

*Setting the Standard for Automation™*



# **Cyclone Technology protects analyzer systems for unrivalled reliability and tops productivity**

Standards

Certification

Education & Training

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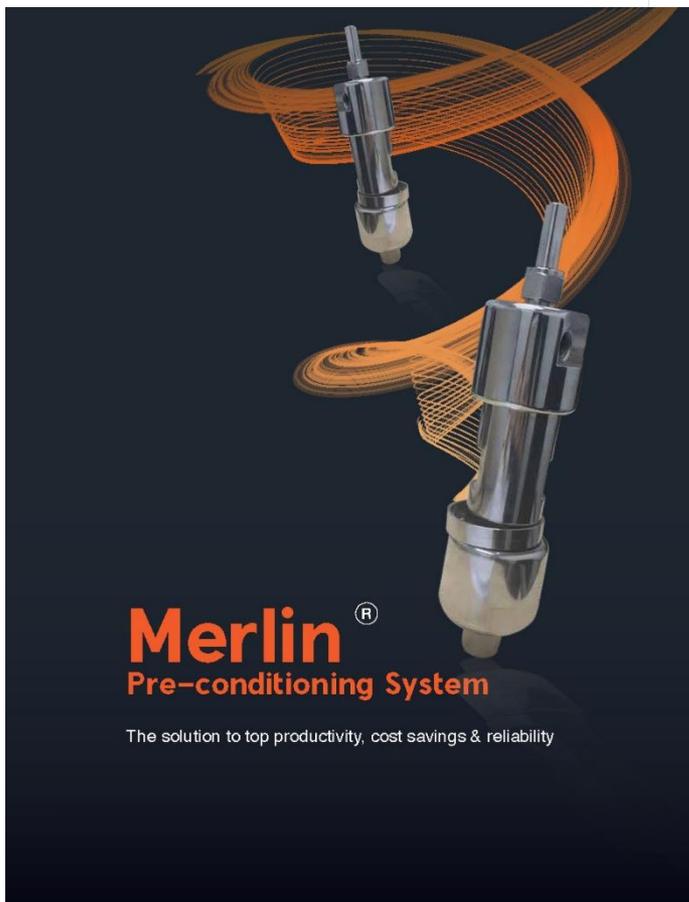
Benson Loh



35 years of experience in designing and providing analytical systems to the Oil & Gas, Petrochemical, Water and Waste Water industries globally.

7 years of experience in applying cyclone solutions to improve and protect analyzer systems.





## Merlin<sup>®</sup>

### Pre-conditioning System

is the ultimate protection for all on-line process gas analyzers and equipment against particulates, liquids and mists found in process gases. It employs a patented and innovative technology to protect on-line gas analyzers over a wide range of operating conditions. It is the solution to top productivity and to ensure significant cost savings in the plants.

*It can also be used for liquid applications too!*





Application 1: Remove Zinc Oxide Powder in Nitrogen gas for Oxygen Analysis in Lubricating Oil Plant.



Challenge:

- Zinc Oxide dosing cannot start without Oxygen Measurement due to safety reasons.
- The medium size filter used required replacement monthly.
- Sample gas was sucked by vacuum pump at low flowrate.
- Zinc Oxide dust has adverse effect to the human respiratory system.

Solution:

- Dual stage Merlin Cyclone in series works under vacuum and low gas flowrate.
- Zinc Oxide powder and dust are blown back by nitrogen automatically through sample line and return to the vessel after each batch process.
- Medium size filter is replaced once in 6 months as preventive maintenance.



## Application 2: Remove Particles in Cracked Kerosene for Refinery Analysis in Refinery.

### Challenge:

- Refinery Analysis such as Flash Point, Freeze Point, Colour, Distillation Point are crucial to process control and final fuel product quality.
- The traditional inertia filter used required filter dismantling every few weeks to clean the filter element.

### Solution:

- Merlin Cyclone with filter element.
- Cyclone filter was backflushed manually once in three months.
- No dismantling of tubes in the sampling system.





### Application 3: Remove Algae and Particles in Seawater Cooling Medium for pH Analysis in Chemical Plant.

#### Challenge:

- Seawater contains algae and many broken pieces of sea shell. Seawater is a critical cooling medium in the plant.
- The traditional inertia filter used required filter dismantling every few weeks to replace the filter element.

#### Solution:

- Teflon Merlin Cyclone with integral pH sensor holder.
- Cyclone internal was manually once in three months.



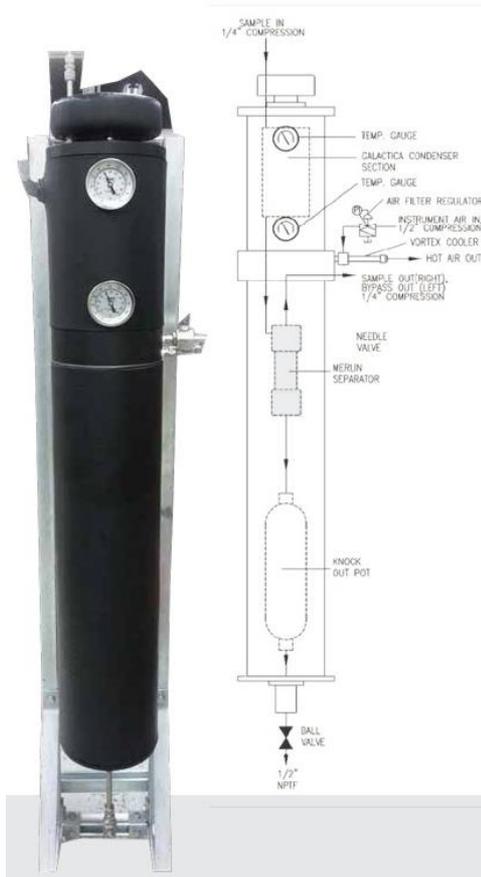
Application 4: Remove Oily Mist and Particles in Recycle Gas for Hydrogen Analysis in Refinery.

Challenge:

- The traditional membrane filter carried-over oily mists. The Gas Chromatograph Analyzer operated for a few days and was down for maintenance for one week due to column contamination.
- The recycle gas is 80 barg and contains high percentage of Hydrogen Sulphide.

Solution:

- Inconel 625 Dual Stage Merlin Cyclone with Vortex Cooler.
- There was no more oily mists carry-over and the Gas Chromatography Analyzer was able to operate continuously.



## Application 5: Remove Unknown Liquids in Flare Gas for Oxygen Analysis in Refinery.

### Challenge:

- Oxygen measurement in Flare Gas is a critical safety monitoring. When high oxygen content is detected, nitrogen is introduced to dilute the Flare Gas to prevent flash back.
- Flare Gas is waste gas of unknown gas composition and unknown liquid content especially during plant upset.
- The traditional coalescing filter used carried-over liquids and damaged the Oxygen Analyzer repeatedly.

### Solution:

- Merlin Cyclone Type C with integral Vortex Cooler.
- There was no more liquid carry-over and the Oxygen Analyzer was able to operate continuously.



Application 6: Remove Oligomers and oily yellowish mists in Liquid 1,3 Butadiene in Butadiene Plant.

#### Challenge:

- The traditional coalescing filter used carried-over oily mists. The Gas Chromatography Analyzer operated for a few days and was down for maintenance for one week due to column contamination.
- Oligomers are by-products which is very sticky and clogs up filter element very quickly.

#### Solution:

- Merlin Cyclone was used for separation of Oligomers in liquid phase. Merlin Type C with integral vortex cooler was used for separating oily mists.
- There was no more clogging and oily mists carry-over and the Gas Chromatography Analyzer was able to operate continuously.
- The Cyclone systems were steam cleaned every six months as preventive maintenance.



## Application 7: Remove Algae from Waste Water for Total Organic Carbon (TOC) Analysis in Chemical Plant.

### Challenge:

- Algae in the waste water pit was sucked up by the recirculating pump and broken into fine particles.
- The medium size traditional fibre filter used clogged up within a week and this caused the sample flow to stop.
- Algae particles resulted in spike in TOC readings which affected the environment reporting.

### Solution:

- Merlin Cyclone with filter element.
- Client backflush the filter element manually once a month.
- No dismantling of filter or tube in the sampling system.





Application 8: Remove Oil from Waste Water for Total Organic Carbon (TOC) Analysis in Chemical Plant.

Challenge:

- Waste water quality was good except for occasional small oil stain. The TOC readings jumped because of the oil stain and this resulted in spike in TOC readings which affected the environment reporting.

Solution:

- Merlin Cyclone.
- Sample to TOC analyzer is taken from bottom of the cyclone instead of from the top side.





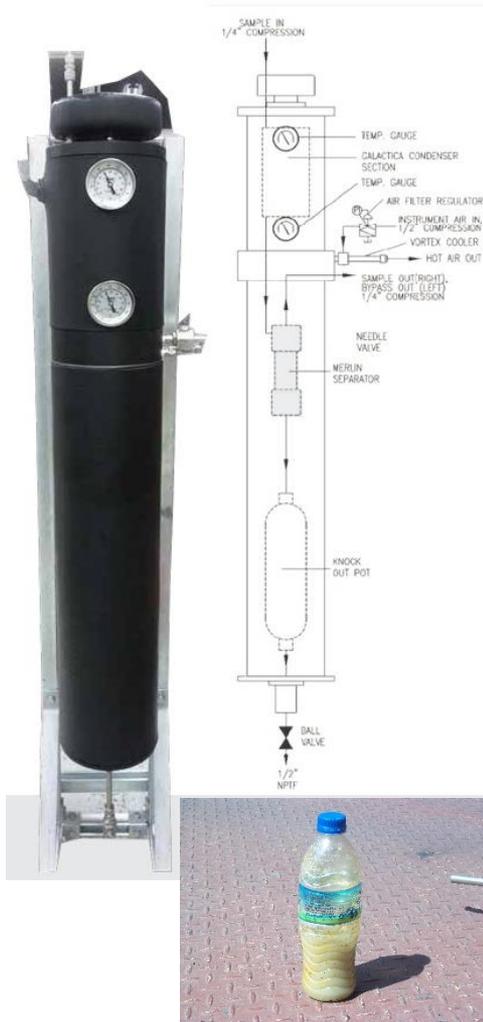
## Application 9: Remove Green Oil By-Product in Ethylene Cracker for Gas Chromatography Analyzer.

### Challenge:

- The Gas Chromatography Analyzer was used to measure the gas composition of the Ethylene Cracker for process control.
- Green Oil carry-over through traditional coalescing filter resulted in column contamination and frequent downtime of the Gas Chromatography Analyzer.

### Solution:

- Merlin Cyclone Type C with integral Vortex Cooler.
- There was no more liquid carry-over and the Gas Chromatography Analyzer was able to operate continuously.



Green oil Collected



Application 10: Remove Tertiary Butyl Catechol (TBC)  
Inhibitor in 1,3 Butadiene Liquid in 1,3 Butadiene Plant.

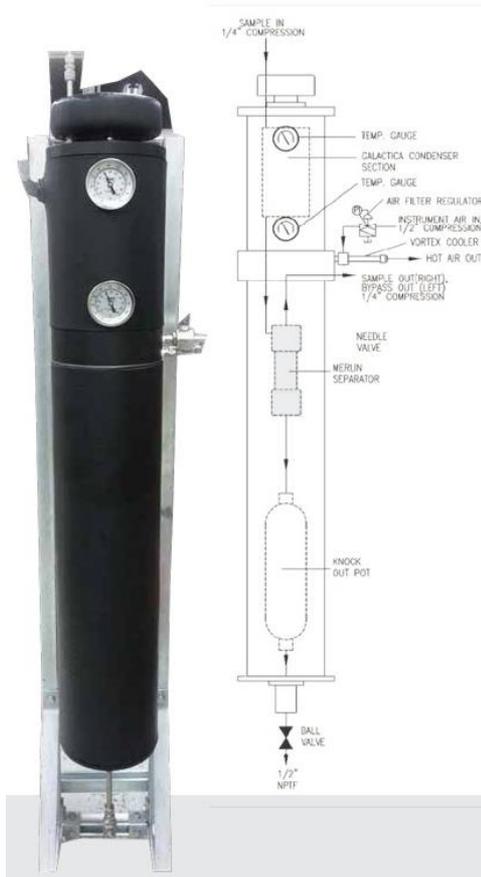


Challenge:

- The Gas Chromatography Analyzer was used to measure the gas composition of the 1,3 Butadiene for process control.
- The TBC carry-over through traditional filter resulted in column contamination by purplish stains and frequent downtime of the Gas Chromatography Analyzer.

Solution:

- Merlin Cyclone Type C without filter element.
- TBC liquid was separated from 1,3 Butadiene liquid by their different densities.
- There was no more liquid carry-over and the Gas Chromatography Analyzer was able to operate continuously.



## Application 11: Remove Water in 1,3 Butadiene gas for Trace Oxygen Analysis in 1,3 Butadiene Plant.

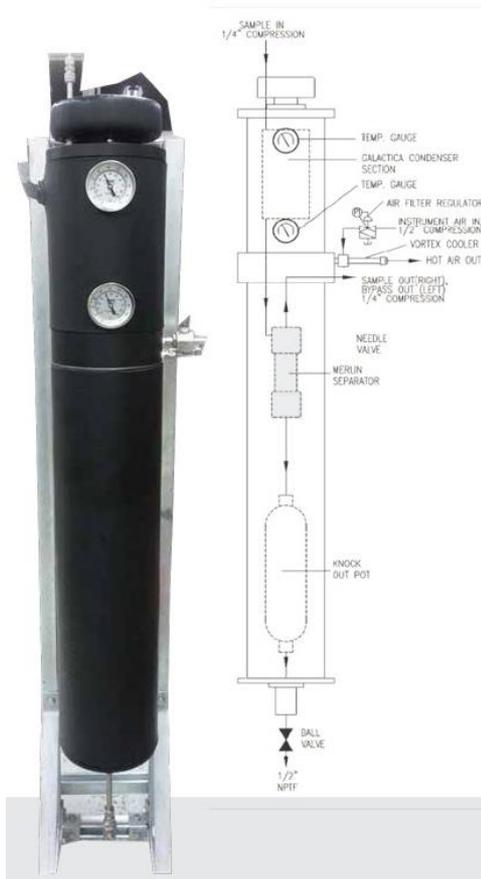
### Challenge:

- Water and liquids are often found in 1,3 BD services and this caused the trace Oxygen Analyzer sensor to drift continuously.

### Solution:

- Merlin Cyclone Type C with integral Vortex Cooler.
- There was no more liquid carry-over and the trace Oxygen Analyzer was able to operate continuously.

Green oil Collected



Application 12: Remove Oily Mists and liquid condensate from waste gas for H<sub>2</sub>S Analysis in Refinery.

Challenge:

- The Tunable Laser Diode H<sub>2</sub>S Analyzer was used to measure the H<sub>2</sub>S content in waste gas as fuel to furnace.
- Liquid condensate carry-over through traditional Membrane Filter resulted in repeated coating and stains on the optical reflective surfaces of TDL H<sub>2</sub>S Analyzer and very high replacement cost.

Solution:

- Merlin Cyclone Type C with integral Vortex Cooler.
- There was no more liquid carry-over and the TDL H<sub>2</sub>S Analyzer was able to operate continuously.



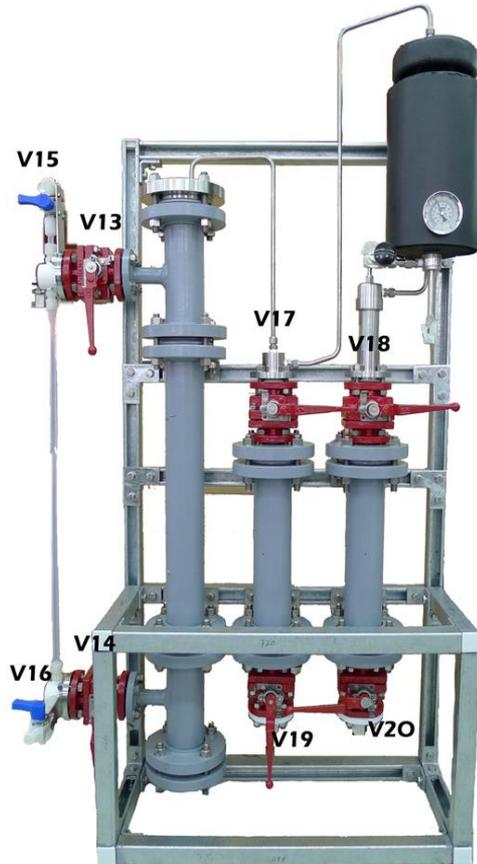
### Application 13: Remove Calcium Sulfate in Waste Water for Volatile Organic Carbon (VOCs) analysis in Chemical Plant.

#### Challenge:

- The Gas Chromatography Analyzer was used to measure VOCs through stripping of the waste water.
- The Teflon Waste Water Filter required replacement hourly as it was clogged up very quickly by hard deposit of Calcium Sulfate.

#### Solution:

- Redundant Merlin Cyclone with filter element.
- Automatic backflush every 5 minutes.
- The filter element requires ultrasonic cleaning every 3-4 weeks.
- The VOCs Gas Chromatography Analyzer was able to operate continuously.



## Application 14: Remove Corrosive Catalyst fines for Catalyst Regeneration Process for Oxygen Analyzer in Refinery.

### Challenge:

- The Oxygen Analyzer measurement is critical for safety monitoring purpose.
- The Catalyst Regeneration Process became very corrosive due to high chloride content as the Catalyst get exhausted. Insitu Zirconia Oxygen Analyzer was destroyed repeatedly.

### Solution:

- Dual Stage Merlin Cyclone with Vortex Cooler.
- Wetted parts in Inconel 625 or PTFE.
- Clean and dry sample gas was sent to the TDL Oxygen Analyzer for continuous safety monitoring.



## Summary:

The cost of the innovative Merlin Cyclone and or system is 5% to 20% of the analyzer system investment.

The return of investment is 3 to 10 times in just 3 months by drastically reducing maintenance and protecting critical analyzer assets from failure and associated repair cost.

The return of investment on high availability on-line analysis for production process control is huge.

Please tap on Cyclone Technology to protect on-line analyzer systems for unrivalled reliability and tops productivity.

Close to 200 units installed in Singapore, Malaysia, Taiwan, Indonesia, France and Germany.



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