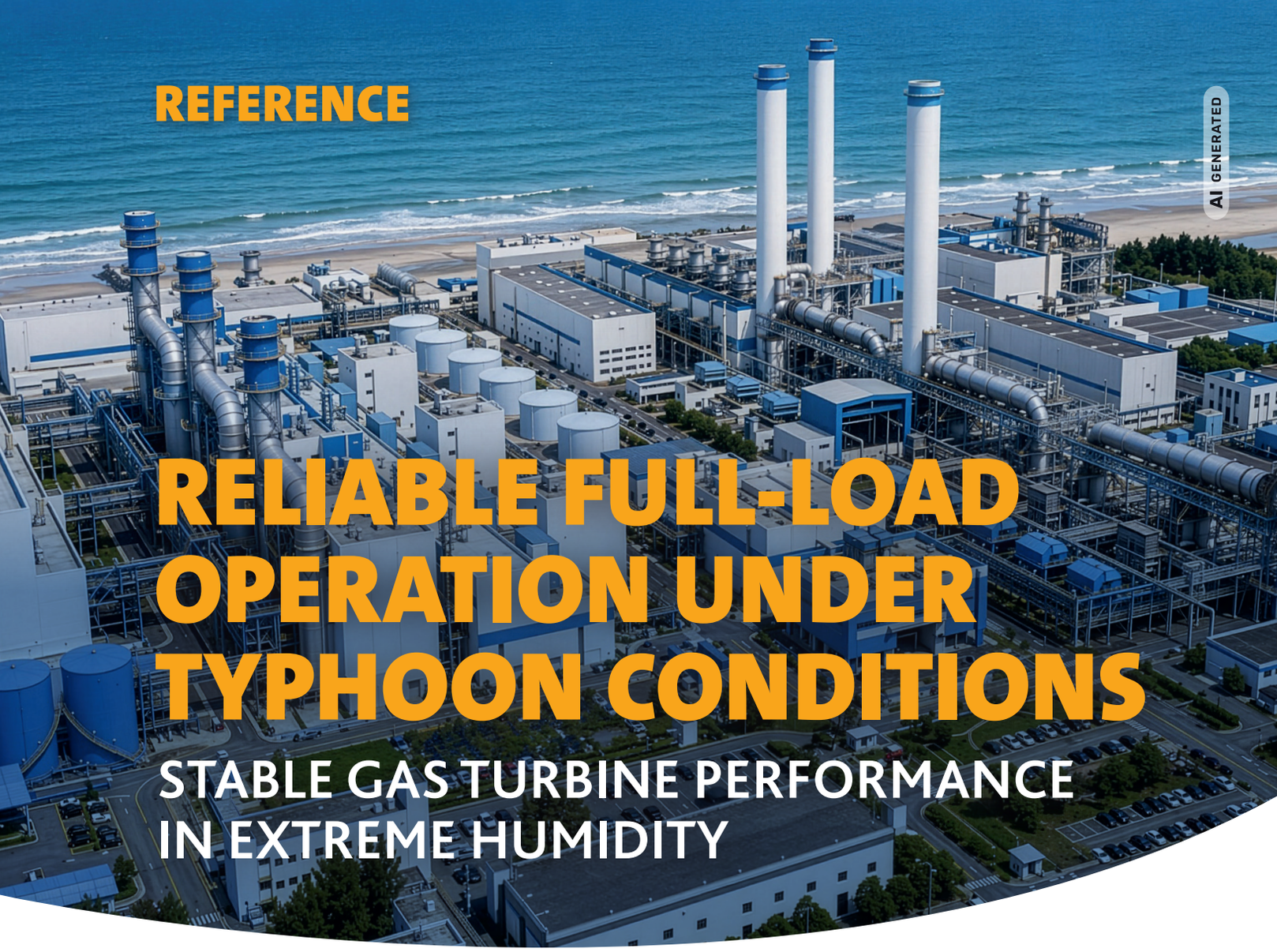

REFERENCE

RELIABLE FULL-LOAD OPERATION UNDER TYPHOON CONDITIONS

STABLE GAS TURBINE PERFORMANCE IN EXTREME HUMIDITY

viledon®

Working closely with the plant operation and maintenance teams, Freudenberg Filtration Technologies helped a Taiwanese ~4,000 MW power plant (with three state of the art Mitsubishi M501J and three older type gas turbines) to resolve recurring performance limits caused by high humidity, heavy rainfall, typhoons, and saline air. These conditions led to excessive water ingress into the air intake system and carryover of water in the filter stages, triggering air-filter pressure-drop spikes and forced load reductions. When reliable power output was needed the most the plant availability was limited.

Operating constraints required a smart retrofit solution

A complete redesign of the intake system was not feasible due to operational constraints and the need to avoid extended downtime. Previously installed filter configurations showed either notably short service life or required labor-intensive maintenance, especially under high humidity and heavy rainfall conditions.

The challenge was clear: Improve overall moisture separation, keep fine and high-efficiency filters dry and stabilize differential pressure without major structural modifications to the intake system.

The Viledon® solution

In late 2021, Freudenberg Filtration Technologies introduced the Viledon® hydroMaxx coalescer prefilters as a dedicated moisture protection stage within the existing intake system.

The solution was integrated into a four-stage configuration:

- **1st stage:** Weather louvers
- **2nd stage:** Viledon® hydroMaxx coalescer filters
- **3rd stage:** Class T9 static fine filters (ISO 29461-1)
- **4th stage:** Class T12 static high-efficiency filters (ISO 29461-1)

Thanks to the compact design, installation was completed rapidly, within less than one day per turbine unit, without requiring structural modifications. The Viledon® modular clip-on system simplified the handling and installation of the hydroMaxx filters significantly.



Proven performance under typhoon conditions

Post-Installation Performance Monitoring
Following installation, differential pressure across the hydroMaxx stage was continuously monitored. Over more than a year of operation, the pressure drop remained remarkably stable, increasing by less than 50 Pa.

Typhoon Stress Test – July 2024
The system's resilience was put to the ultimate test in July 2024, when a severe typhoon struck Taiwan, delivering 400 - 600 mm of rainfall within just three days. The three turbine units equipped with hydroMaxx maintained full-load operation throughout the event, with no water carry-over or pressure drop spikes in the air filtration system.

In contrast, the three units not yet retrofitted experienced excessive differential pressure increases and were forced to reduce output to half load.

Operational and Financial Impact
By maintaining full capacity, the customer avoided significant revenue losses estimated at approximately US$300,000 per day per gas turbine, based on an energy selling price of roughly US$120/MWh.

The clear difference in operational stability between retrofitted and unretrofitted units was compelling enough to convince the customer and prompted the concept to be shared with other power plants across the region.



Clip-on hydroMaxx cross-section

CUSTOMER BENEFITS

- ✔ Reliable full-load operation even during extreme weather and typhoon conditions
- ✔ Significantly improved moisture separation and protection of downstream filter stages
- ✔ Additional revenue of US$300,000 per day per turbine
- ✔ Stable, low differential pressure behavior under heavy rain and fog
- ✔ Avoidance of the need for load reduction creating additional revenue
- ✔ Faster installation and simplified maintenance with clip-on connector design
- ✔ Extended service life of intermediate and high-efficiency filters

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Contact us
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2-TM-821-June-2026-EN

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