

DPM Workshop

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Diesel Particulate Filter Application Case Study

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- **Multi pronged approach for DPM control**
 - **Corrective Measures for Existing Ventilation**
 - **Engine Replacement**
 - **Exhaust Filtration**
 - **Upgrade Mine Ventilation Volumes**
 - **Alternative Fuel Trials**

Exhaust Filtration

- **Assess equipment fleet as to primary sources for DPM**
- **MSHA listing for Particulate Index (P.I.)**
- **P.I. is based on Ventilation Rate to normalize emissions to 1000 $\mu\text{g}/\text{m}^3$**
- **Some of your larger engines may not be your biggest polluters**

Diesel Particulate

MAJOR EQUIPMENT FLEET

● 40D Truck	6	475 HP
● 450/1250 Loader	4	300 HP
● 420 Teletram	6	225 HP
● 436 Teletram	2	375 HP
● Wagner ST3.5D	4	200 HP
● Elphinstone Loader	1	165 HP
● Getman Carriers	11	150 HP
● Normet Carrier	2	150 HP
● Jumbos	10	75 HP
● Tractors	25	53 HP

Exhaust Filtration

- **Target Equipment Requirements for Passively Regenerated Filters**
 - 4 Cycle Engines
 - High Duty Cycle
 - High Exhaust Gas Temperatures

Exhaust Filtration

- **Temperature profiling is imperative**
- **Data logging over several days to gain a good perspective of operating conditions**
- **Test each piece of equipment in a given production cycle**
 - **Eg; Two LHD's, similar configuration, one in remote mucking, the other in manual mucking**
 - **One configuration was successful, the other, marginal**

4 Channel Data Logger



6" K type Thermocouple



Data Logger, Probe and Case



Toro 40 D Installation



Toro 40 D Installation



Getman A64 Scissors Truck



Getman A64 Installation



Getman A64 Installation



Getman A64 Installation



Kubota M5030 Tractor



Kubota M5030 Tractor



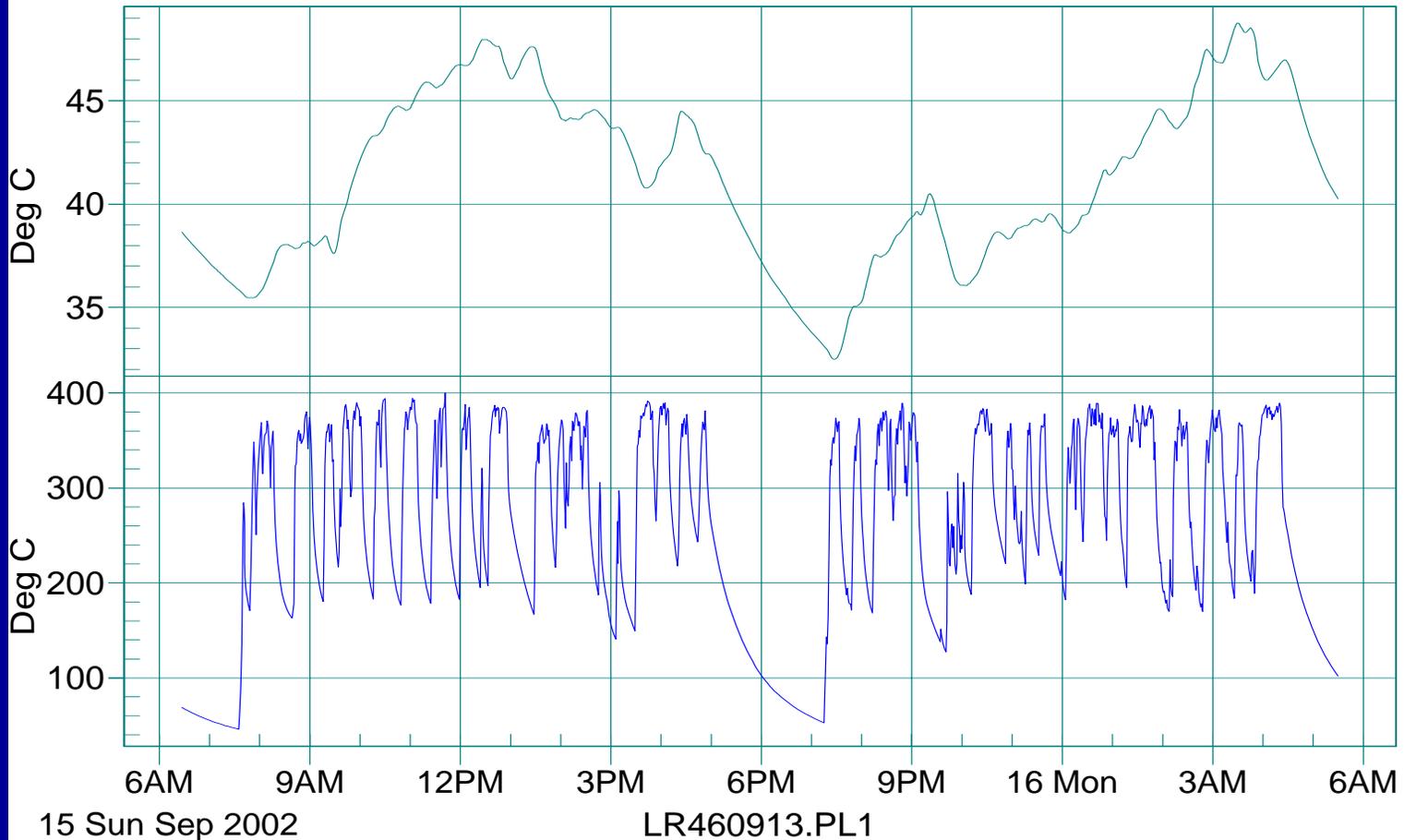
Kubota M5030 Installation



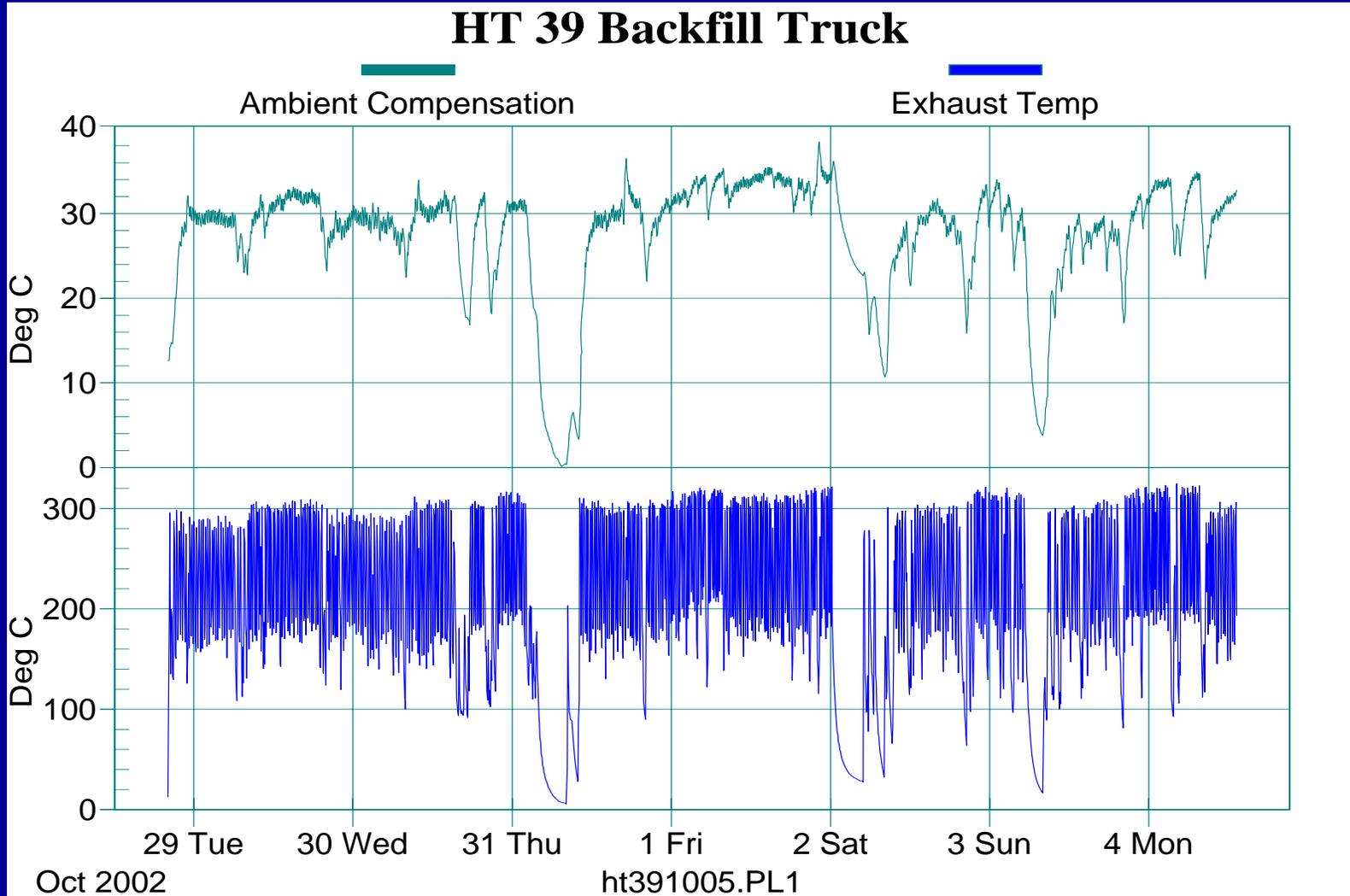
Temperature Profile

LR 46 Temperature 09/11/02

LR46 Exhaust deg C

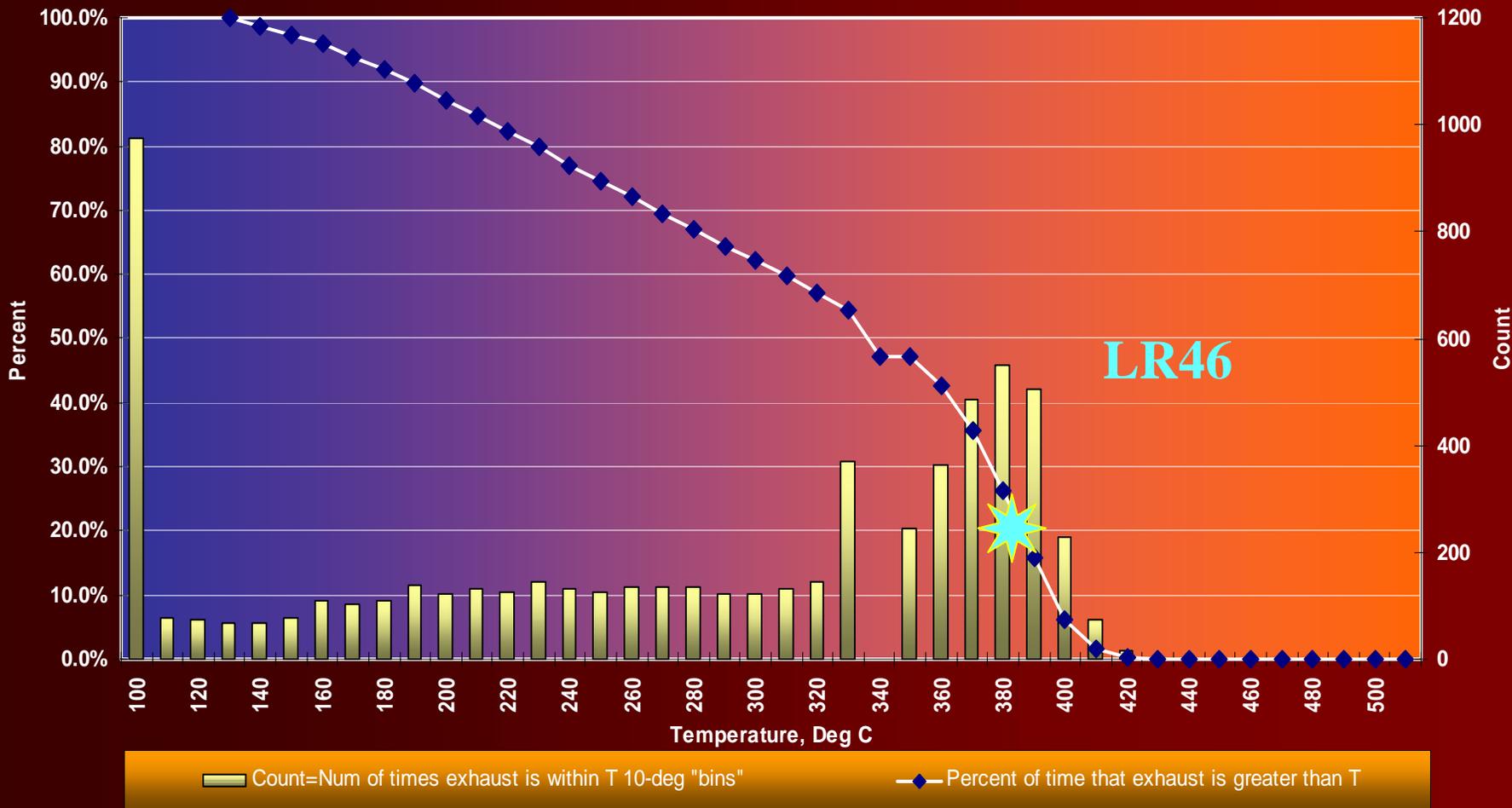


Temperature Profile



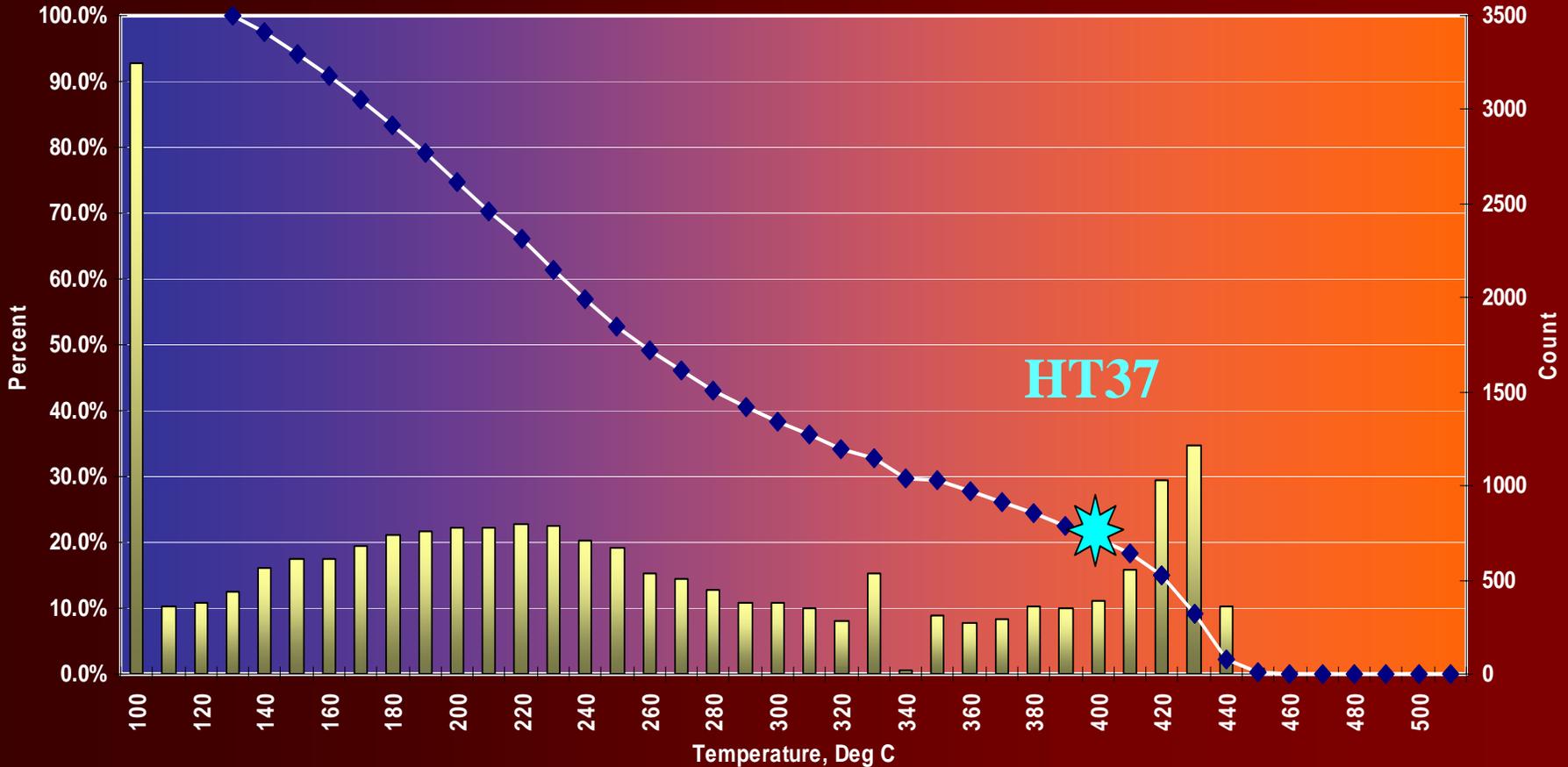
Temperature Histogram

Temperature Histogram
10-degree C increments



Temperature Histogram

Temperature Histogram
10-degree C increments

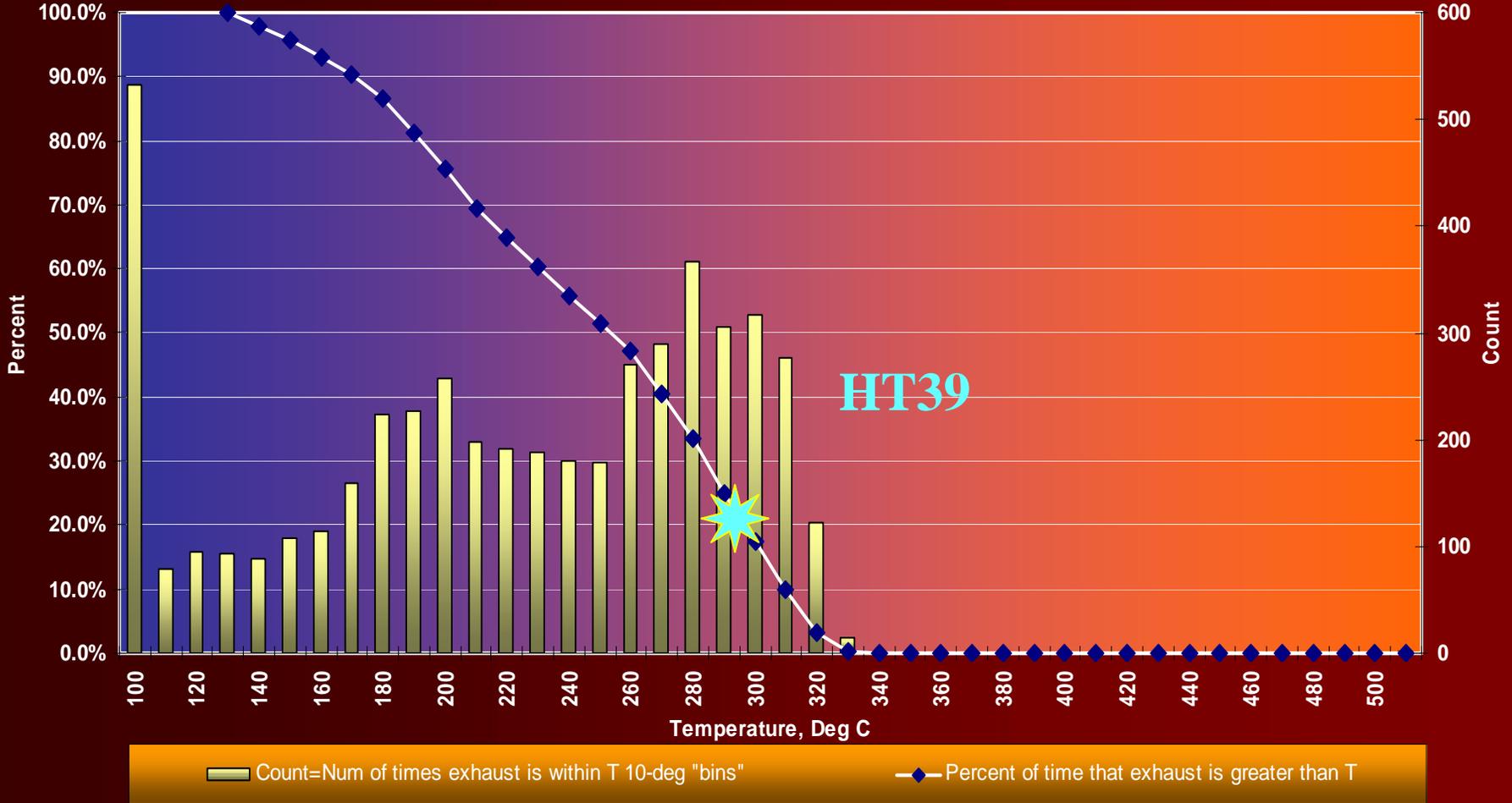


Count=Num of times exhaust is within T 10-deg "bins"

◆ Percent of time that exhaust is greater than T

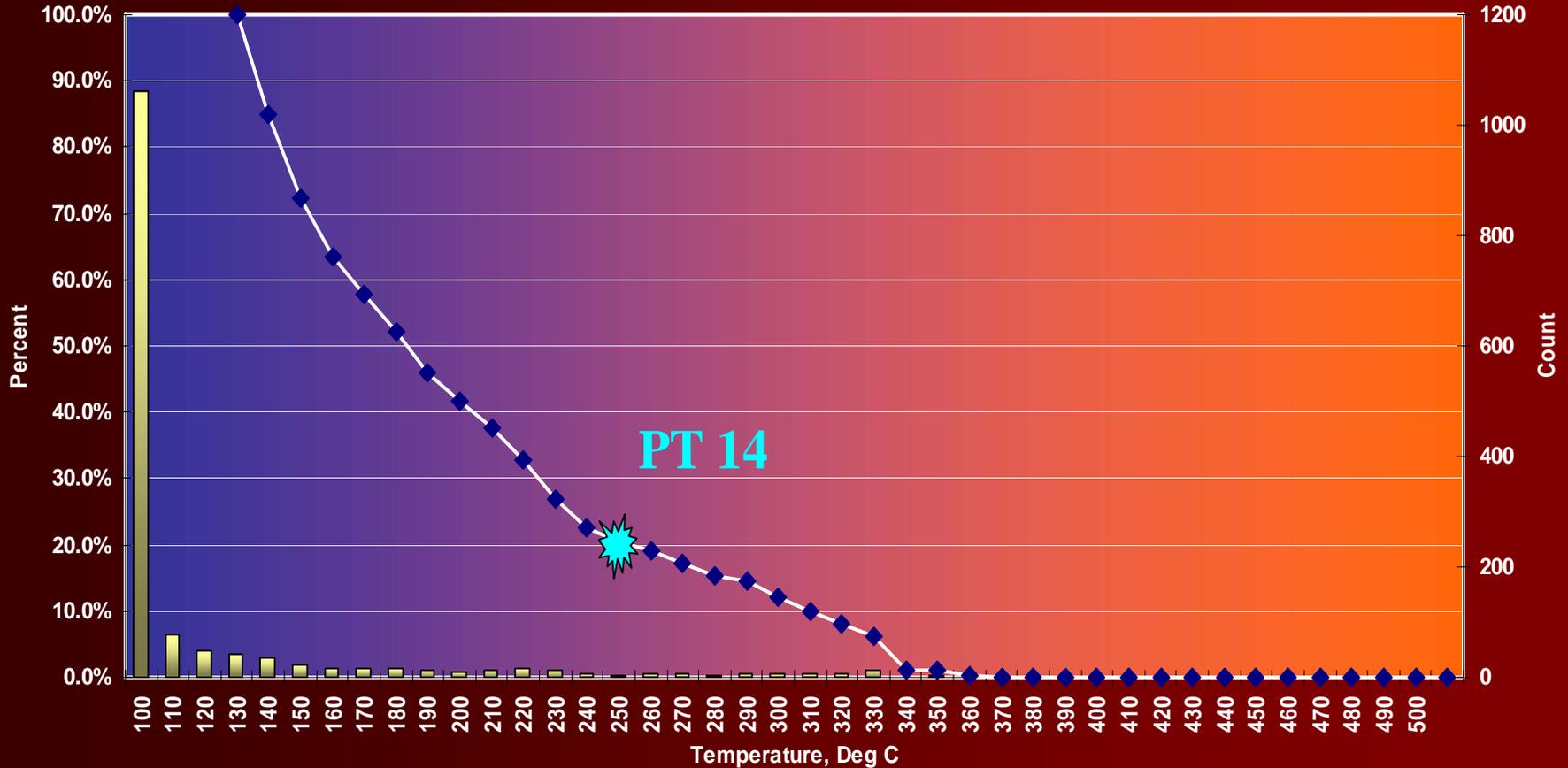
Temperature Histogram

Temperature Histogram
10-degree C increments



Temperature Histogram

Temperature Histogram
PT14 - Mercedes 904 LA



Count=Num of times exhaust is within T 10-deg "bins" Percent of time that exhaust is greater than T

Passive Filter Installation



Active Filter Installation Getman A64 Powder Truck



Active Filter Mounted on Getman Powder Truck



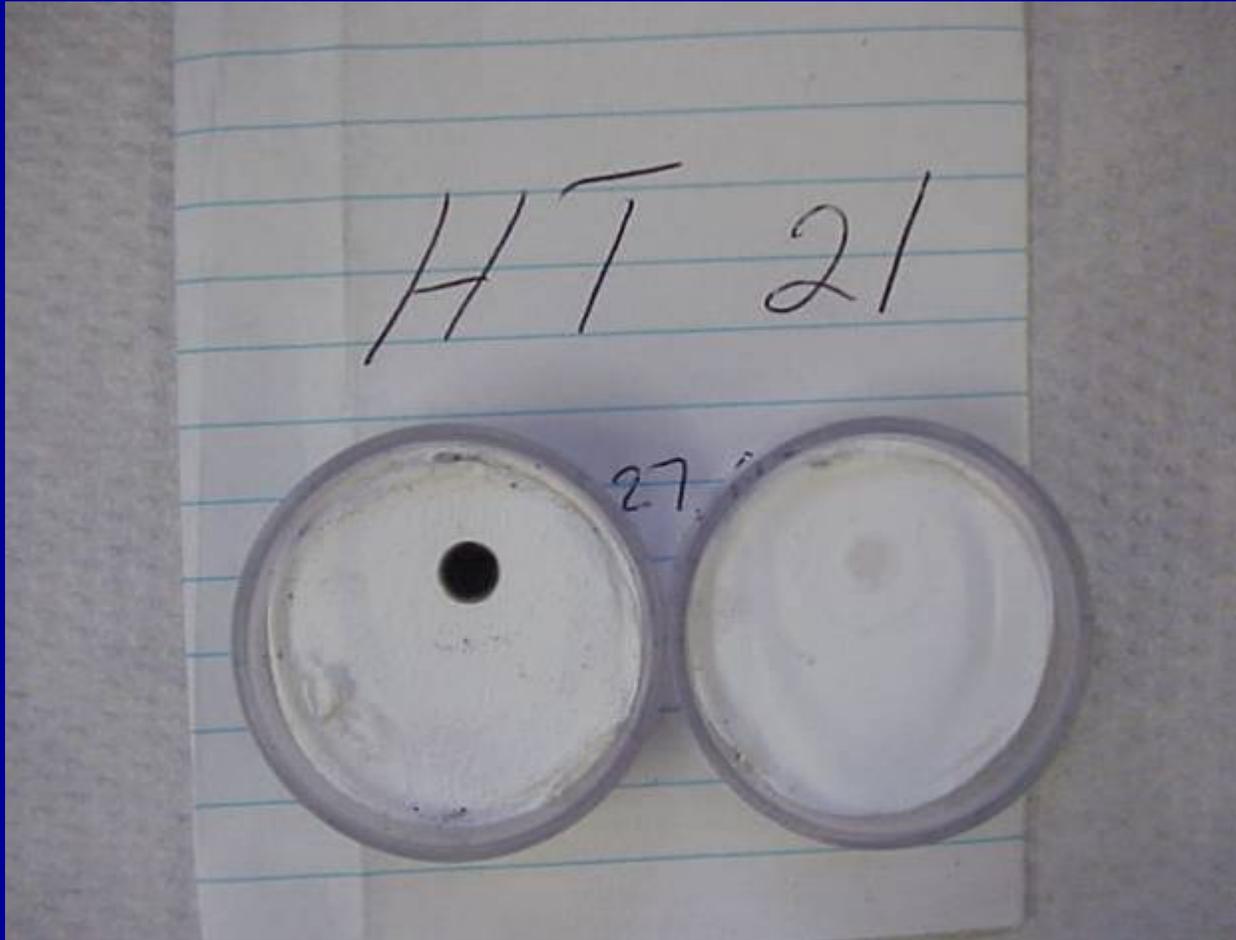
LR46 - 6 Weeks - Filtered Exhaust



LR46 - 1 1/2 Shifts with no Filter



Pre & Post Filter Samples

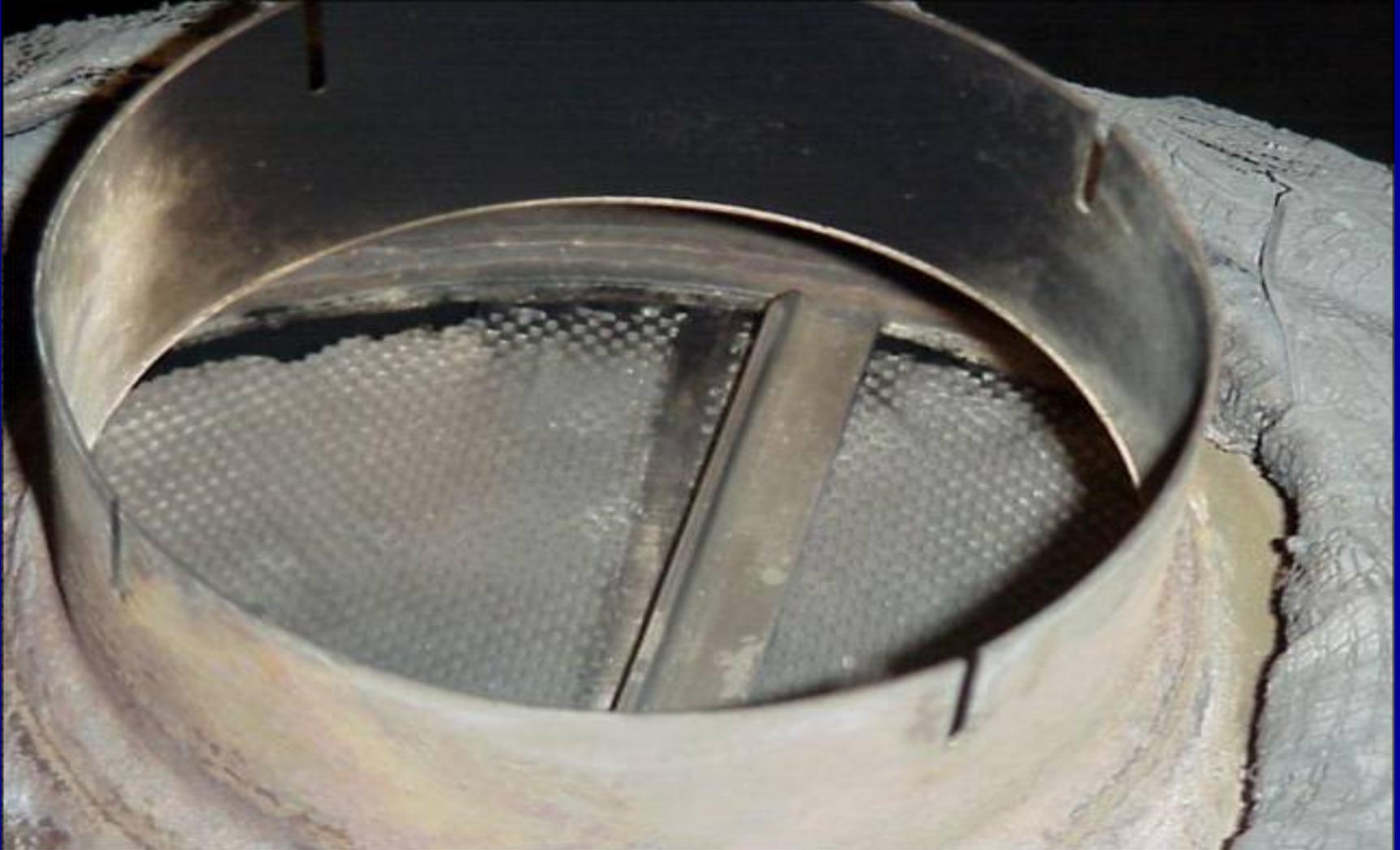


Failing Filter

Discharge Side - Soot Ghosting, Rotation

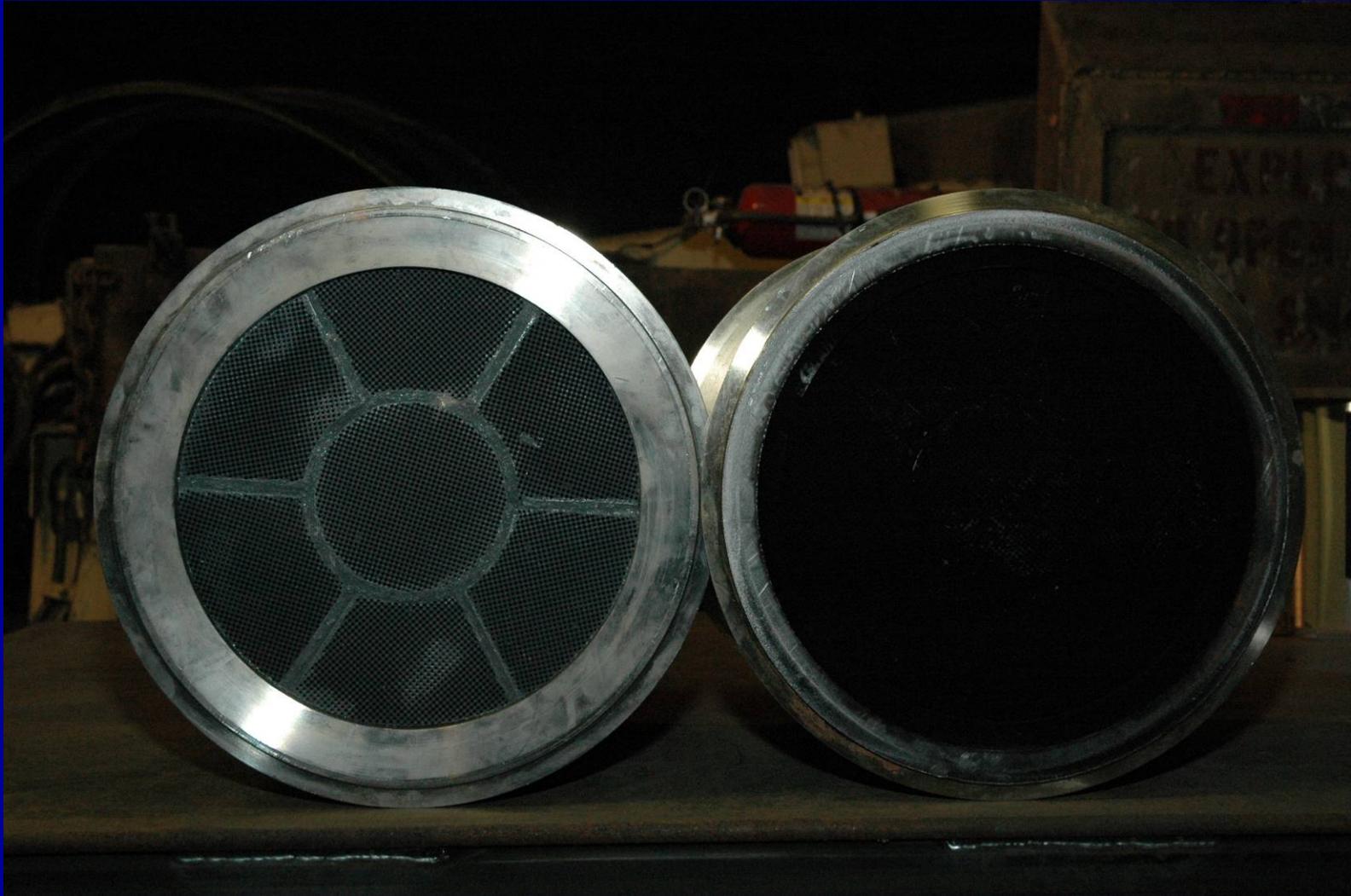


Failed Ceramic - Exhaust Bypass



Active Regeneration Filters

Left – Clean Filter, Right - Soot Loaded Filter



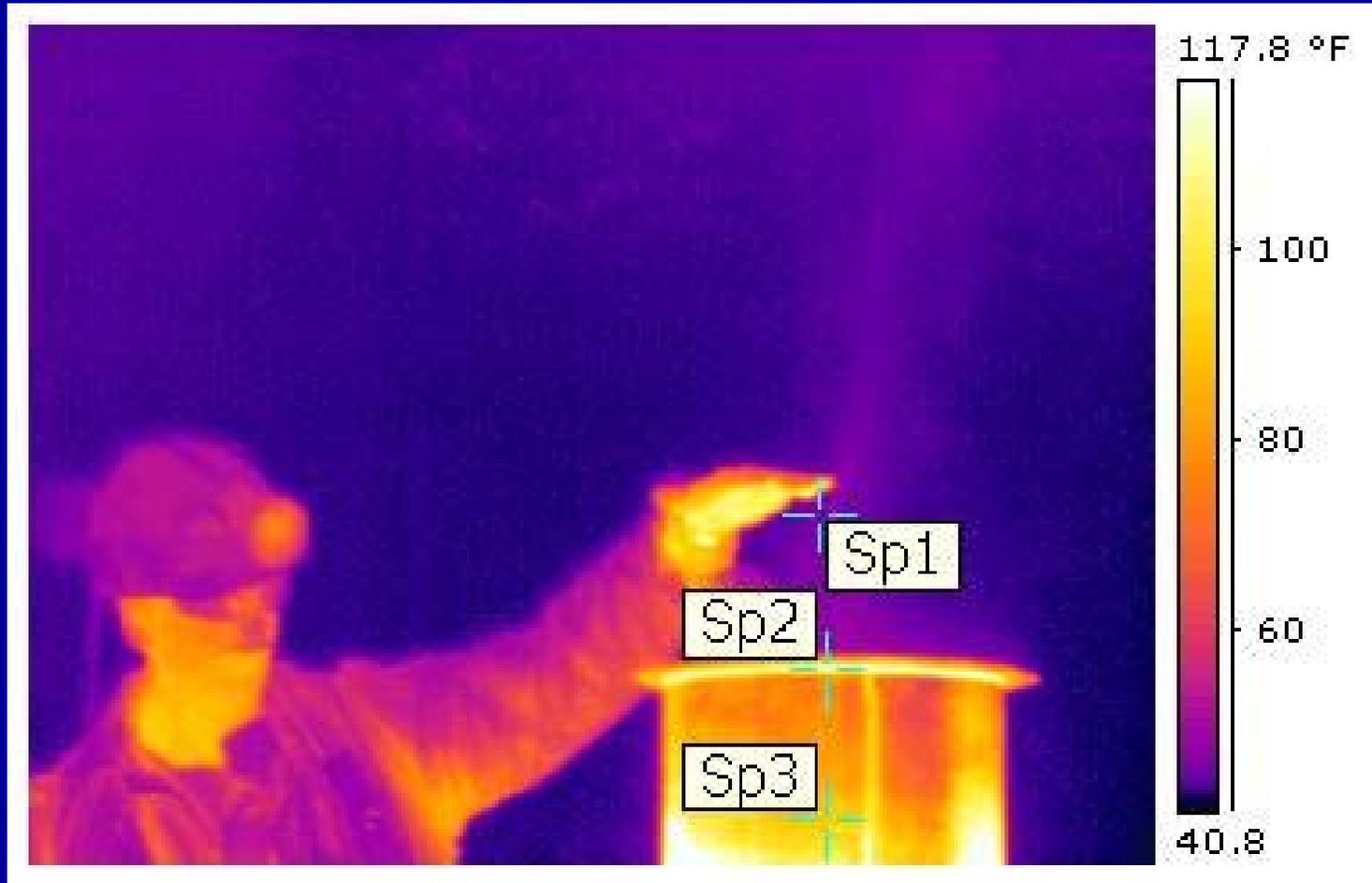
Active Regeneration Station Control Panels



Active Regeneration Station Heater Bases

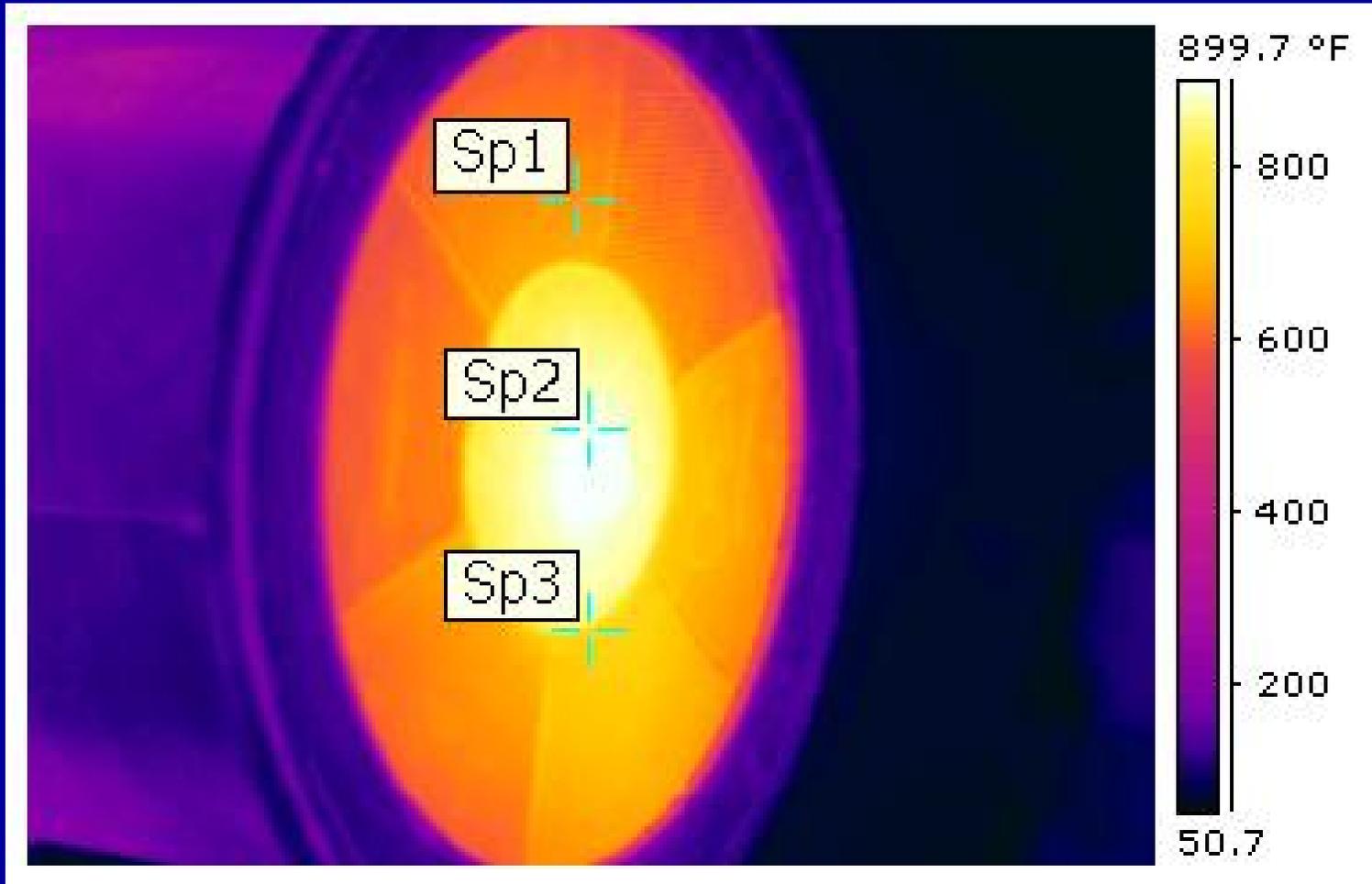


Thermograph Heat Plume of Heating Filter



Thermograph

Discharge side of Regenerating Filter



MSHA Cooperative Test DPM Sampling - Jan 2003

- Average Stope Sample - Total Carbon
- Stopes tested 675 / 704 / 490 / 446 / 30

- Sampler mounted on LR46, outside cab
 - Filtered Equipment : 205 ug/m³
 - Unfiltered Equipment : 1,233 ug/m³

MSHA Cooperative Test DPM Sampling - Jan 2003

- **Average Stope Sample - Total Carbon**
- **Stopes tested 675 / 704 / 490 / 446 / 30**

- **Sampler mounted on LR46, inside cab**
 - **Filtered Equipment : 49 ug/m³**
 - **Unfiltered Equipment : 271 ug/m³**



Questions ?