Minutes of Meeting
Working Group: Methodologies to Demonstrate Expected Life of Lubricants Used in Switching Devices
Ad Hoc: High-Voltage Switches (HVS)
10:00 am – 12:00 pm (EDT), September 9, 2024

1. Call Ad hoc meeting to order — Joe Andreyo (HVS Ad hoc Chair)
   Meeting called to order at 10:02 am (EDT).

2. Introduction of Participants — Doug Edwards (Secretary)
   Participants inputted their names and affiliations via the TEAMS Chat.

3. Determine Quorum
   No quorum is required for Ad hoc
   - 11 WG Voting Members
   - 1 Ex-officio Member
   - 19 Non-Voting Members

4. Approval of Meeting Agenda — Joe Andreyo
   - Approved by consent.
   - Agenda had been circulated.

5. Policies & calls for (provided prior to meeting) — Doug Edwards
   - IEEE's Patent Policy
   - IEEE's Copyright Policy
   - IEEE's Participant behavior in IEEE-SA activities' Policy

6. Approval of previous virtual Ad hoc meetings — Joe Andreyo
   - Not Applicable – Placeholder for future Ad hoc meetings.

7. Ad hoc Chair Comments — Joe Andreyo
   Will discuss applications, characteristics, testing (field and accelerated).
   Provided bio. Have experience with grease testing for various HVS applications.
   Have learned of various issues over time.

8. C37.100.8/D14 — Doug Edwards
   One (1) version of the draft is provided via Meeting Invitation and in IMeetCentral – Standards Development folder.
   - Latest draft – D14

   Draft document is available for modifications in the future.

   Document draft was not used during the meeting.

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9. Applications — Joe Andreyo

   a. Switch contacts, outdoor/exposed

      Key application needs for outdoor/exposed switches are:

      - Grease needs to stay put.
      - Grease needs to not wash-out (rain or spray)
      - Grease needs to not attract dust & dirt.

   b. Switch mechanisms, outdoor/exposed

      Key applications needed for outdoor/exposed switch mechanisms are lubrication of mechanisms/gears.

   c. Current carrying bolted connections – aluminum & copper

      For selection of lubricants (out of scope of this document), there can be issues with lubricants that are waxed based. Lubricants which include metal particles as these metal particles may improve these connections depending on the application.

   d. Hardware – bolts & nuts

      It is common to use “anti-seize” lubricants which include metal particles, copper particles which keep the base grease stable in high temperature applications, on hardware.

   e. Enclosed (sealed) switch contacts

      Key application needs for enclosed (sealed) switches is:

      - Shelf-life of the lubricant.

   f. Enclosed (sealed) mechanisms

      Same as enclosed (sealed) switch contacts

      - Shelf-life of the lubricant.

   Discussion of Scope: Yes, need to simplify the discussions.

10. Grease characteristics — Joe Andreyo

   a. Type, base, oil

      There are huge number of options for lubricant selection.

      Scope of this Guide is concerning once choice is made, evaluation methods for determining life.

   b. EP/Timken OK Load

Timken OK Load is a standardized measurement that indicates the possible performance of extreme pressure (EP) additives in a lubricating grease or oil.

The test machine consists of a standardized bearing race mounted on a tapered arbor rotating at high speed. The race is brought into contact with a square steel test block under a constant load. The contact area is flooded with the lubricant or grease being tested. The Timken OK Load is the highest standard load at which the spinning bearing race produces no scouring mark on the test block, but only a uniform wear scar.

Timken OK Loads are listed on grease and oil property charts and are part of many specifications. It was once generally assumed that the measure and the film strength of the lubricant were directly related. Today, the primary purpose of the test is to determine whether EP additives are present and functioning. A measure of 35 pounds (16 kilograms-force or 155 newtons) or more means that EP additives are present and working well.

The Timken OK Load test methods are ASTM D-2509 for greases.

Source: Timken OK Load - Wikipedia

OK Load testing is falling out of favor. The reference to Four Ball testing was provided. Four Ball testing is a type of tribotester.

I tribostester is the general name given to a machine or device used to perform tests and simulations of wear, friction and lubrication which are the subject of the study of tribology. A tribometer is an instrument that measures tribological quantities, such as coefficient of friction, friction force, and wear volume, between two surfaces in contact. Tribometers are often referred to by the specific contact arrangement they simulate or by the original equipment developer.

c. Temperature range of operation.

Yes – of interest. Temperature of operations would be per the Normal Service Conditions as detailed in the applicable standard for specific equipment, e.g. IEEE Std C37.30.1 for HV Switches Rated at Above 1 kV.

d. Low temperature torque

Discussed that there can be variations of pressure squeeze at various temperatures.

e. Drop Point (run-out)

Drop Point (run-out) is associated with high temperatures. At high temperature, there may be drop-out.

f. Water Spray Off
Standard to reference and review is ASTM D4049, Standard Test Method for Determining the Resistance of Lubricating Grease to Water Spray
Tests may include conductivity or heat-run type tests.

g. Water Wash Off
Standard to reference and review is ASTM D1264, Standard Test Method for Determining the Water Washout Characteristics of Lubricating Greases
Tests may include conductivity or heat-run type tests.

h. Conductivity - discussed. But, how to test? Potential testing of micro-ohm testing (DLRO).
Argument: Conductivity testing is not needed due to wiping action in switch blades. However, if NOT an appropriate grease, hardening can occur resulting in poor conductivity. Also, lubricants may include components such as Silicon which create “silicon carbide - sandpaper” and which become abrasive thus removing silver and reducing conductivity.

Future – Consider used of language such as “Influence of grease on contacts” e.g. abrasion. This leads to appropriate testing be Continuous Current testing.

11. Testing — Joe Andreyo

a. Field
Not discussed

b. Accelerated
Outdoor applications
Reference discussed is ASTM G 154, Standard Practice for Operating Fluorescent Ultraviolet (UV) Lamp Apparatus for Exposure of Materials
Reference is to 80C (cycle 1)

Action: Doug Edwards to request Copyright permission.

ASTM G 154 does not include mechanical operations. The item (switches) sits in a chamber.
Mechanical Operation would require separate or subsequent tests.

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12. Venting to eliminate condensing humidity — Joe Andreyo

Important unless SF6, hermetically sealed, submersible.

Venting needed to address condensation issues as seals may allow moisture ingress due to pressure differentials.

Is this a test of the product?
Gore vents (like Gore tex).
Not clear how discussion fits in the Scope of this Guide.

13. Next meetings — Doug Edwards

In conjunction with WG meeting in 2024 Fall Switchgear Conference, Oklahoma City – C37.100.8 WG meeting.

14. Adjourn — Joe Andreyo

Adjourned at 11:26 am (EDT).

Reported by,
Doug Edwards, Siemens
Secretary, C37.100.8 WG

E: doug.edwards@ieee.org

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Attendance

Participant Type	LastName, FirstName	Company	9/9/2024 HVS Ad hoc
Voting Member (Chair)	Harley, John	FirstPower Group LLC	VM (Chair)
Voting member (Secretary)	Edwards, Doug	Siemens Industry, Inc.	VM (Secretary)
Voting Member	Burse, Ted	Powell Industries, Inc	VM
Voting Member	Carne, Clint	Schneider Electric	VM
Voting Member	Hunt, Terry	Westinghouse	VM
Voting Member	Leccia, Brad	Eaton	
Voting Member	Ricciuti, Anthony	Eaton Corporation	VM
Voting Member	Shiller, Paul	FirstPower Group LLC	VM
Voting Member	Thomas, Christo	Schneider Electric	VM
Voting Member	Webb, John	ABB	VM
Voting Member	Wolfe, Dan	MEPPI	VM
Voting Member (Ex-Officio)	Flowers, Keith	Siemens Industry, Inc.	
Voting Member (Ex-Officio)	Swing, Donnie	Avail	VM (ExO)
Non-Voting Member	Anderson, Tim	Aluma-Form	
Non-Voting Member	Andreyo, Joe	Southern States	NVM
Non-Voting Member	Antantis, Michelle	Duquesne Light	
Non-Voting Member	Aristizabal, Mauricio	Hitachi	
Non-Voting Member	Bartels, Andreas	Powell	NVM
Non-Voting Member	Blake, Randy	Schneider Electric	
Non-Voting Member	Boyce, Russell	Eaton	NVM
Non-Voting Member	Bridges, Chris	Eaton	
Non-Voting Member	Coziuc, Fiom	S&C	

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Non-Voting Member	Davies, Stacey	Siemens	NVM
Non-Voting Member	Diallo, Boubacar	Southern States	
Non-Voting Member	Flores, Sergio	Schneider Electric	NVM
Non-Voting Member	Gill, Juan	Southern States	NVM
Non-Voting Member	Glinsky, Ilya	Southern California Edison (SCE)	NVM
Non-Voting Member	Grahor, Lou	Eaton Corporation	
Non-Voting Member	Guidry, Sean	Omicron Electronics	
Non-Voting Member	Hall, John	Tennessee Valley Authority	
Non-Voting Member	Hartman, Oliver	Siemens	
Non-Voting Member	Hawkins, Tom	Siemens Industry, Inc.	
Non-Voting Member	Hensberger, Jeremy	MEPPI	
Non-Voting Member	Hoss, Danny	Southern States	
Non-Voting Member	Irwin, Todd	GE Grid Solutions	
Non-Voting Member	Jamal, Shah	Avangrid	
Non-Voting Member	Jarnigan, Christopher	Southern Company Services	NVM
Non-Voting Member	Keels, Thomas	kEElectric Engineering	NVM
Non-Voting Member	Khan, Umer	ABB	
Non-Voting Member	Leopard, Johnathan	Eaton	NVM
Non-Voting Member	Livshitz, Albert	Qualus Services	
Non-Voting Member	Lopez, Adrian	Powell Industries	
Non-Voting Member	Lu, Li	Eaton	NVM
Non-Voting Member	May, Steven	Southern Company	NVM
Non-Voting Member	Miller, Anne	TCI	
Non-Voting Member	Milnikel, Henning	Siemens AG	NVM

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Non-Voting Member	Moser, Darryl	ABB	
Non-Voting Member	Nenning, Andrew	Omicron Electronics	
Non-Voting Member	Orosz, Miklos	CBT&S LLC	
Non-Voting Member	Pal, Sumitabha	Schneider Electric	
Non-Voting Member	Parks, Owen	ABB	
Non-Voting Member	Pecile, Conrad	Myers Power Products	NVM
Non-Voting Member	Rakus, Paul	Eaton	
Non-Voting Member	Reid, Laura	Hubbell Power Systems	NVM
Non-Voting Member	Runov, Artyom	S&C	
Non-Voting Member	Salinas, Alex	Doble/Vanguard	NVM
Non-Voting Member	Sax, Ben	Nashville Electric Service	
Non-Voting Member	Sigmon, Hall	Siemens	
Non-Voting Member	Sims, Garrett	Eaton	NVM
Non-Voting Member	Solanki, Lokeshkumar	ABB	NVM
Non-Voting Member	Sullivan, Paul	DuPont	
Non-Voting Member	Tillery, Tim	Howard Industry	
Non-Voting Member	Walgebach, Jake	Siemens	
Non-Voting Member	Ward, Jeffrey	Doble Engineering Company	NVM
Non-Voting Member	Ward, Randy	Aluma-Form	
Non-Voting Member	Weishuhn, William	ABB	
Non-Voting Member	Woodyard, Terry	Siemens	NVM
Non-Voting Member (IEEE Staff)	Santulli, Jenn	IEEE (Staff)	