

MAG Turbo™

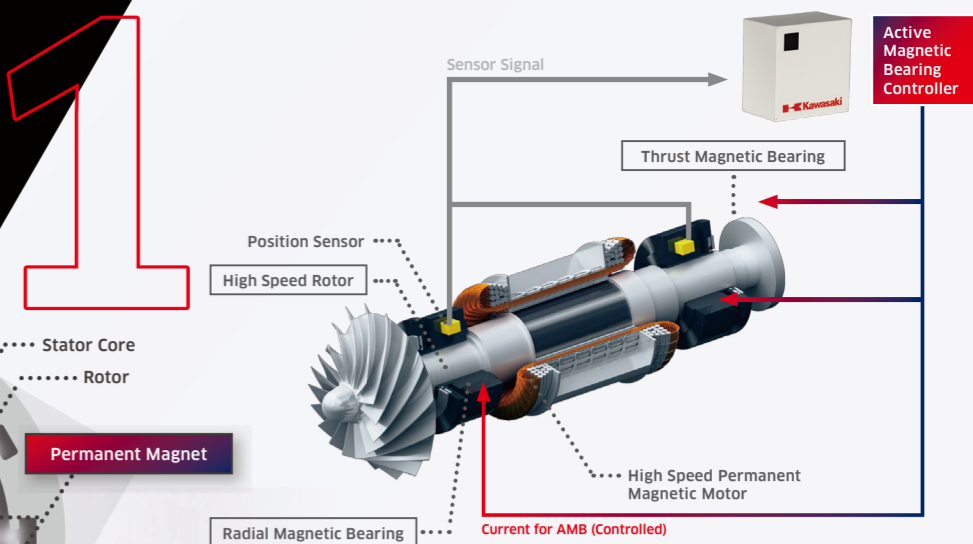
Aeration Blower
for sewage-treatment plant

Magnetic Bearing

We thought that if we could develop a non-contact type shaft bearing that didn't require oil lubrication, we could give birth to a revolutionary blower with superior efficiency and performance over conventional blowers. To achieve this, we adopted a magnetic bearing system, which led to the introduction of the MAG Turbo.



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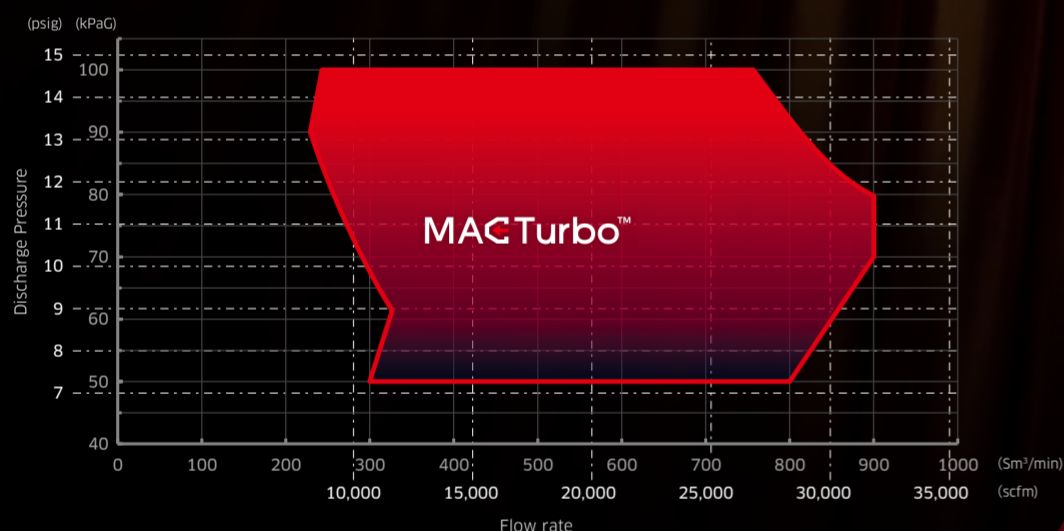
Kawasaki AMB Control (Active Magnetic Bearings)

Active magnetic bearings, electromagnet, are one of the core technologies of MAG Turbo. The rotor is levitated by the magnetic bearings, which attract the rotor in either direction. The clearance between the rotor and the bearings is extremely tight; approx. 500 μm. The active magnetic bearing controller uses position sensors to accurately determine the rotor's position relative to the X, Y, and Z axes at all times. The rotor is maintained in its optimal position by controlling the amount of electric currents that flows through the bearings. The motor contains a rotor that rotates at high speed as an integrated system. The rotating speed is variable via inverter control, which optimizes the speed according to inlet conditions. The rotor supported by the magnetic bearings has an impeller attached to the shaft end directly.

02 MW Power

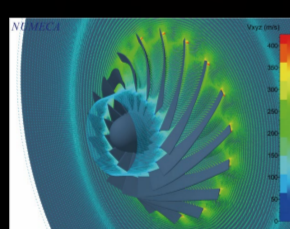
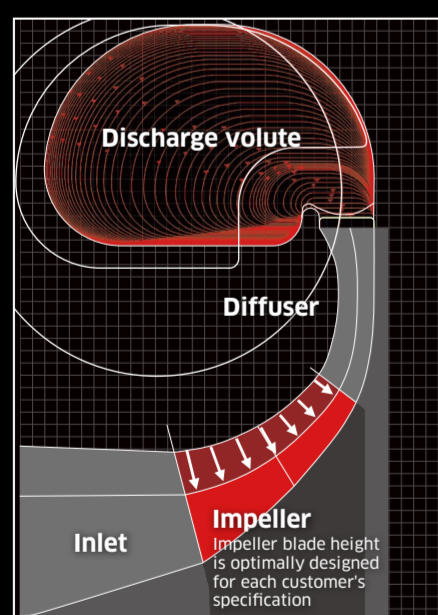
Development for large sized MAG Turbo with Kawasaki Heavy Industries electronic control technology. We have developed accurate levitating control system for large capacity blower and heavy rotor.

MAG Turbo™ Flow Range



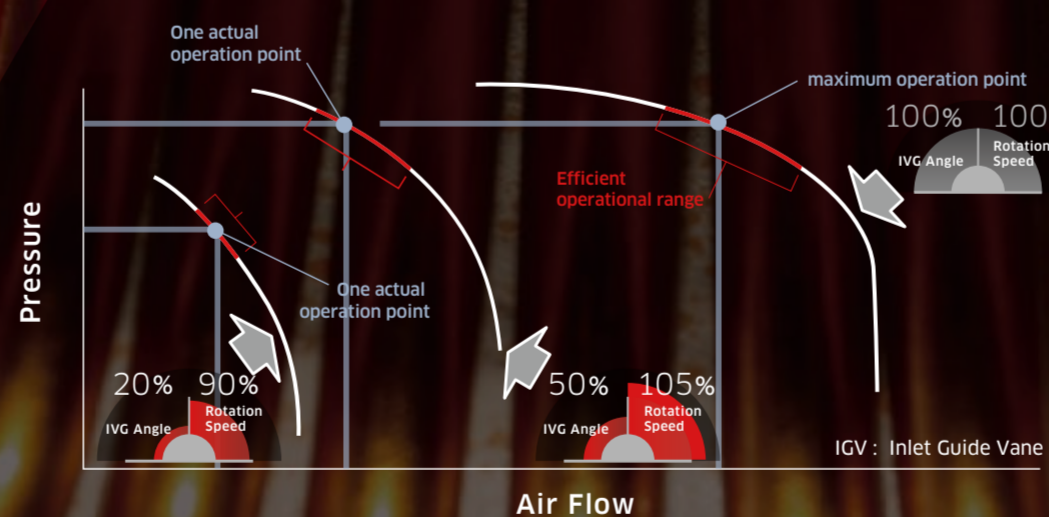
Sm³/min (suction condition) @ 20 degC, 1 atm, 65 %RH
scfm (suction condition) @ 68 degF, 14.7 psi, 36 %RH

The custom-made impeller for customer's specification

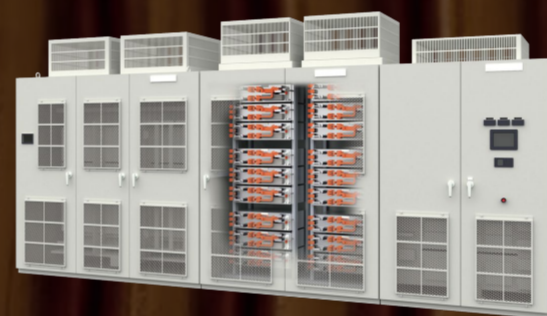


Anytime Highly Efficient Operation

Efficient operational range of each performance curve can be controlled.



High Speed Drive System with Medium Voltage



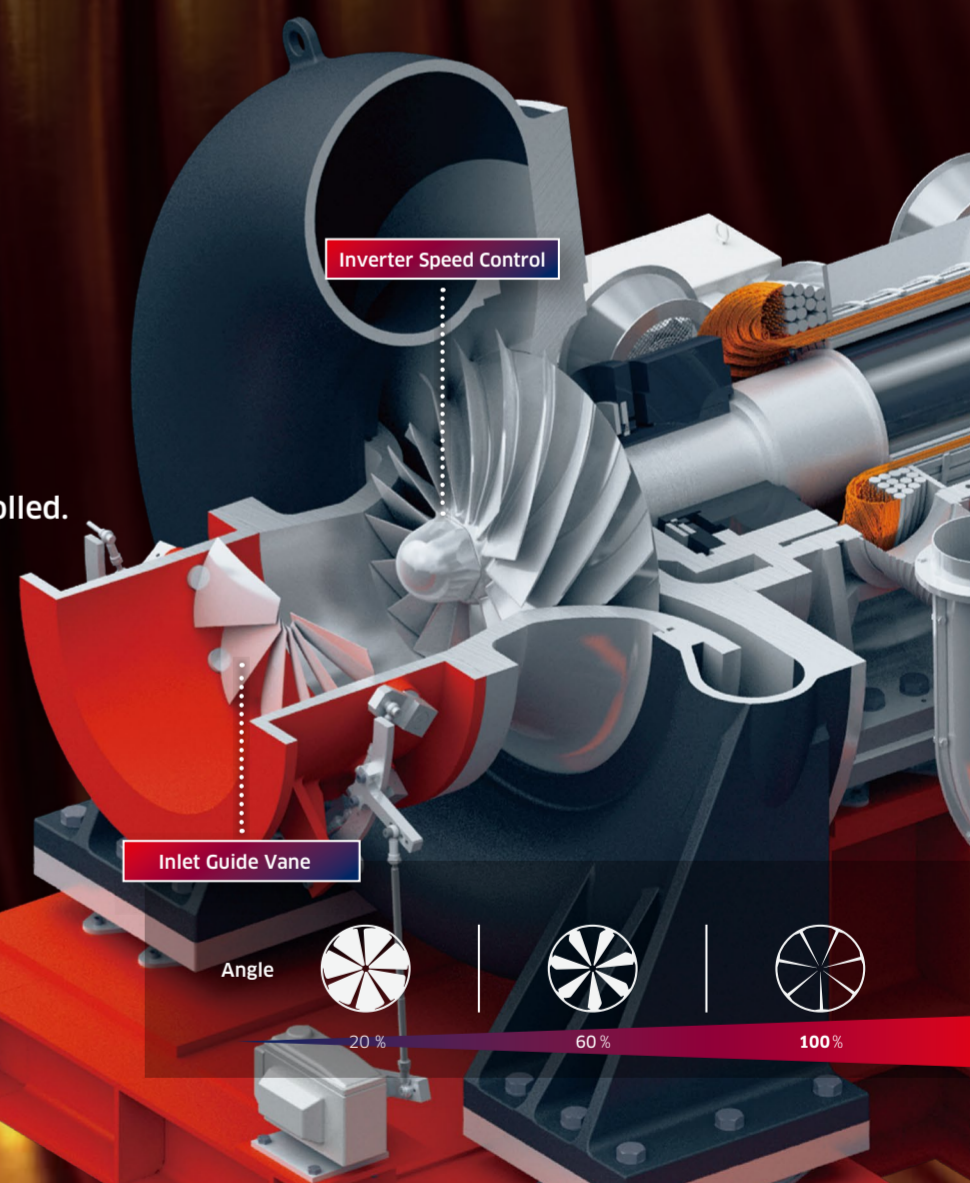
Frequency Inverter with Multi-level PWM Control

The rotation speed is variable via high spec inverter

Multi-level PWM control enables our inverter to receive 6.6 kV-10 kV, and to output high frequency to the high speed motor. Inverter efficiency achieves approx. 97%, including input transformer's efficiency.

Dual Flow Control

MAG Turbo enables stable and efficient air supply in order to follow up daily variable water inflow load such as air flow capacity, air pressure and water quality by Dual Flow Control: Inlet Guide Vane (IGV) Control and Variable Rotor Speed Control. Dual Flow Control attains high partial load efficiency and wide range of flow capacity, achieving high performance by shifting performance curve to the most efficient point in response to daily variable required water inflow load.



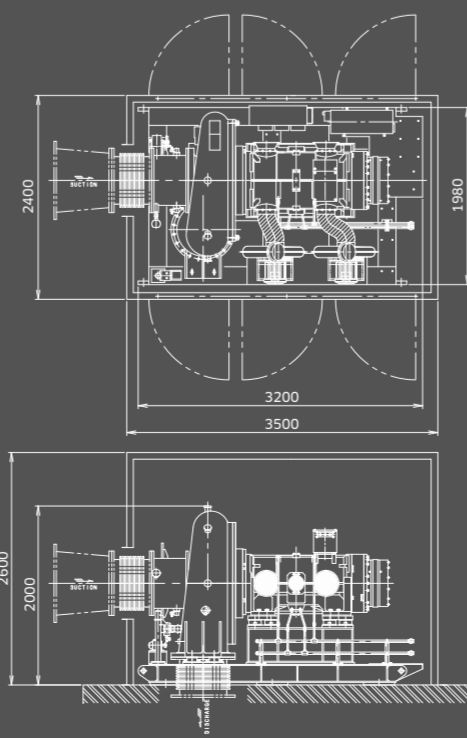
Detail

Product Features

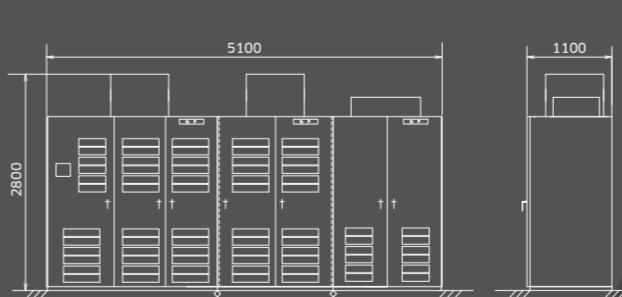
General Data	
Blower Type	High speed motor driven single stage turbo blower with magnetic bearing
Installation Condition	Indoor, Non-hazardous area 0 ~ 40 °C (32 ~ 104 °F)
Gas	Air
Allowable inlet temp.	-40 ~ 40 °C (-40 ~ 104 °F)
Environment Category	C2 (IEC 60721-3-3)
Motor Output Range	Up to 1,300 kW (1,743 hp)
Variable Speed Range	Up to 11,500 rpm
Bearings	Active magnetic bearing (AMB)
Auxiliary Equipment	Closed-loop water cooling unit * with air-cooled radiator UPS for AMB controller
Certificate	EMC tested (IEC-61800-3)

MAG Turbo Technical Data	
Performance Data	
Flow Capacity Range	300 to 920 m³/min (10,600 to 32,500 ft³/min) at 20 °C (68 °F), 101.3 kPa (14.7 psi), 65 %RH
Flow Regulation Range	45 ~ 100 % of design flow
Flow Regulation Control	Variable speed control and Inlet guide vane
Design Pressure Range	50 to 100 kPaG (7.25 ~ 14.5 psiG)
Electric Power Supply	
Main Power Supply	6,000 / 6,600 V (50 Hz or 60 Hz) (Customizable: 4,600 ~ 10,000 V)
Auxiliary Power Supply	230 V (Customizable: 200 ~ 440 V)

* Following systems for motor jacket cooling are available
a) Water cooling *1 (primary) × Air cooling (secondary)
b) Water cooling *1 (primary) × Water cooling *2 (secondary)
*1 Mixture of Coolant & Purified water
*2 Specified industrial water
Motor direct cooling by industrial water is not available



Blower Unit



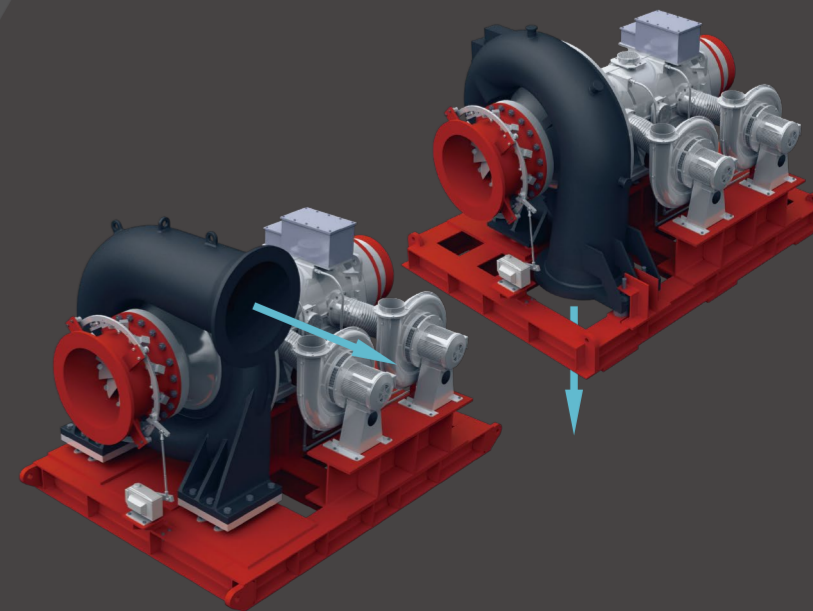
Variable Frequency Drive Control Panel

Outline Dimension (mm) and Weight (kg)

Blower Unit	
Blower Unit	W3,100 × D2,000 × H2,100, 7,000 kg
Enclosure	W3,500 × D2,400 × H2,600, 2,100 kg
Variable Frequency Drive	
2,000 H (High Load Model)	W5,800 × D1,200 × H2,800, 8,000 kg
1,000 H (Low Load Model)	W5,100 × D1,100 × H2,800, 7,000 kg

Blower package can be packed in High cube container.

Inlet and discharge nozzles can be freely customized to any directions.



MAG Turbo is a trademark of Kawasaki Heavy Industries.

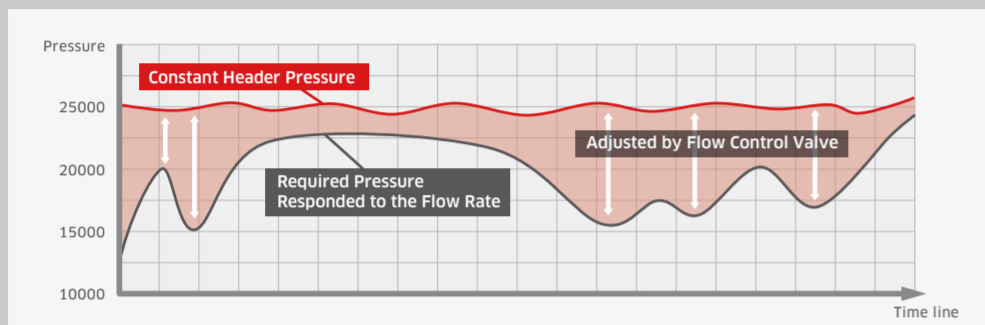
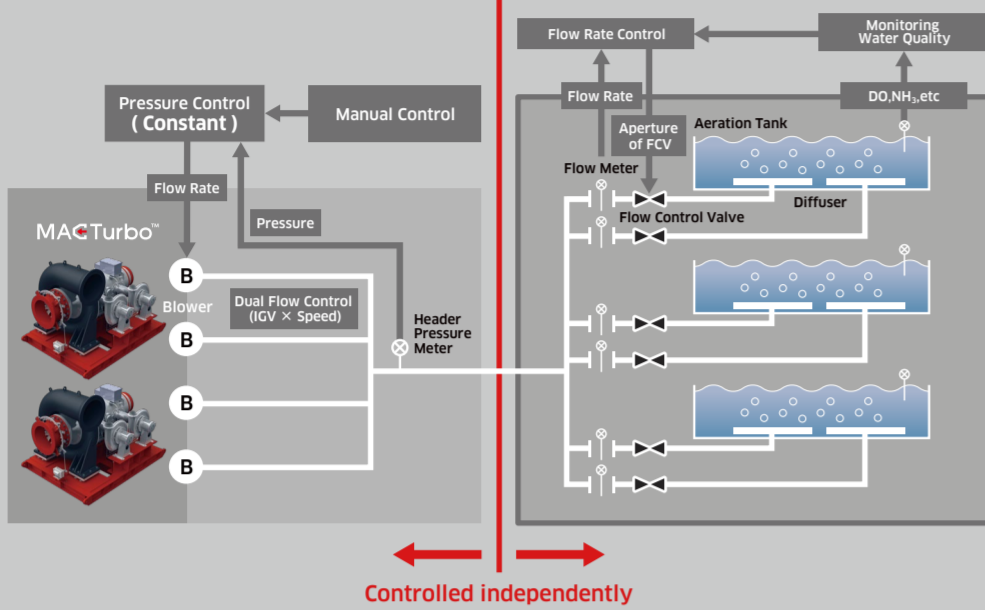
Saving Energy by Pressure Control

Active Variable Pressure Control System

Variable Pressure Control by Kawasaki MCP (Master Control Panel) revolutionizes aeration system

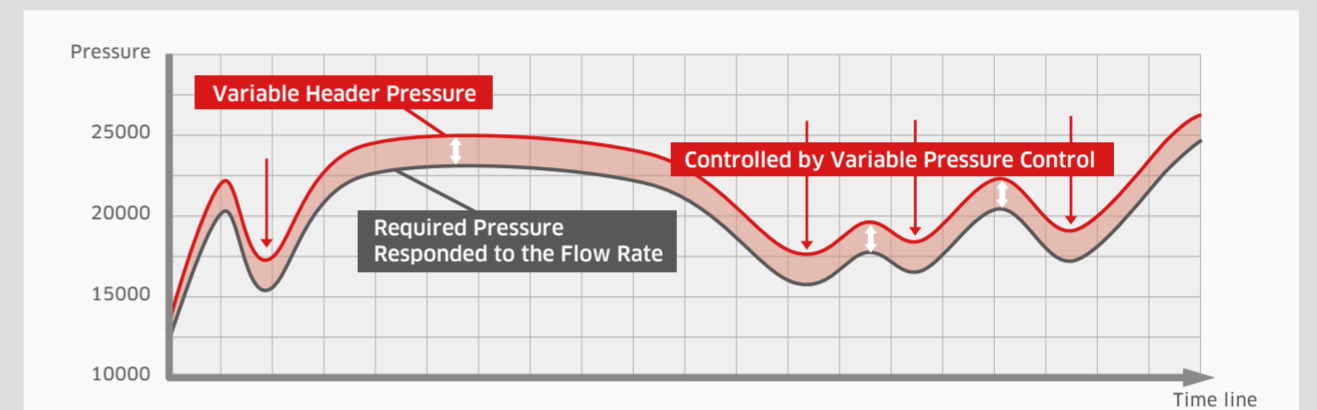
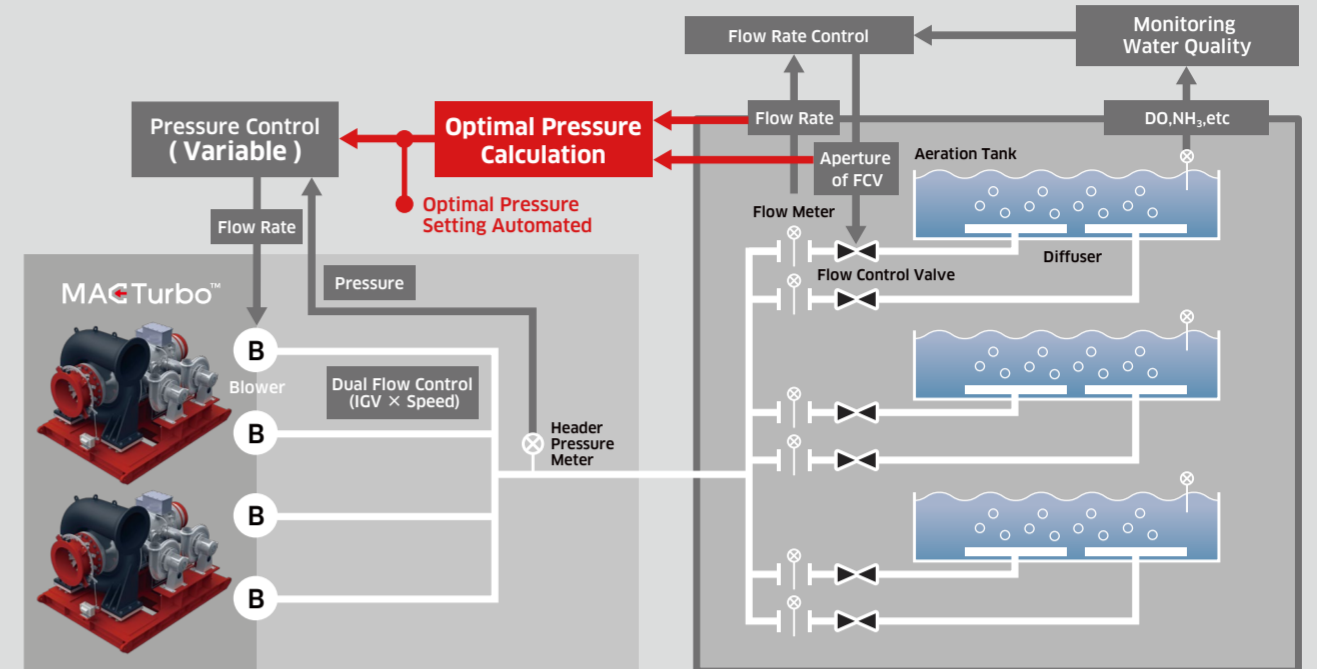
$$\text{Flow Rate} \times \text{Pressure} \div \text{Power Consumption}$$

Constant Pressure Control Conventional Operation



Constant header pressure control results in enormous unnecessary pressure loss at FCV

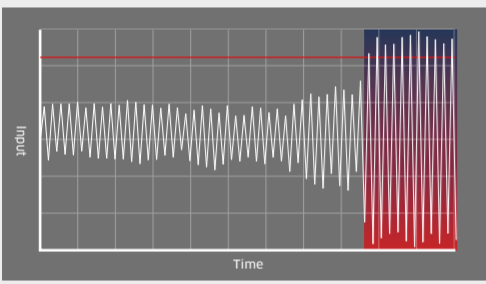
Variable Pressure Control ECO-Operation



Variable pressure control optimizes the required header pressure

Kawasaki Remote Service

Kawasaki Remote Service includes performance check, fault analysis, and commissioning support.



Remote Performance Check and Fault Analysis

Kawasaki Remote Service enables remotely to check current operation and performance. Using this remote service, we suggest proper maintenance schedules according to operational data gathered. When breakdown happens, the system compares operational log data immediately after a breakdown with a trouble analyzing matrix based on past breakdowns and other factors. The system can automatically identify malfunctioning parts and the causes of the problem.



Remote Commissioning Support

The remote commissioning support function uses smartglasses to remotely view on-site conditions and extract data for the support of commissioning. It helps to give technical advices to on-site workers based on operational, and to adjust operational programs to fit actual conditions for secured commissioning.

MAG Turbo × Kawasaki Gas Turbine × Energy & Environment Management System

1 MAG Turbo (Aeration Blower)



MAG turbo is a high-speed motor driven single stage turbo blower with an active magnetic bearing, using high-speed permanent magnetic motor and frequency inverters with Multi-level PWM control. MAG Turbo can handle large capacity, whose range was impossible to cover with levitating blowers until Kawasaki developed. This development enables to match cogeneration system.

2 Gas Turbine Cogeneration System



CHP (Combined Heat and Power) / Cogeneration is one type of distributed power. With this approach, energy security can be boosted by installing generators in the area where both heat and power are consumed, and more efficiently using energy by utilizing the heat produced during generation. Our products provide various types of CHP solutions to suit the customer's specific needs for a combination of electrical and thermal energy.

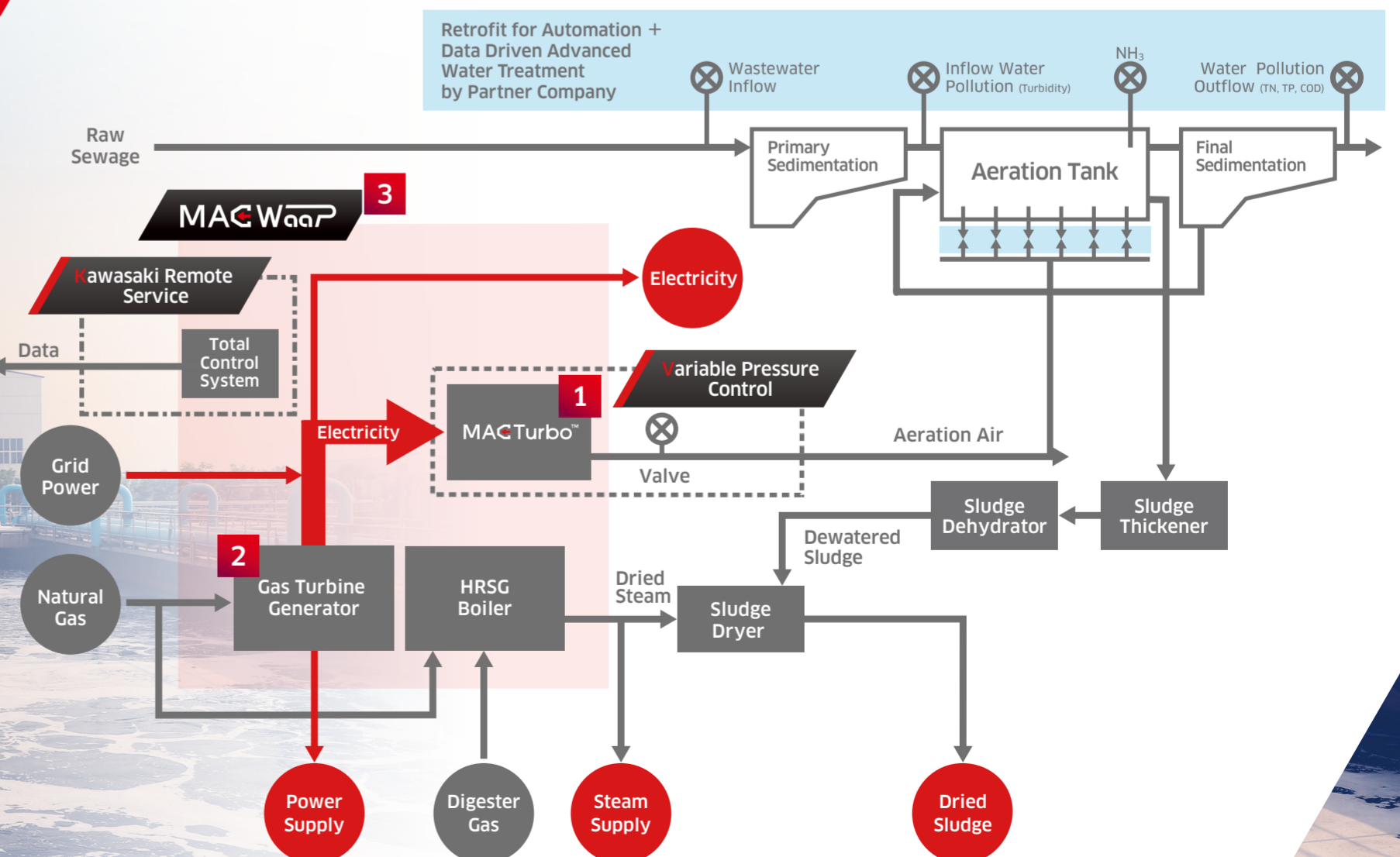
3 MAG WaaP EMS (Energy Management System)

MAG WaaP Energy Management System, MAG WaaP EMS, manages each component such as blowers and generators as the integrated control systems. It constantly monitors current process conditions, and optimizes outputs to components, these outputs which are calculated with parameters of performance, cost, and environmental data.

MAG WaaP

MAG Turbo Wastewater treatment plant as a Power hub

We revolutionize the concept of WasteWater Treatment Plants, WWTPs, by transforming them to Power hubs from just energy consuming infrastructures. This concept is named WaaP, Wastewater treatment plant as a Power hub, which enables WWTPs to not only operate as self-sustainable plants, but also supply their surrounding area with surplus energies. To advance the new world, we propose our solution, MAG WaaP, which consists of MAG Turbo, Gas Turbine Cogeneration System, and Energy Management System.



MAG WaaP
EMS

Gas
Turbine

MAG
Turbo