# ACTIVE MOISTURE REMOVAL PUTS HEADLAMP CONDENSATION PROTECTION ON A NEW LEVEL

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# The Story


JOHNSON ELECTRIC

# Complex Moisture Transfer Routes

**Primary source: moisture transfer via plastic**

Two Mechanisms

1 **Sorption**
within and on plastic surfaces

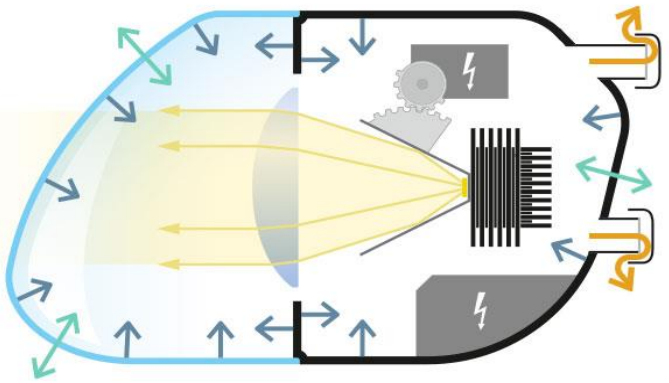
2 **Permeation**
through the plastic

**Secondary source: moisture transfer through the vent**

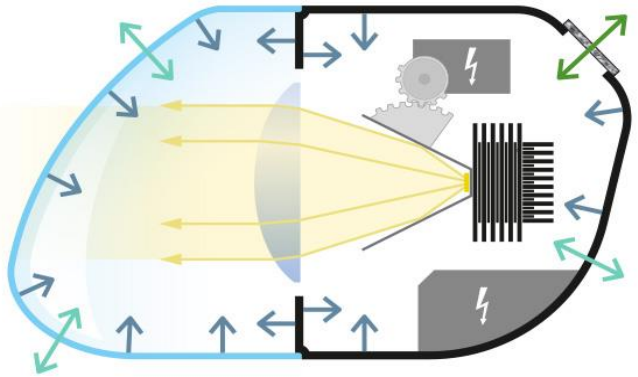
Two Mechanisms

3 **Convection**
works only when vehicle is in motion

4 **Diffusion**
works always – whether vehicle is on or off, moving or stationary

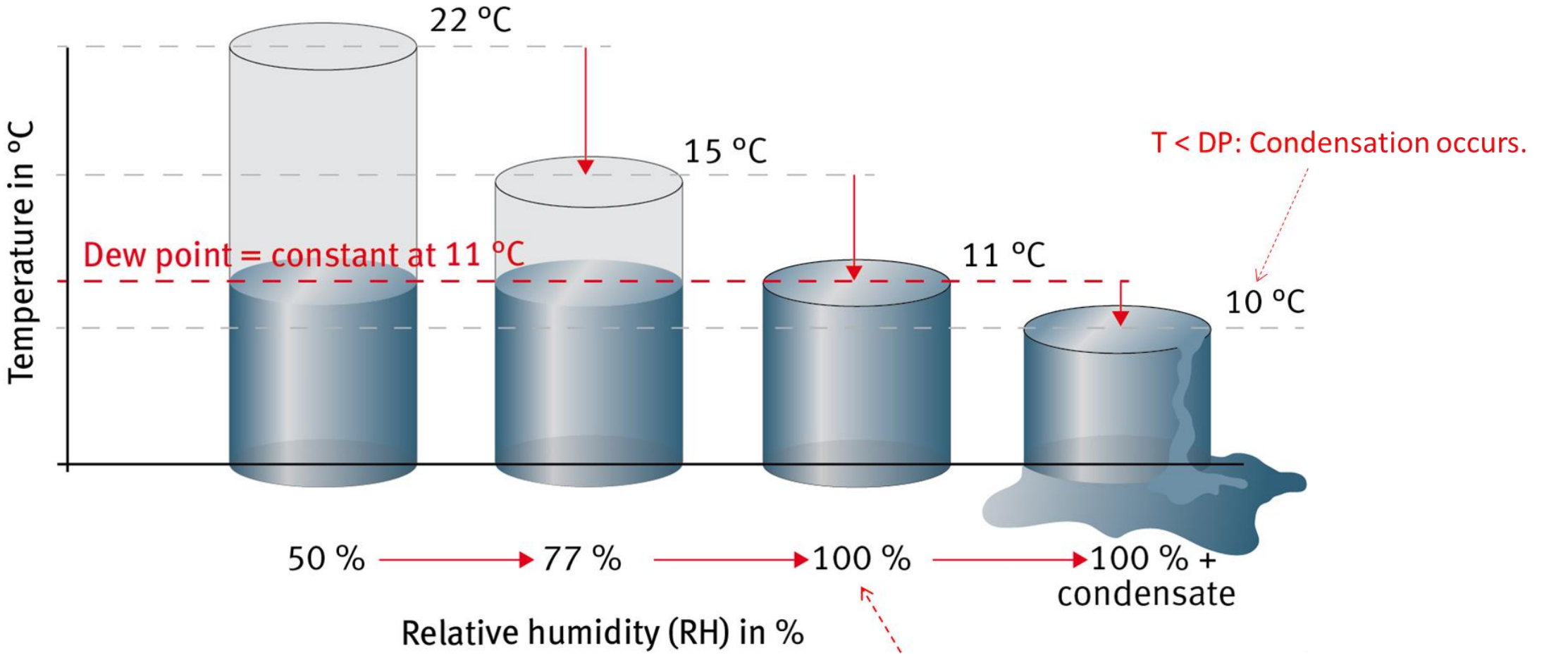


1 Sorption



2 3 4 Permeation, Convection & Diffusion

# How Condensation Occurs



# Passive Condensation Reduction Technologies

Pressure Equalization

1 Hole in headlamp (convection)

Condensation Reduction

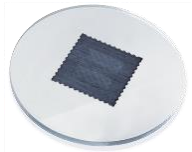
2 Holes in headlamp (convection)

Insect & Spray Water Protection

Open tubes, foam, caps (convection)

Pressure Equalization, Condensation Reduction, Fine Dust Protection

Membrane venting solutions (diffusion)



Disguise Condensation on Lense

Anti-fog coating


www.plasmatreat.com

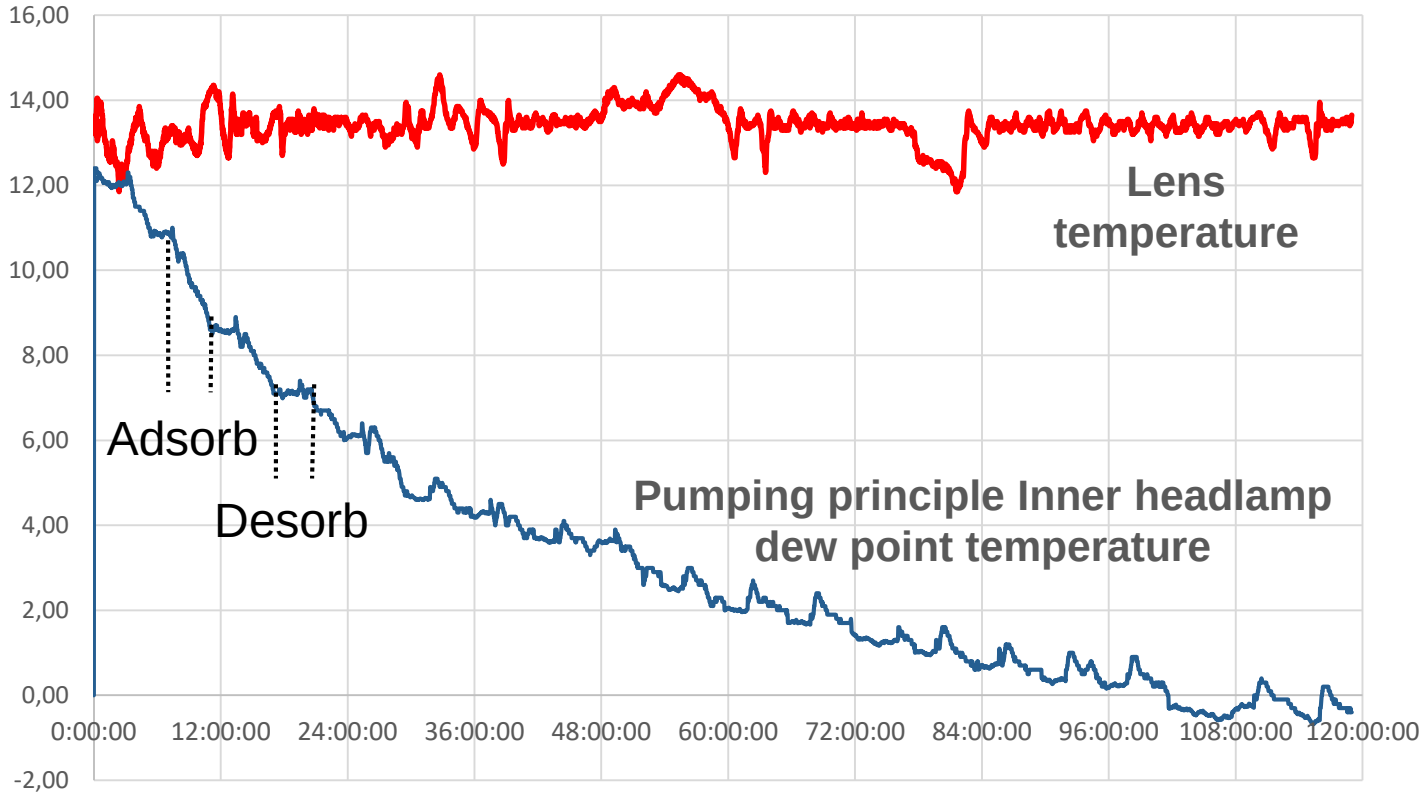
Non-regenerable Moisture Removal

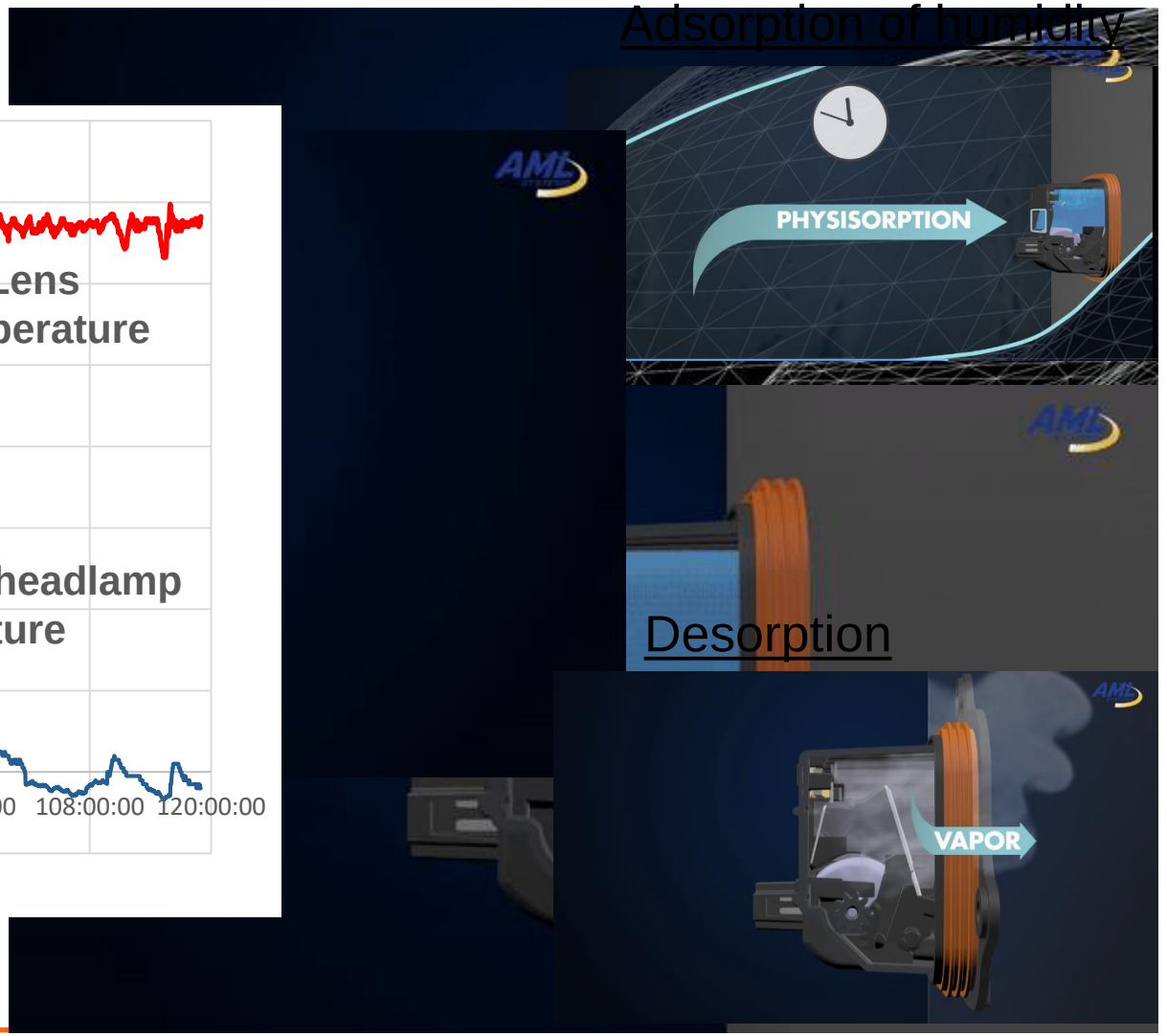
Dessicants


www.amazon.de

New Condensation Management Technology

# AML Condensation Management Device (CMD)
# Enabled by GORE™ Condensation Management Products



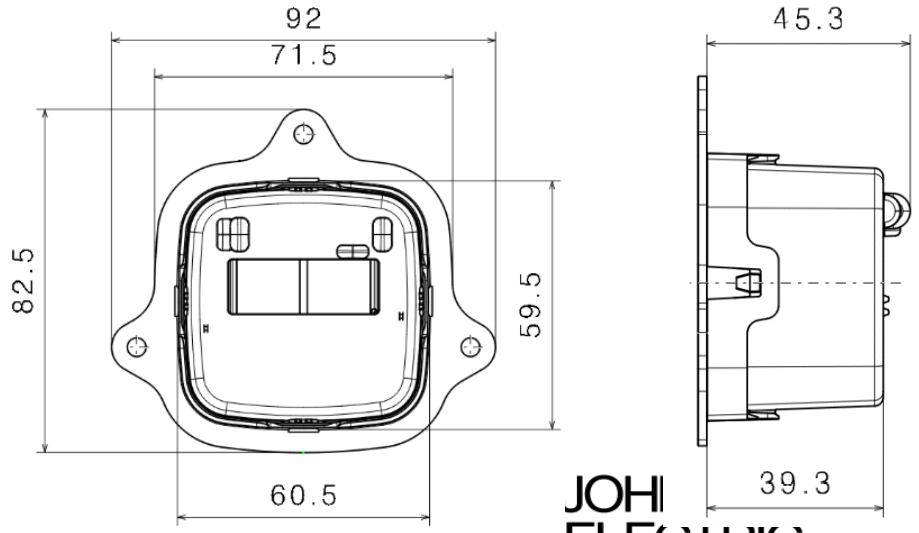
# Benefits of Active Condensation Prevention

- Lowers dew point to prevent condensation
- No need for anti-fog coating, desiccants or vents
- Protects headlamp from water and fine dust contamination
- Improves design flexibility

# CMD Product Attributes

| Performance (typical) | |
|---|---|
| Temperature range of operation | |
| Typ./max. current | |
| Weight | |
| Moisture removal rate | |
| Durability | |

* when previously equilibrated at 30°C/80%rH



# Gore Condensation Testing Capabilities

## Lab Testing

**Lamp Characterization**
- Moisture release
- Infrared thermal profile
- Design analysis

**Dual-Climate Chamber Testing**
- Industry standards
- Gore real-world scenarios

## Application & On-Car Testing with real-time measurements

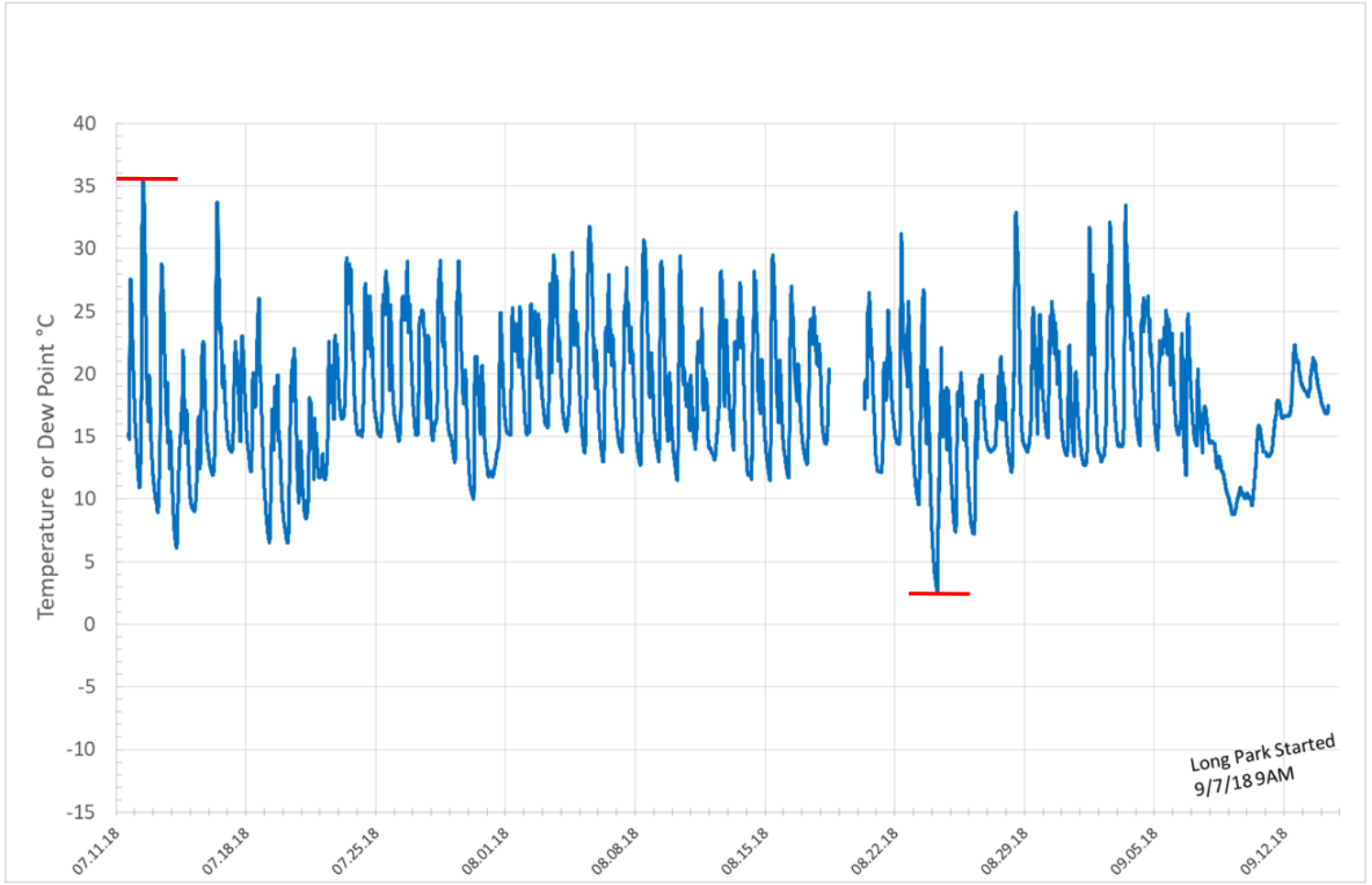
**Vehicle Modifications**
- Installation of instrumentation & sensors
- Installation of venting system

**Vehicle Tests**
- OEM test protocols
- Induced condensation tests

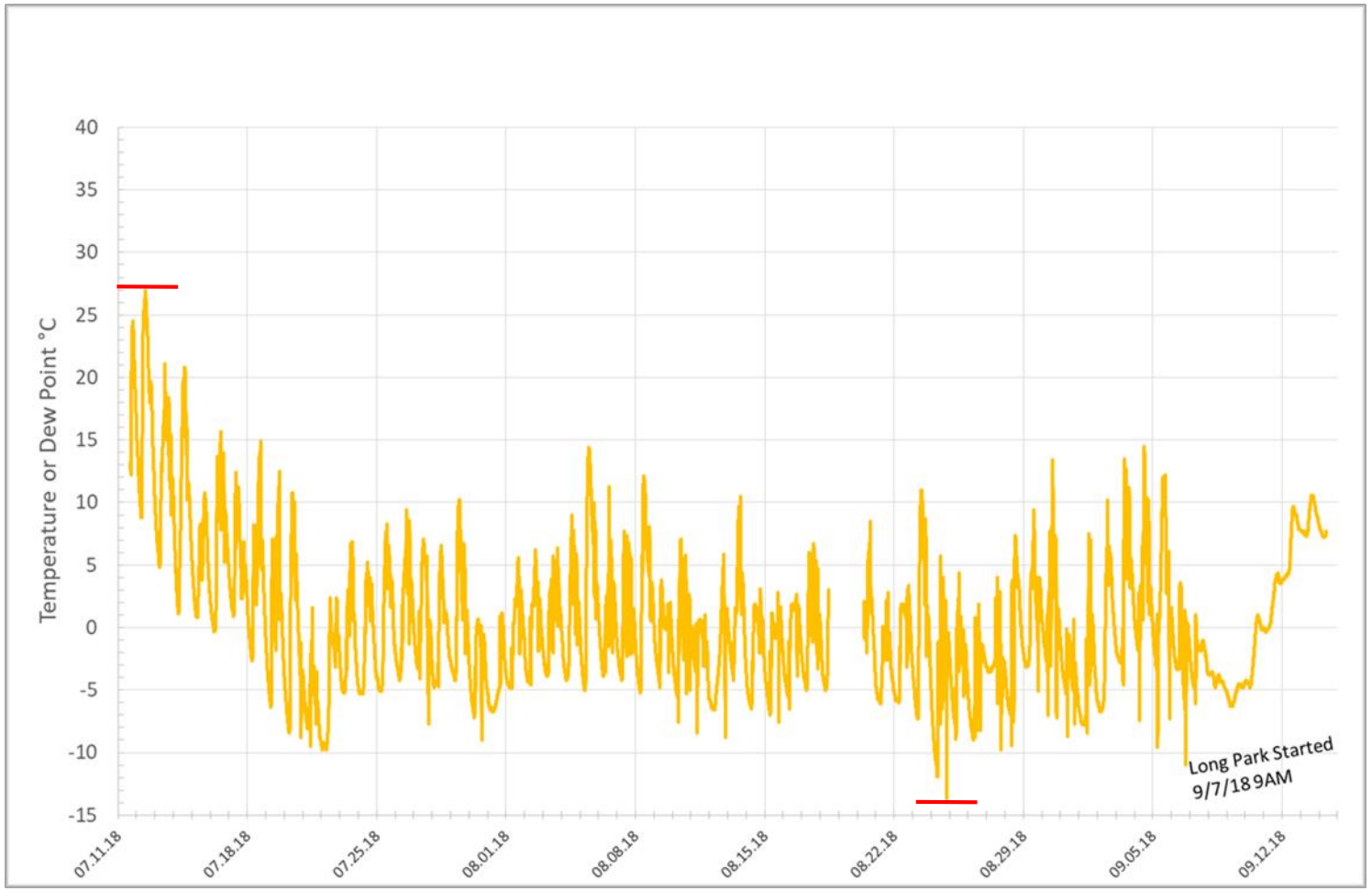
# On-Car Test Results (CMD Prototype)

- Compact crossover SUV with full-LED headlamps;
- On-car testing: July-Sept 2018 – Delaware & Maryland / U.S. – warm & humid average ambient conditions (27 °C / 70 % r.H. / 21 °C DP);
- Car usually operated twice a day for 30 minutes or longer (morning and evening);
- Driver side (DS) equipped with CMD prototype (turned on during driving for 30 minutes each).
- Passenger side (PS) equipped with standard OEM vents.

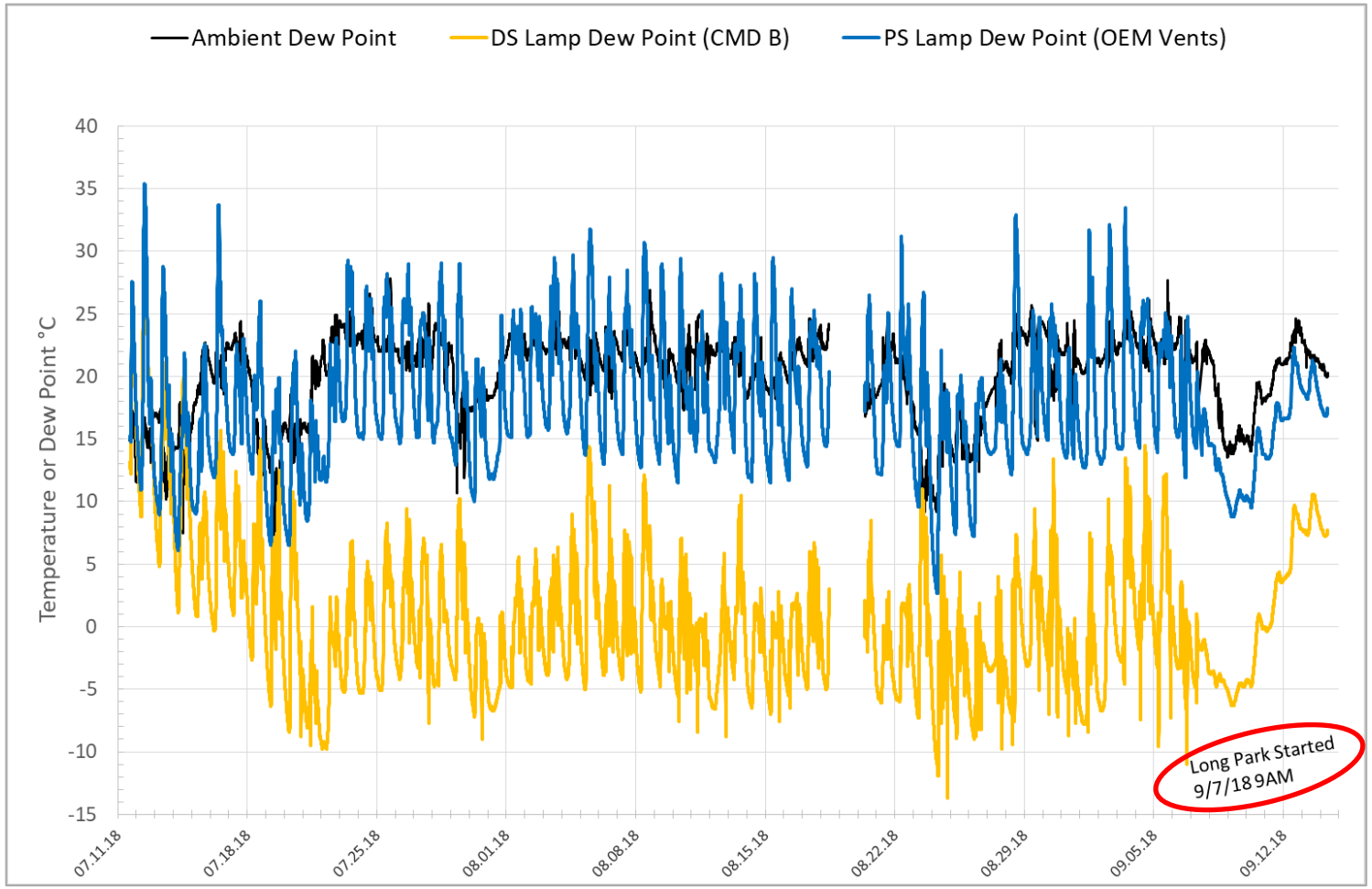
# DP in PS-Headlamp (OEM Standard Vents)



# DP in DS-Headlamp (CMD Prototype)



# DP Comparison at a Glance



- Link to VIDEO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