

4.10 Pulsed Plasma Lubrication Device and Method

Statement: Pulsed plasma lubricator for the in-situ replenishment of lubricants in extreme environments.

Problem: Dry lubricants provide superior lubrication and are not susceptible to solidification, but continued operation of the mechanical assembly removes the lubricant over time, and this eventually leads to mechanical failure.

Solution: Pulsed plasma lubricator (PPL) is a practical means of extending the life of dry lubricants. In less than five minutes, the PPL can replenish the lubricating material sufficiently to enable hours of operation. PPL technology has the demonstrated potential to extend the lifetime of mechanical assemblies in extreme environments, thus maximizing the usefulness and reliability of expensive equipment.

Technology description: Pulsed plasma lubricator comprises a solid lubricant disposed between and in contact with a pair of electrodes that are sized and configured such that the application of a sufficiently large electric potential between the two electrodes produces a plasma that vaporizes a portion of the solid lubricant. The electric potential can be applied as a plurality of pulses for a duration that depends on the lubrication needs of that mechanical assembly, the composition of the solid lubricant, etc. The resulting vapor stream of solid lubricant can be directed onto the surface of a mechanical assembly. This provides a reduction of surface wear and, therefore, extends the lifetime of the mechanical assembly.

Benefits of the product: This technology has a benefit when low friction to be achieved.

- Achieves both low friction and high wear resistance over a long lifetime while overcoming the temperature limitations of wet lubricants.
- Low power consumption and short firing times of the PPL free up valuable operations time and power for other uses.
- Extends the lifetime of mechanical assemblies and enables smoother operation.

Areas of application: The technology could be used in the following applications:

- Mechanisms in extreme environments and mechanisms that are not easily field-serviceable - deep-sea and arctic oil drilling.
- Another potential opportunity is using this method for applying metallic coating on pipeline surface; see comment below.

Comments: This technology has great potential in lubrication and possibly in metallic coating of pipes for drilling casings and drilling risers.