booz, (610) 380-2440
Skip.Booz@ExelonPowerLabs.com
Project: CCN-00852
Subject: Failure Analysis of a Selector Switch
Manufacturer: Senasys, Inc.
Model: 910CMC-5240X
Stock Code/Cat ID: 0001774009
AR/CR/WO: 04130071/ MO C93664356
Quantity Received: 1
Date: 25 June 2018

STATION DESCRIPTION

Switch was new from stock, installed in 2018 RFO (April 2018) and found failed during subsequent testing. Control circuit found grounded isolated to inside hand switch. Appears that switch mounting screw penetrated one of the internal lighting transformers. Marked on switch with "X".

CONCLUSIONS

PowerLabs confirmed that one of the four mounting fastener screws penetrated the associated internal lighting transformer, causing it to short to the grounded panel board. The cause was a wrong length screw being supplied with the switch. Three of the mounting fastener screws were 1-3/8" long, but the fourth screw was 1-1/2" long. The extra 1/8" allowed it to puncture the transformer when the fastener screw was tightened as part of switch installation. All (4) switch lamps had previously been illumination tested satisfactorily at PowerLabs as part of Parts Quality Initiative (PQI) testing, substantiating the theory that the damage occurred as part of switch panel mounting.

COMMENTS AND RECOMMENDATIONS

The switch was safety related and the supplier/dedicator (Curtiss-Wright) should be notified regarding Part 21 implications.

Any remaining switches should be checked to confirm none of the mounting fastener screws are the wrong length. There were (5) switches PQI tested in January 2018, so there is likely at least (3) in stock. Based on the nature of this failure installed switches would not be impacted by this issue since the problem would be apparent during post-installation testing.

The Exelon PowerLabs Quality System meets 10CFR50 Appendix B, NQA-1 (1994), ANSI N45.2, ANSI/NCSL Z540.3-2006, ISO 9001:2008, ISO 17025:2005, and 10CFR21/10CFR50.55 (e).

COMMENTS AND RECOMMENDATIONS (Continued)

Senasys was aware of the issue and will replace the switch at no cost. Refer to the Discovery section of this report for details.

The PowerLabs PQI testing templates for this switch and similar models will be revised to include inspection of the mounting fastener screws to confirm proper length.

REQUIREMENTS

Determine if this was a manufacturing defect, compare other positions, determine if there is a possibility of this being a Part 21 issue.

TEST PLAN

1. Document Nameplate Information
2. Document As-Received Condition
3. Perform Electrical Testing
4. Perform Disassembly and Analysis
5. Document Discovery Items

STATEMENT OF QUALITY

Testing was performed with standard equipment that have accuracies traceable to nationally recognized standards, or to physical constants, by qualified personnel, and in accordance with the Exelon PowerLabs Quality Assurance Program.

Technician(s): Skip Booz, (610) 380-2440, Skip.Booz@ExelonPowerLabs.com

Prepared by: Skip Booz 6/25/18
ANSI Level III / Sr Engineer Date

Reviewed by: Joe Mulcahy 6/25/18
ANSI Level III / Sr. Engineer Date

Approved by: _____ Date
ANSI Level III / Sr. Engineer

Project review and approval are electronically authenticated in the Exelon PowerLabs project record.

cc:

OBSERVATIONS AND DATA

1. Document Nameplate Data

Photos 1, 2 & 3: Switch Nameplate

Manufacturer: Senasys

Type: CMC Series Multi-Light Oiltight Selector Switch

Model: 910BFA011

910 – Grey knob

B – Position 1, 2, 3

F – Orientation 1

A – Maintained

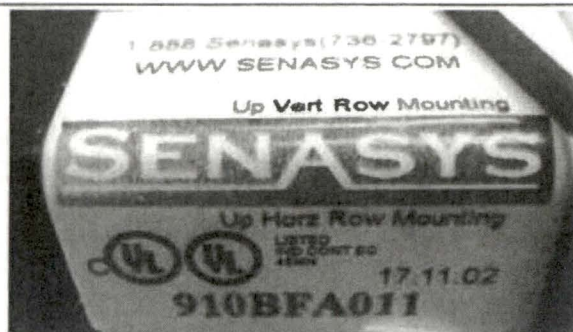
01 – 5 Terminals, 120V Transformers,
No.755 Lamps

1 – Turn Cam Orientation

Part No.: 910CMC-5240X

Date Code: 17.11.02 (likely Nov. 2, 2017)

Dedication: Switch was dedicated by Curtiss-Wright under Exelon PO 00630804



910CMC-5240X

Curtiss-Wright Tag#: CJ1419201
Curtiss-Wright S/N: 01
Exelon PO#: 00630804
LI #: 0001
P/N: 910CMC-5240X

2. As-Received Condition

The selector switch was in good condition. There were a few minor scratches on the body and cover lens, and no evidence of physical damage.

The switch had a solidly constructed feel. There was no exterior evidence of physical, electrical or thermal damage. It emitted no unusual aroma.

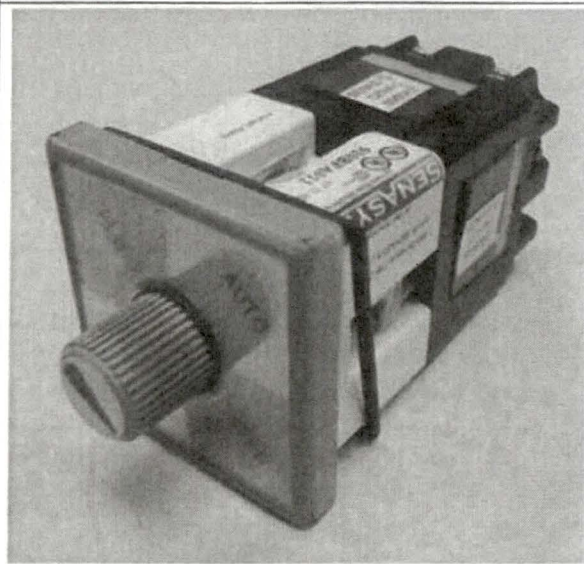
The mounting gasket was intact and the (4) mounting fasteners were loose on the screws.

When manipulated, there was a slight rattle in the bulb area of the switch.

The cover plate and lens were secured tight to the switch body.

There was a PowerLabs test sticker on the switch body (CCN-74260-01).

Photo 4: Selector Switch



2. As-Received Condition (Continued)

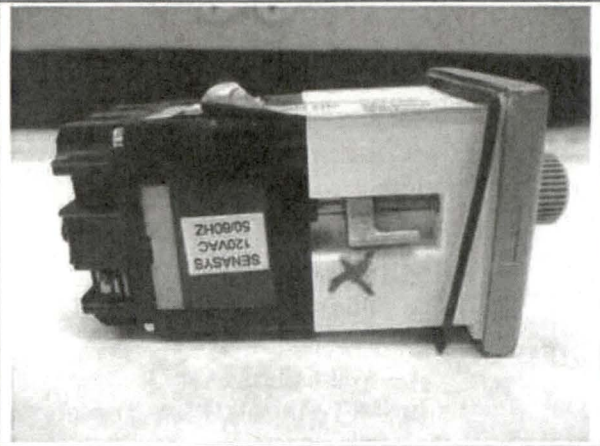
There was a blue 'X' on the side of the body near one of the mounting fasteners.

All (5) terminal screws were intact but loose.

The contact block was missing from the switch end. The cam appeared to be in good condition.

The switch snapped smoothly between all three positions. The knob and cam wiggled slightly at each position (less than 1/16").

Photo 5: Station Marking on Switch



3. Electrical Testing

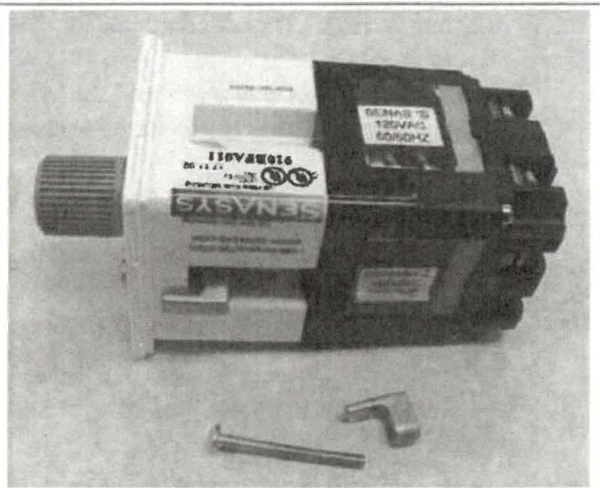
The following static electrical testing was performed on the switch:

- Insulation resistance was checked at 500 VDC from each mounting fastener to all (5) terminals. All readings were very good ($> 100 \text{ G}\Omega$).
- Resistance was checked from each numbered terminal (1 to 4) to the common terminal (C). The resistances of terminals 1-C, 2-C and 4-C were 1176, 1222 and 1139 Ω , respectively. Terminals 3-C were found to be open circuited. This reading indicated an issue with the associated lamp transformer, as identified by the station.
- The (4) lamps were removed and resistance checked. The readings ranged between 4.3 and 5.2 Ω .

4. Disassembly and Analysis

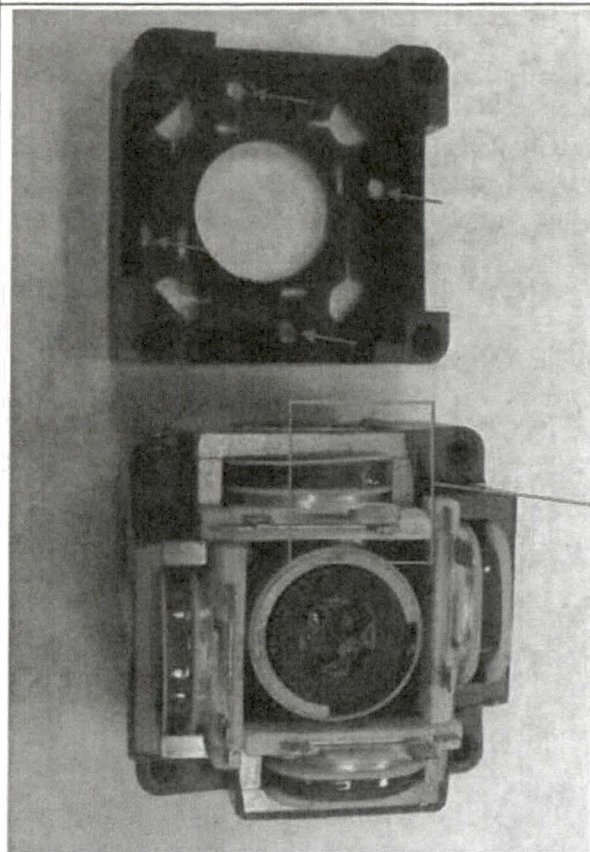
Photo 6: Switch Disassembly

The selector switch was disassembled to investigate the issue. The photo shows one of the mounting fasteners removed from the switch and one still installed. The fasteners swing out when the switch is installed in the panel cutout and draws it in snug to the panel when tightened. There are (4) mounting fasteners, one on each side.

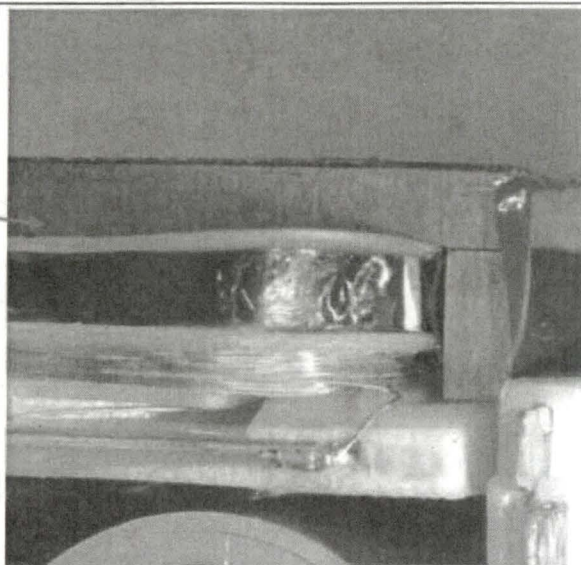


4. Disassembly and Analysis (Continued)

Photos 7 and 8: Switch Lamp Transformers

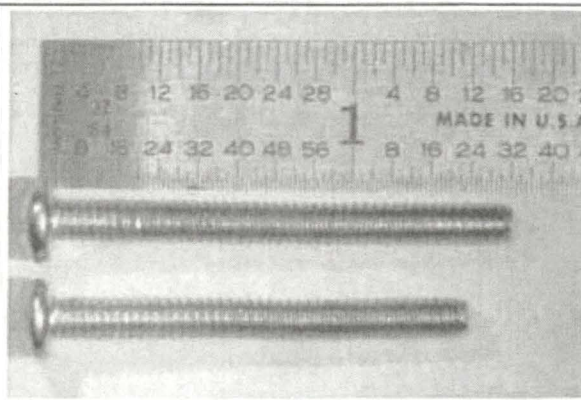
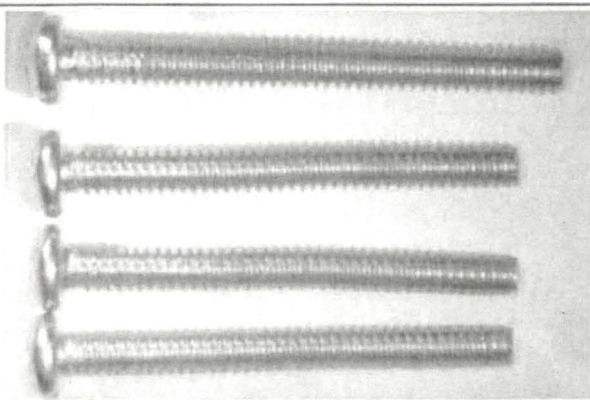


When the switch was disassembled far enough to expose the lamp transformers, the suspected damage was evident. The mounting fastener screw appeared to have punctured the transformer windings. There are (4) holes in the molded plastic cover (blue arrows) that help keep the fastener screws in place, but the screws should not be able to reach the transformer.



Photos 9 and 10: Mounting Fastener Screws

The mounting fastener screws were inspected and one was found to be 1/8" longer than the rest. When the switch was installed in the panel and tightened, the longer screw punctured the lamp transformer causing a short to ground. During CCN-74260 PQI testing at PowerLabs, a lamp illumination test was performed satisfactorily on this switch. This confirmed the switch was not damaged when shipped from Curtiss-Wright, but the incorrect screw caused the damage during installation.



5. Material Analysis (if necessary)

No material analysis was warranted or performed.

6. Discovery

Senasys was contacted and the representative was familiar with the issue. It occurs rarely and Senasys policy is to replace the defective switch at no cost, except for return shipping of the switch. The representative provided the following RMA and returning shipping address:

RMA Number – 15672

Return Mailing Address – 704 Bartlett Ave., Altoona, WI 54720

End of Report