TELEDYNE TECHNOLOGIES INCORPORATED	KNOWLEDGE BRIEF Customer Interest	#KB-4435	REVISION: 8/12/2021 10:50 AM
BUSINESS UNIT: TML			STATUS: OPEN
SUBJECT: LaserHawk 360 Laser Diode Predictive Maintenance		PRODUCT LINE: Particulate PRODUCTS: LaserHawk 360 ITAR:	
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ACCESS: Public			

DESCRIPTION: LaserHawk 360 Laser Diode Predictive Maintenance

CUSTOMER(S): All LH360 customers

PURPOSE: To provide guidance to customers and service personnel on when to consider replacing LH360 laser projection module P/N 1810-0975-01.

ANALYSIS: The LaserHawk 360 (LH360) is a backscatter particulate monitor that utilizes a USHIO HL6501MGA 658nm red laser diode. This diode has an estimated life of 3-7 years depending on the temperature of the operating environment. When the LH360 is continually operated at the upper end of its ambient temperature range (-25*F to 140*F), the lifespan of the laser is shorter compared to when operated at milder temperatures.

Replacement of the laser diode must be done at the Teledyne Monitor Labs (TML) factory, and turnaround times can take up to 2-3 weeks. The entire laser projection module must be replaced, aligned, and calibrated.

Since laser current can be used as an indicator of the health of the laser diode, it is advisable to implement a predictive maintenance plan. The LH360 can be sent to the TML factory during a user's planned plant outage for a preemptive laser replacement service. This can help prevent unexpected laser failures, and reduce the amount of particulate monitoring downtime.

Laser current increases with the age of the laser, and with operating temperature. So, in order to properly evaluate the state of the laser's health the below steps should be taken.

1. **Note the LH360's internally measured optical head temperature. This can be viewed in the S6 bank of the LH360 local user interface (LED display on the optical head), or in the Service Data menu in the LH360 Enhanced Remote Panel. Both are given in units of *C.**
2. **Note the LH360's laser current. This can be viewed S2 bank of the LH360's local user interface, or in the Service Data menu in the Enhanced Remote Panel. Both are given in units of mA.**
3. **Locate the operating point of the laser on the Figure 1 graph.**

If the operating point is located in the orange region, it is recommended the LH360 be sent in for laser replacement during the next planned plant outage. If the operating point is located in the red region, the laser could fail suddenly, or be uncontrollable (ie. reference voltage not between 6.85-6.87). The LH360 should be sent in for laser replacement as soon as possible. Always send the LH360 calibration kit in along with the LH360 optical head. The calibration kit will be used to adjust the new laser module, and ensure the response of the monitor is the same as before service.

NOTES:

- **The internal optical head temperature is typically ~5*C higher than the local ambient temperature outside the optical head. The local temperature outside the optical head may be ~5*C higher than the average installation location temperature due to radiant heat from the stack, and heat generated from the LH360's purge blower. Figure 1 is based on internal optical head temperature.**
- **Figure 1 was generated based on a sample size of 1, and rule-of-thumb type information provided by the laser manufacturer. Actual results may vary.**
- **This laser experiences a burn-in period so the user may observe a decrease in laser current after a period of operation. This is normal. Eventually the laser current will start to increase with time.**
- **A failed laser will still provide a visible laser light beam but it will not be at a high enough power level, and will not remain constant. Thus, daily calibrations will fail, and in-stack readings will decrease and be invalid. A reference fault status code 20 will result from a failed laser.**

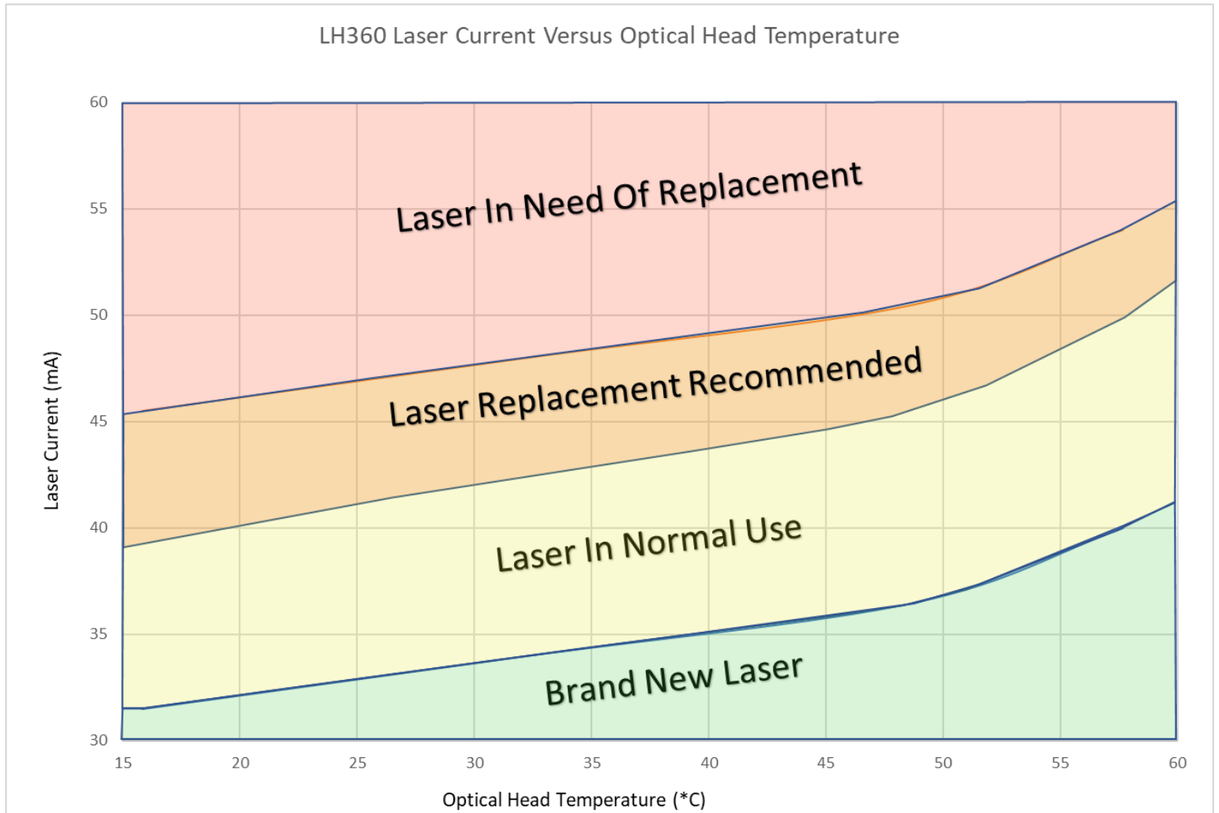

Figure 1 - Laser Current vs Optical Head Temperature