

# Delta F - Markets & Applications

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**Application:** Oxygen and Moisture analysis in High Purity Bulk Gases

**Products:**

- NanoTrace Dual Oxygen and Moisture Analyzer – DF-760
- NanoTrace Moisture Analyzer – DF-750
- NanoTrace II Oxygen Analyzer – DF-560
- NanoTrace Oxygen Analyzer – DF-550
- Platinum Series Oxygen Analyzer – 310-H0050M

**Market:** All major semiconductor manufacturers need to monitor their bulk gases. Bulk gases typically include N<sub>2</sub>, Ar, H<sub>2</sub>, O<sub>2</sub> and sometimes He. Sometimes the gas supplier will integrate analyzers into analytical panels. Other times the fab will source analyzers themselves. Facilities or Bulk Gas engineers are responsible for gas quality.

**Analytes of Interest:**

- O<sub>2</sub>, H<sub>2</sub>O, Particles – Always.
- CO, CO<sub>2</sub>, NMHC (non-methane hydrocarbons), N<sub>2</sub>, H<sub>2</sub> – sometimes.

**Process Information:** Processes within the Fab need to run in pure process environments. Contaminant content in gas specs can vary from <1ppb in the state-of-the-art fabs, <10ppb is typical and <100ppb is rare, but still seen in some of the older fabs. The gas manufacturer will send the gases through a purifier and over to the Fab in a pipeline (UHP Gas Distribution System). The gases will be monitored either as they come out of the purifiers or as they enter the Fab.

**Problem:** O<sub>2</sub> and H<sub>2</sub>O can cause undesirable side reactions to the products produced within the Fab. O<sub>2</sub> or H<sub>2</sub>O concentration above spec can lead to increased defect density on wafers. This can translate to hundreds of thousands of dollars of non-sellable product per hour.

**Solution:** A fixed panel of analyzers monitoring for O<sub>2</sub> and H<sub>2</sub>O content ensures that these contaminants are not introduced at their source. However, contaminants can be introduced downstream of the analyzers and at the point-of-use...the process tool. Mobile Analytical Carts, explained on the next page, are used to detect for atmospheric contaminants throughout the Fab. NanoTrace analyzers dominate these applications. They are fast to respond, extremely reliable and provide superior low-end sensitivity.

The typical 300mm Fab will have:

(3) DF-760 monitoring O<sub>2</sub> and H<sub>2</sub>O in N<sub>2</sub>, Ar and He.

(1) DF-760 monitoring O<sub>2</sub> and H<sub>2</sub>O in H<sub>2</sub> having a Hydrogen Safety System

(1) DF-750 monitoring H<sub>2</sub>O in O<sub>2</sub> background gas.

Particle analyzers and an analyzer that measures CO, CO<sub>2</sub> and NMHC will be used also. The Fab will also have one or two Mobile Analytical Carts for trouble shooting.

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**Application:** Mobile Analytical Carts used to measure Oxygen and Moisture content of high purity bulk gases (N<sub>2</sub>, Ar, H<sub>2</sub>, O<sub>2</sub> and He).

**Products:**

- NanoTrace Dual Oxygen and Moisture Analyzer – DF-760
- NanoTrace Moisture Analyzer – DF-750
- NanoTrace II Oxygen Analyzer – DF-560
- NanoTrace Oxygen Analyzer – DF-550
- Platinum Series Oxygen Analyzer – 310-H0050M

**Market:** All major semiconductor manufacturers need to ensure their bulk gases meet spec inside the Fab.

**Analytes of Interest:**

- O<sub>2</sub>, H<sub>2</sub>O, Particles – Always.
- CO, CO<sub>2</sub>, NMHC (non-methane hydrocarbons), N<sub>2</sub>, H<sub>2</sub> – sometimes.

**Process Information:** Processes within the Fab need to run in pure process environments. Gas specs can vary from <1ppb in the state-of-the-art fabs, <10ppb is typical and <100ppb is rare, but still seen in some of the older fabs. The gas manufacturer will send the gases through a purifier and over to the Fab in a pipeline. The gases will be monitored either as they come out of the purifiers or as they enter the Fab.

**Problem:** O<sub>2</sub> and H<sub>2</sub>O can be introduced downstream of the source through leaks in the UHP Gas Distribution System (plumbing network). Undetected leaks to atmosphere can introduce O<sub>2</sub> and H<sub>2</sub>O and cause reduced yields.

**Solution:** A mobile analytical cart will be used for spot checks or as a routine quality check. Fabs sometimes outsource this function to “3<sup>rd</sup> party QC contractors” or “mechanical contractors”. Analyzers are often integrated into “carts” with PC, printer and monitor put on wheels. The DF-760 NanoTrace Dual is extremely advantageous in this application. All data can be downloaded to disk, eliminating the need for integration with PC, CRT and printer. Just put the analyzer on wheels and go.