Technical Memo #018.1

Subject:	**Heat Lamp Upgrade**
Release Date:	October 25, 2017
Systems Affected:	DSS-200 Series 2 CE, DSS-200 Synergy and Synergy Integra
Reference Components:	12-8882-092 ASSY,HEAT LAMP 12-8882-117 ASSY, PKG, BULB, HEAT LAMP 73-0001-001 QUARTZ LAMP 1000W. 120V 73-0001-010 LAMP, HALOGEN, 120V, 1000W
Summary:	Upgrade kit to the original stage light style heat lamp to provide a longer lifetime bulb and higher efficiency lamp solution.

Summary

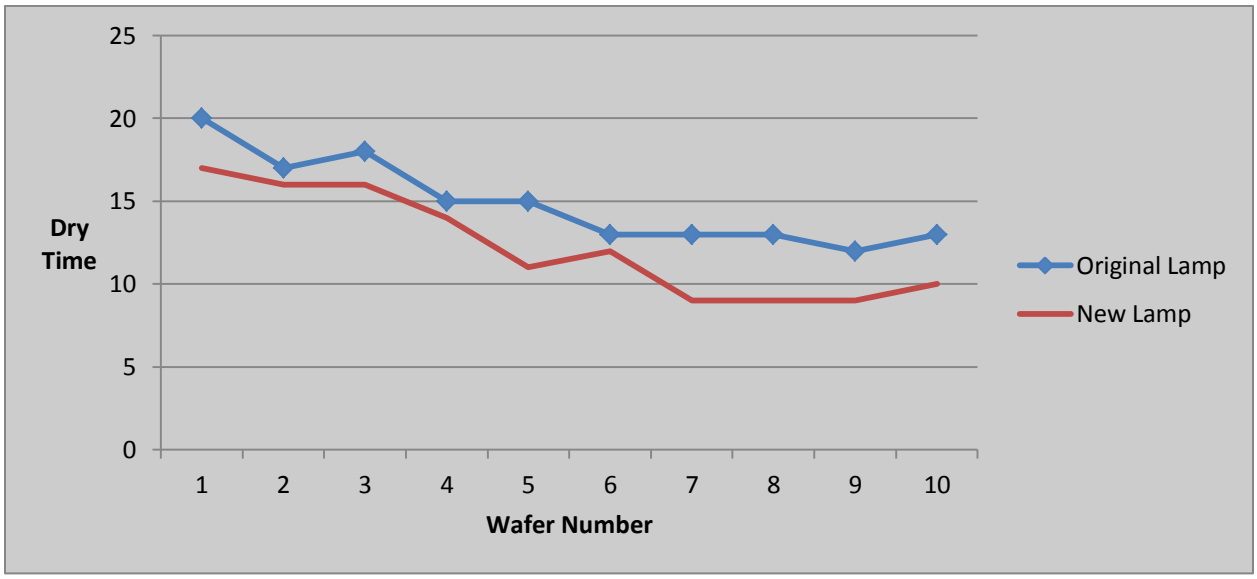
During the course of investigating safety and bulb lifetime concerns Entrepix determined the stage light style of heat lamp was no longer adequate to meet the changing process needs for the OnTrak scrubber. A change to the design of lamp bulb and reflector was developed along with a new housing to reduce heat accumulation behind the reflector which caused the components and wiring to degrade.

The end result is an over 10x longer lifetime bulb with higher thermal efficiency using less power while providing for throughput improvement and less heat induced part failure.

Due to some systems failing it has been noted that some of the original lamps will turn on or stay on if the software locks up or users turn the lamp on manually for too long. In addition the lamp replacement the Solid State Relay (SSR1) has been replaced by a Single Shot Relay which will not allow the lamp to be activated for longer than 20 seconds. In additional to the lamp efficiency improvements a safety feature is added in the form of a Single Shot Solid State Relay that replaces SSR1. This relay will turn off the lamp after 20 seconds regardless of recipe setting. After qualifying the new lamp if a longer recipe time is still required adding recipe steps with a lamp off period followed by a lamp on period is a possibility.

Retrofit Kit PN 26-8882-906 HEAT LAMP UPGRADE KIT

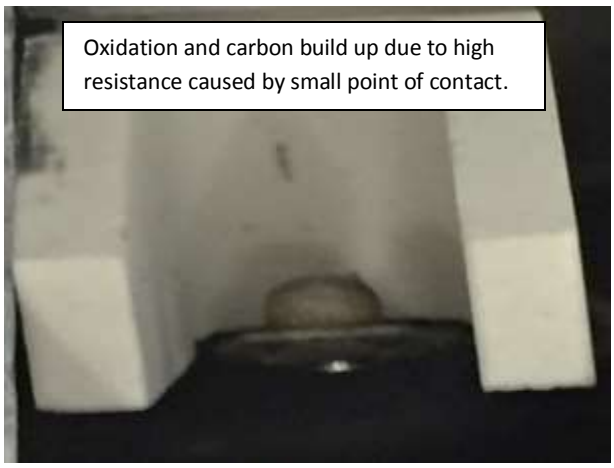
Original Stage Lamp	Entrepix Heat Lamp
Trans axial (no center focus)	Axial (center focused)
1000 Watt	800 Watt
Unpolished reflector with cutouts that create "dead bands"	Polished, full radius reflector provides increased and directed thermal output
150 hours median bulb lifetime	2000 hours median bulb lifetime
Spring loaded dimple contacts create high resistance	Full diameter fixed contact improves output performance

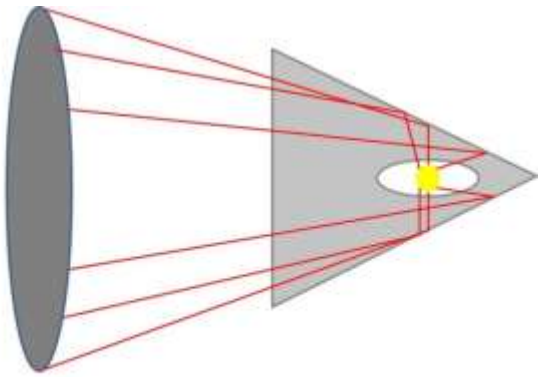


Results were determined by monitoring when the "center spot" had evaporated. Average of 15-20% dry time improvement across a Si, W, TEOS sample.

Background

The original stage lamp used a trans axial bulb and an aluminum reflector, with slots cut out of the sides, and a spring load contact. The effect of this configuration was a lack of center focus on the target wafer, loss of efficiency (dead bands), heat transfer to the back of the reflector due to the cutouts, and a high resistance in the small surface of the spring loaded contacts.

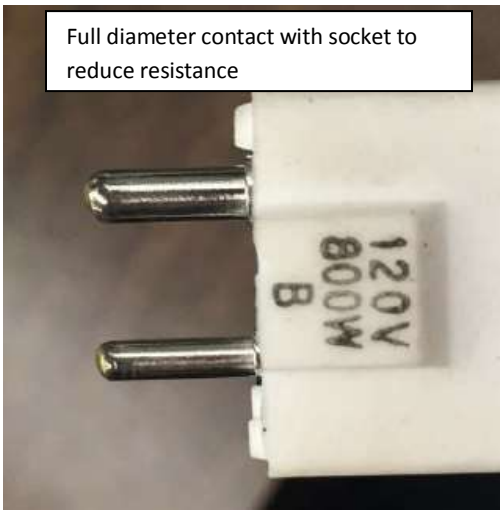


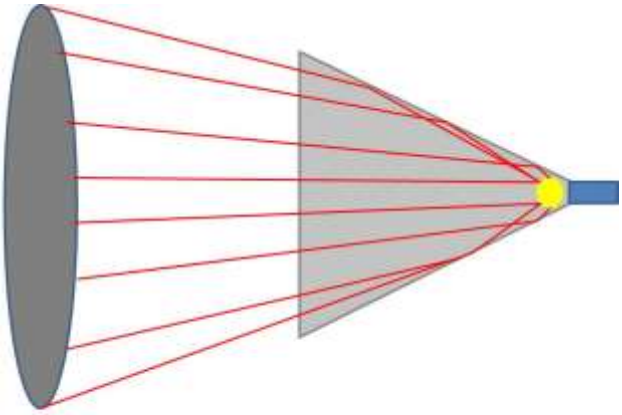


Trans axial bulb, cut out in reflector, and dull uneven surface caused slow center drying

Solution

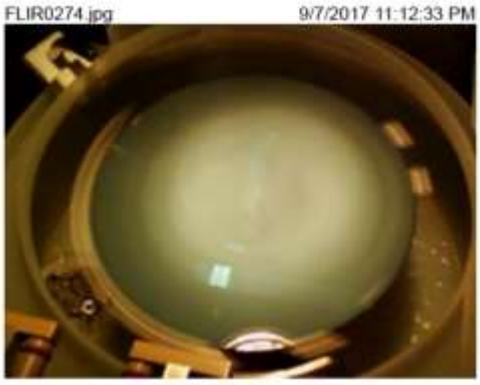
The Entrepix solution was to provide a center focus axial bulb, electropolished full radius reflector, and a large contact area for the lamp terminals with a positive locking mechanism. The results are a lower wattage bulb with increased thermal output and a 10x lifetime.





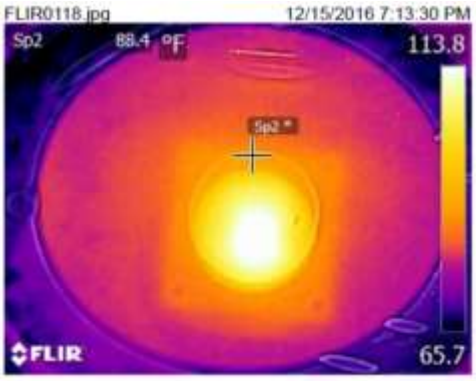
Axial bulb, full radius reflector, and high polished surface allows for center focused, high energy transfer

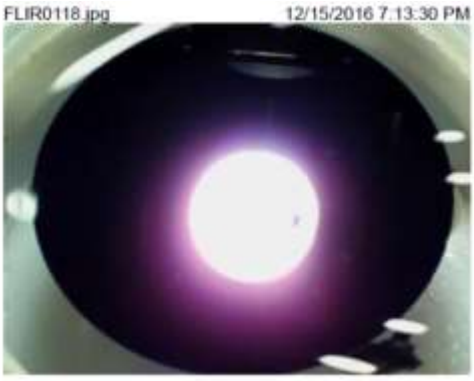
Even with a lesser power 800 Watt bulb the new design is able to provide higher thermal output which decreases the drying time during the lamp step in the Spin Station. Temperatures were collected at the last 2 seconds of an 18 second dry step.

	Tungsten	
Original Lamp 75 F		
New Lamp 80.4 F		

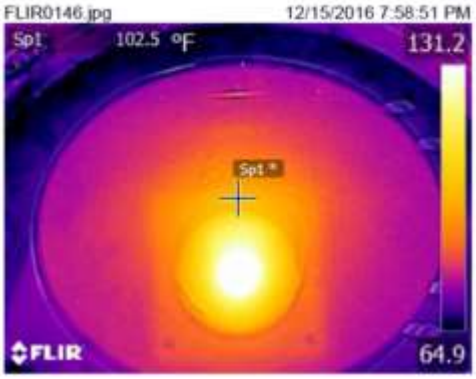
Blanket Oxide

Original Lamp
88.4 F





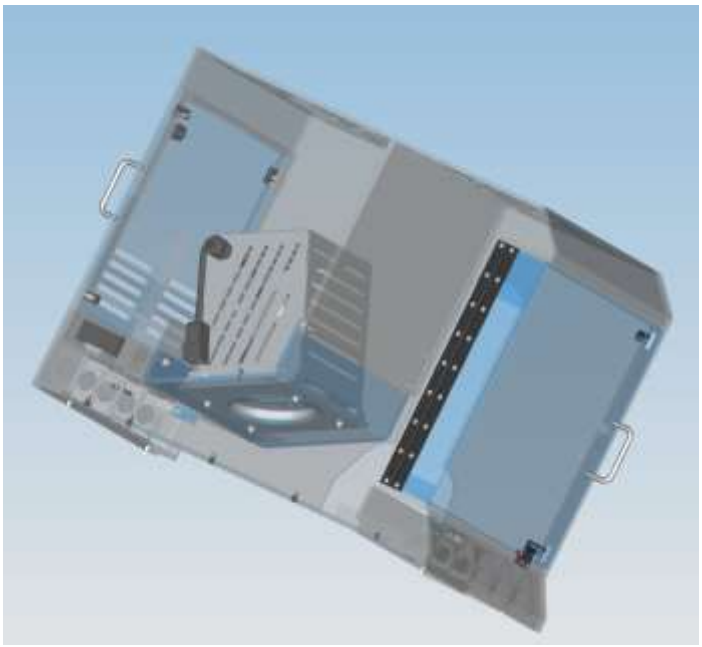
New Lamp
102.5 F



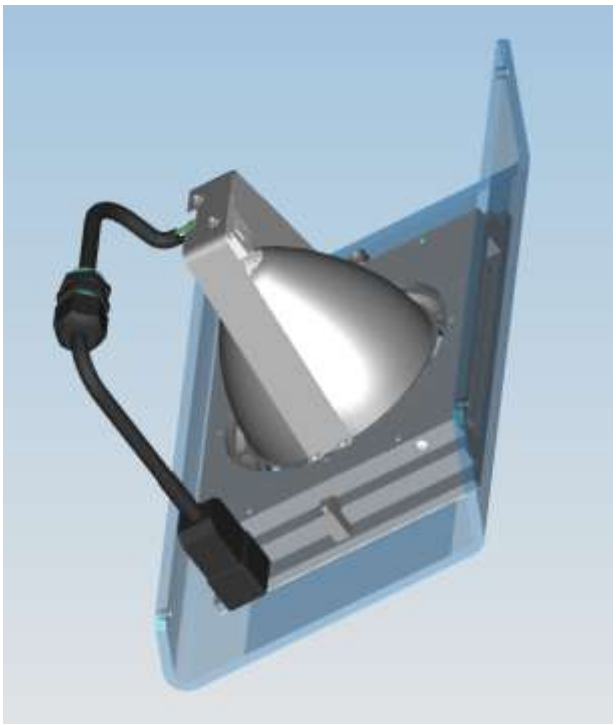
System Integration

A retrofit kit is required to replace the original stage lamp design. The retrofit fits into the existing Spin Cover and includes a new slotted heat shield to allow for laminar airflow to cool the bulb and reflector while protecting against inadvertent contact. In addition to the shield, lamp, and reflector the kit consists of mounting hardware and a thermal gasket to add protection for the acrylic Spin Cover.

Note: The Integra does not use the Heat Shield due to space constraint, protective covers are already installed on the Spin Cover, and the HEPA filter located directly above the lamp will cool the reflector.



Assembly installed in Spin Cover



Heat shield removed for viewing

Recommended Action

Install Retrofit Kit # 26-8882-906 HEAT LAMP UPGRADE KIT.

Evaluate process performance and select new step times for the Heat Lamp step in the recipe.