Gas Turbine
Flame Monitoring
A Flame Scanner (aka monitor or detector) watches the combustion process and tells the turbine control it’s okay to keep feeding fuel to the fire.

A serious subject.
Worst case, malfunction can be catastrophic.
Present flame monitoring technology on GE ® frame style gas turbines

UV tube

Flametracker®
(Reuter-Stokes ®)

Ametek®

a. Not fail-safe!

b. Unrepairable $3,500 to $6,000 throw-aways

c. Have unpredictable expiration

d. Can not be replaced with turbine running

e. Wires can be heat-damaged
Cold start, just at full speed, no load, the flame signal disappears.

Shortly after going to Lean-Lean

After **one hour** in lean-lean!

With a cold start, liquid cooled flame sensors are the coldest spots near the combustion cans. When relative humidity is high, cooling coil makes the sight tube a condenser. Water droplets refract UV radiation that the Flametracker is looking for. This causes loss of flame at full speed no load and loss of flame during transfer from lean-lean to premix operating mode.

**But, according to GE, the potentially worst problem with liquid cooling...**
Liquid Cooling…

**Can leak and damage the turbine! (TIL 1579-R1)**

- Turbine shell quenching?
- Distortion?
- Cracking?

*Ethylene / propylene glycol mix  FIRE HAZARD?*
The safest flame scanner will measure ‘flicker’ modulation if not, it could be fooled by background radiation, reporting residual heat inside the combustor can, instead of flame.

They all sense UV

Using flame edge carbonization
Armored fiber optics separate electronics from heat & vibration

- Temperatures up to 480°F  *short term 570°F*
- HT version up to 660°F  *short term 750°F*

We are standard OEM equipment on…

…and retrofit on
The easy solution for your turbine!

Remove tubing

... cap it off forever

then...
Replace your scanner with our probe

It will take the heat!

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sp1</td>
<td>154°F</td>
</tr>
<tr>
<td>Sp2</td>
<td>270°F</td>
</tr>
<tr>
<td>Sp3</td>
<td>650°F</td>
</tr>
<tr>
<td>Ar1:Max</td>
<td>754°F</td>
</tr>
</tbody>
</table>
2

Route Fiber Optic Cable
3

Install Scanner Box

Features

✓ 2 channels for flame monitoring and evaluation
✓ Adjustable Sensitivity and switch-off time
✓ Analog flame intensity output 4-20 mA
✓ Data logging function (can be trended to spot candidates for repair)
✓ **Can be repaired!** 10-12 year typical sensor life on gas
✓ **If ever required, user can quickly swap spare board** turbine running
✓ Any output to control system (pulse / relay / 4-20mADC)
✓ Allows internal termination of 300V DC supply if other outputs desired
✓ Flame diagnostic software

Optional

✓ RS 232/485 output to bus system for visualization (TCP/IP) *if required*
✓ Relay Output Available – 19” Rack Mount or DIN Rail
Connect a few wires

Done!
Built-in diagnostic with remote visualization capability using optional converter

5012
Frequency to current conversion
4 – 20 mA depending on combustion frequency
Wide range power supply 100 – 240 V AC 50/60 Hz / 24 V DC
Laptop computer connection for local data display
Signal conversion RS232 – RS485 for connection of up to 16 CFC 3000's on one COM Port
Software for display in control room

Layered screens showing 1, 4 or up to 16 scanner graphics
Amplitude  Frequency (useful for combustion optimization)  Relay output  Current output
<table>
<thead>
<tr>
<th>Problems</th>
<th>Solutions!</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liquid cooling required</td>
<td>✓ No liquid cooling</td>
</tr>
<tr>
<td>Potential turbine damage</td>
<td>✓ No liquid cooling</td>
</tr>
<tr>
<td>Potential fire hazard</td>
<td>✓ No liquid cooling</td>
</tr>
<tr>
<td>Costly to maintain</td>
<td>✓ No liquid cooling</td>
</tr>
<tr>
<td>Always in the way of other work</td>
<td>✓ No liquid cooling</td>
</tr>
<tr>
<td>Temperature differential causes condensate</td>
<td>✓ No liquid cooling</td>
</tr>
<tr>
<td>Pressure to be maintained</td>
<td>✓ No liquid cooling</td>
</tr>
<tr>
<td>Not fail safe</td>
<td>✓ Fail sale  opens contact upon failure</td>
</tr>
<tr>
<td>Not self-checking</td>
<td>✓ Self checking  every second</td>
</tr>
<tr>
<td>Not repairable</td>
<td>✓ Can be repaired</td>
</tr>
<tr>
<td>Unpredictable expiration</td>
<td>✓ Predictable, by trending performance</td>
</tr>
<tr>
<td>Requires shutdown to replace</td>
<td>✓ Board safely replaced in minutes  turbine running</td>
</tr>
<tr>
<td>Wires can be damaged by heat</td>
<td>✓ No wires near the turbine</td>
</tr>
<tr>
<td>Costly control modification if changing from UV tube</td>
<td>✓ No control modification required</td>
</tr>
</tbody>
</table>
Flame Monitoring and Evaluation Systems
Power stations, Gas turbine, Refineries
Design and Engineering, Custom Applications,
Fiber Optic Technology, Video Scanner
Founded 1973

Sales, Distribution and Support for the North American Market
Founded 2006

Flame Monitoring and Evaluation Systems
Household Burners, Single Burner applications
Small Industrial Applications
Founded 2004