Fuel Cell Standards

XVII. Cathode Subsystem

XVII.a Cathode Subsystem Mechanization

Overview:

Classroom and lab instruction on the operation of the cathode subsystem and its components

- Primary functions of the cathode subsystem in an OEM system
- Schematic representations versus actual components
- Trouble codes associated with cathode subsystem errors
- Faults caused by air flow restriction in the cathode subsystem
- Faults caused by leakage of air from the cathode subsystem
- Faults caused by out of specification temperature of cathode subsystem compressed air at the membrane

Description:

The cathode subsystem or cathode loop supplies air from the air filtration unit, routes it through the mass air flow sensor to the compressor, then the charge air cooler and humidification unit before supplying it to the cathode side of the fuel cell membrane. The cathode subsystem also allows for rapid depressurization in shutdown situations to avoid membrane damage and controls the oxygen depleted air that will exit through the exhaust.

Outcome (Goal):

Student will be able to explain the functions of the cathode subsystem including air filtration, exhaust gases and water removal, and conditions requiring rapid pressure reduction

Objectives:

Students shall be able to:

1. Follow the air flow path through a schematic and the hardware of a fuel cell system
2. Identify major cathode components in a schematic and on a fuel cell system
3. Articulate the operation of cathode subsystem components verbally an in a written format
4. Define the operation of the systems with a cause-and-effect process for each cathode system component
5. Utilize a serial data tool and DVOM to diagnose cathode system circuit faults
6. Use specialized tools and equipment to repair or replace cathode system components
7. Utilize engineering and/or service information to formulate a diagnostic and repair process for each fault provided by the instructor

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Tasks:

Students will

1. Use a schematic, OEM service instructions and an OEM vehicle or complete fuel cell system to identify major cathode subsystem components
2. Locate the major cathode subsystem components on a fuel cell system
3. Use a serial data tool, oscilloscope, and DVOM to determine the operating performance of the mass airflow sensor
4. Use an oscilloscope and current clamp(s) to determine the operating performance of the air compressor
5. Plot a graph indicating the compressor speed vs current vs airflow
6. Use specialized tools (system dependent) to locate an air leak in the cathode system
7. Check the pressure of the cathode system at the various locations using specialized tools or onboard sensors

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To comment or offer suggestions on this standard, contact Ken Mays:

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