

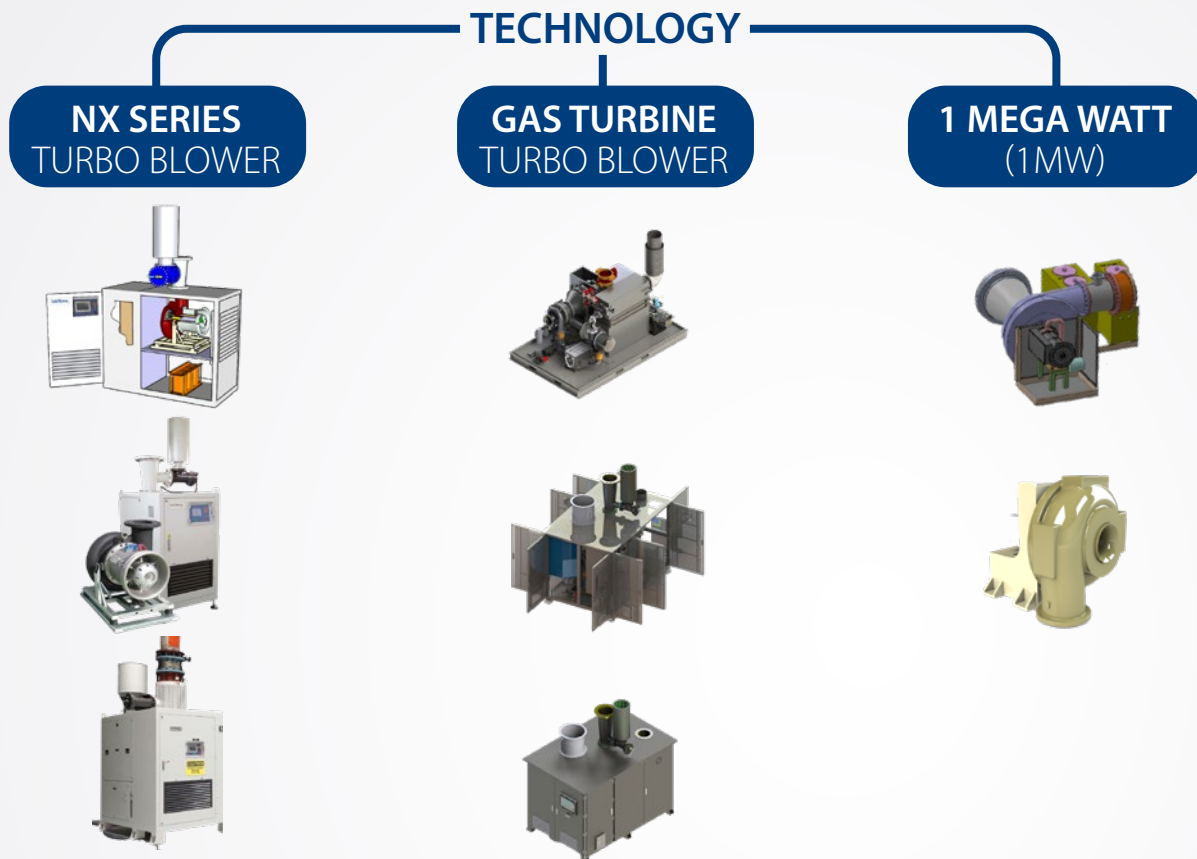
HIGH-EFFICIENCY TURBO BLOWER

Clean
Compact
Energy-efficient
Affordable Technology



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www.apg-neuros.com

APG-NEUROS PRODUCT LINE



TECHNOLOGY

- High-Efficiency Centrifugal/Axial Flow Compressor Design
- Radial/Axial Flow Turbine Design
- Oil-Free Bump Foil Air Bearings and Active Magnetic Bearing
- High-Efficiency Permanent Magnet Synchronous Motor Design and Manufacturing
- High-Speed Flexible Coupling
- High-Precision Flow Measurement/Venturi/Orifice/Nozzle/Belmouth
- Low-Emission Diesel/Natural Gas Combustor
- Air Cycle Turbo Refrigeration
- Precision Electronic Control (Flow Control/Velocity Control)
- Gas Ejector (Jet Pump)
- Design and Integration of Complete Aeration Control System



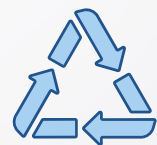
NX SERIES TURBO BLOWER

BENEFITS

- Energy savings up to 40% compared to conventional technologies
- Maintenance cost savings with minimum maintenance
- Up to 50% smaller footprint and significant installation cost savings with compact blower package design
- Product is recognized by energy efficiency and accreditation agencies for energy credit and rebates
- Low noise and vibration for better working environment
- Lower emissions, higher power savings, oil-free, no disposable items, uses washable and re-usable air filters
- Lower greenhouse gas (GHG) emissions and lower carbon footprint



SAVINGS

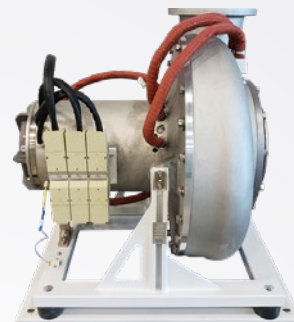


ENVIRONMENT



TYPICAL APPLICATIONS

- Aeration for municipal and industrial wastewater treatment
- Industrial applications such as pneumatic conveying of powders and materials in cement, wood chips, coal, limestone and plastic industries
- Pneumatic conveying and blending for petrochemical industry
- Oxidization in power plant desulfurization process
- Cooling air for power plant generators
- Combustion air in power generation plants
- Air knife application in steel industry
- Atomization



NON S CORE
OF NX SERIES TURBO BLOWER



S CORE
OF NX SERIES TURBO BLOWER



FEATURES AND BENEFITS

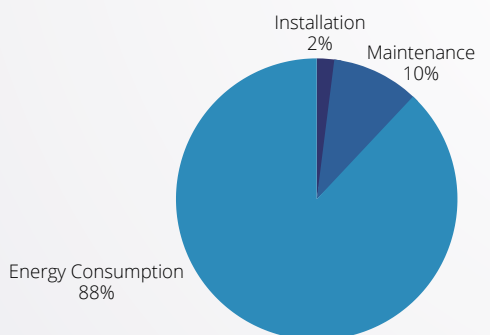
■ INTRODUCTION

The APG-Neuros Turbo Blower is a “plug-and-play” product that offers high efficiency in a compact size unit made possible by combining the latest design technologies of Aeronautic Compressor, Bump Foil Air Bearing, Active Magnetic Bearing (AMB) and High Speed Permanent Magnet Synchronous Motors (PMSM) with built-in Variable Speed Drive and Programmable Logic Controller. APG-Neuros Turbo Blowers can attain flow rates of up to 43,000 SCFM and a discharge pressure up to 15 PSIG with motor horsepower range from 30 to 1500 HP. APG-Neuros also offers Dual Core models from NX60D (60 HP) to NX1000D (1000 HP) that combine dual cores within the same enclosure unit, achieving greater a flow range between 250 and 23,000 SCFM, while maintaining a small footprint compare to conventional technologies with similar flow rates.

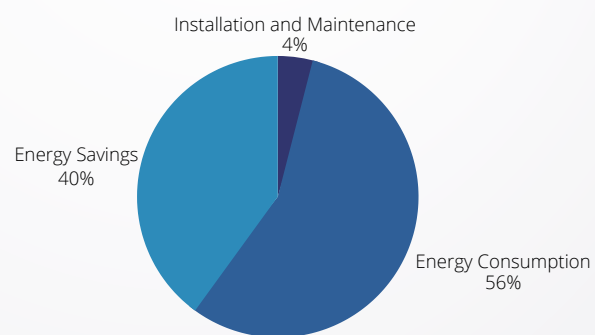
1

ENERGY EFFICIENCY & OPERATING COST SAVINGS

- The APG-Neuros Turbo Blower is the most efficient in its class through the use of advanced technologies in aerodynamics, high-speed permanent magnet motors and bump foil air bearings along with intelligent use of drive & control technologies.
- Operating cost savings of up to 40% are possible when compared to conventional blower, drive and control technologies.



PD BLOWER OPERATING COST



NX SERIES OPERATING COST

2

LOW NOISE AND VIBRATION

- APG-Neuros' clever enclosure design effectively controls sound propagation and reduces noise levels below 80 dB(A).
- Non-contact bearing having low vibration eliminates need for heavy foundations.

3

SMALL FOOTPRINT: RELIABLE PRODUCT & EASY TO INSTALL

- Extensive field experience has proved the product's reliability and durability in hot environments through monitoring of vibration, air bearing endurance and impeller spin tests.
- Blower packages are significantly more compact than conventional technologies and simpler to install. 25 to 50% savings in footprint compared to conventional blowers.
- Outdoor installation package is available.

4

LOW MAINTENANCE

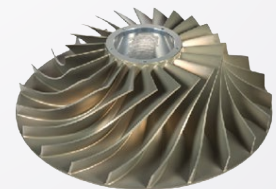
- Regular maintenance involves cleaning or replacing of inlet air filter only, as required.
- Monitoring operating parameters from user-friendly touchscreen control panel.



5

HIGH EFFICIENCY IMPELLER DESIGN AND MANUFACTURING

- Ten years of experience designing impellers in aerospace industry.
- Designed with in-house software and 3-D computational fluid dynamics simulation.
- 5-Axis machining of solid forging provides higher integrity, tighter manufacturing tolerances, larger diameters and lower speeds.
- Production technology permits design of impellers with both axial and radial compression.



6

OIL-FREE, NON-CONTACT AIR BEARING

- No lubricating oil or associated maintenance.
- No contact, less noise and vibration from rotor during operation.
- 25,000 cycle start-stop endurance test, equivalent to more than twenty years' lifetime in typical operation.
- Patent (Air Foil Bearing): No. 10-0604132.



7

PERMANENT MAGNET SYNCHRONOUS MOTOR (PMSM)

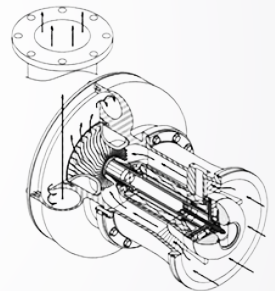
- High efficiency and power factor.
- Maintains efficiency and power factor in partial load conditions.
- Driven by sinusoidal PWM algorithm which lowers motor heat rejection and minimizes cooling requirements.
- High-precision motor speed control.



8

COOLING

- Blower core and motor cooled with blower inlet air.
- VFD and control systems cooled by inlet air.
- No heat rejection to blower room.
- Self-enclosed glycol cooling system in NX200-NX1000D standard models for higher performance and durability.
- No external water supply required.
- No auxiliary exhaust systems. (No additional power consumption).



9

ALTERNATE ARRANGEMENT OPTION

- The specially tuned controls and variable frequency drive integrated in our package can be built into a separate cabinet and located up to 600 feet away from mechanical section for high ambient temperature or toxic gas environments.

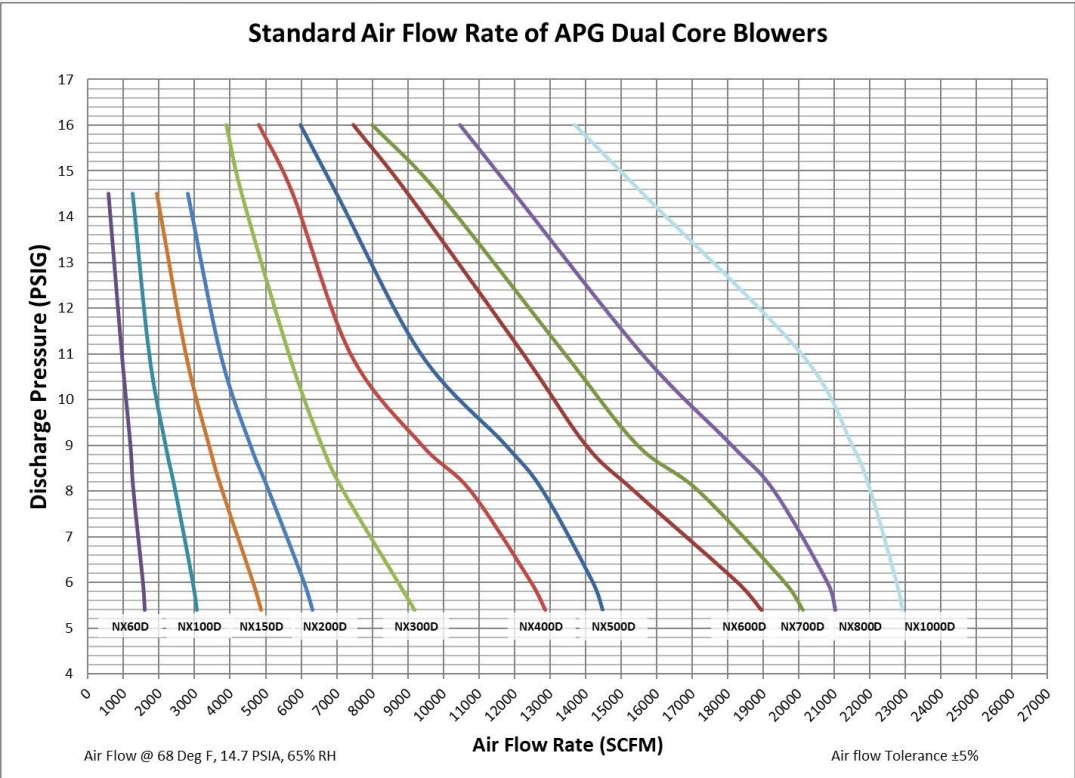
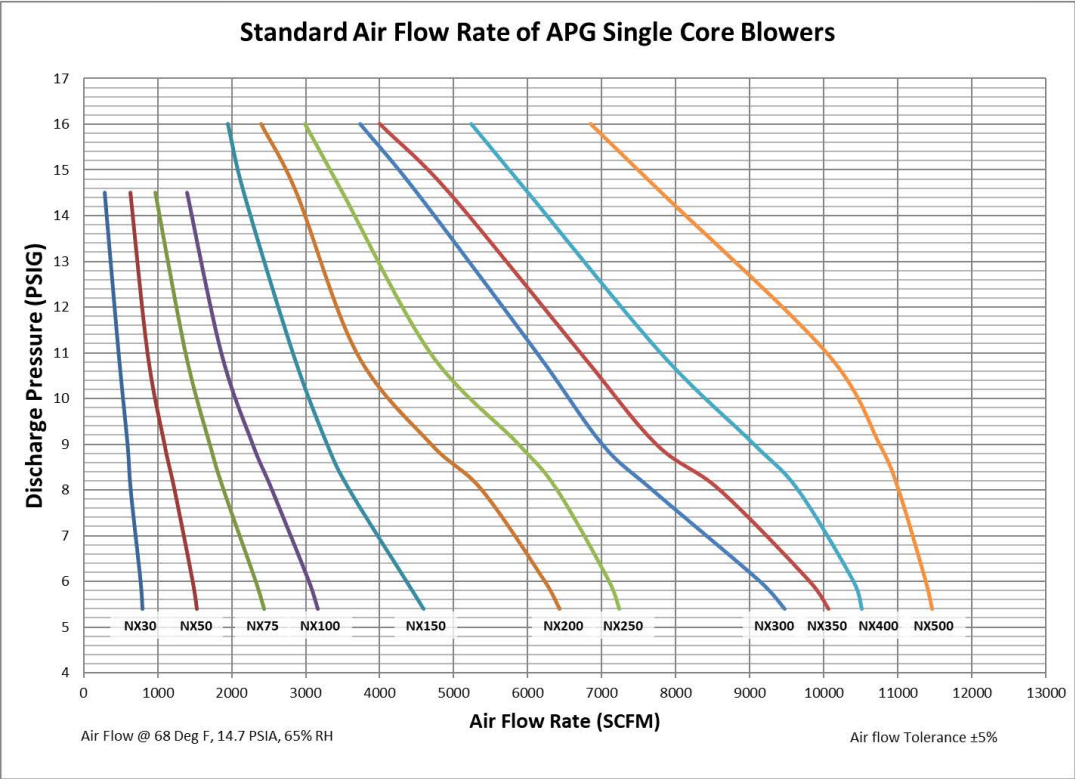
10

CONTROL, MONITORING, DIAGNOSTICS

- Integrated programmable logic controller (PLC) makes it possible to run the blower at constant pressure, flow or DO control mode.
- PLC options: Allen Bradley, Mitsubishi, Siemens, GE and Modicon available to suit customer's control system.
- Communication protocols include Ethernet, Profibus, Modbus and hard wiring.
- User-friendly control, monitoring and diagnostics on touch-screen panel to view all process parameters and blower conditions.



PERFORMANCE CURVES



NX SERIES

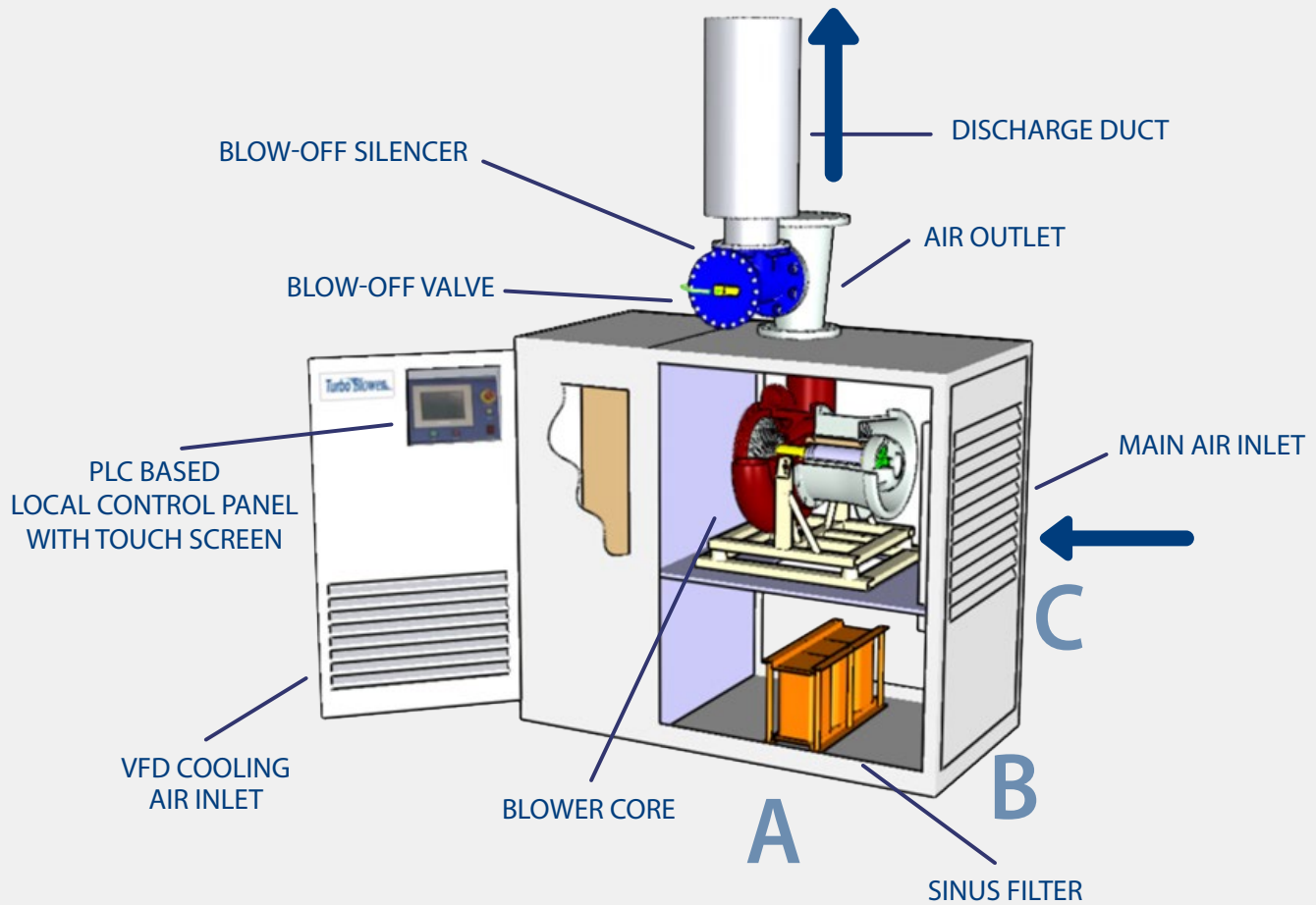
TECHNICAL DATA

Design pressure range	4 - 16 psig (0.276-1.103 bar)
Design suction flow rate	250 - 23,000 SCFM
Reference design condition	68F, 14.7 psia, 65% RH
Flow turndown ratio	Single Core: 100-45% Dual Cores: 100-25%
Operating speed range	14,000 – 58,000 rpm
Motor horsepower rating	30 – 1,000 HP
Casing design pressure	284 psig (19.6 bar) – Scroll
Casing design temperature	300 °C (572°F) – Scroll
Vibration	< 0.039 in/sec
Inlet configuration	Louver or Flange
Impeller	Single Stage/Centrifugal
Air seals	Labyrinth
Discharge configuration	Vertical/Horizontal ANSI 150 lb Flange
Lubrication	Not required
Bearings	Bump Foil Air Bearing or Active Magnetic Bearing
Motor	Permanent Magnet Synchronous Motor type
Motor starter	Inverter type – Variable Frequency Drive
Input power	380-480V, 3 Phase, 50/60 Hz (Optional Medium Voltage)
Noise level	80 to 82 dB(A)
Control panel	PLC & Touch Screen (Allen Bradley, Mitsubishi, Siemens, Modicon)
Control algorithm	Auto Speed/Flow/Pressure Mode/DO
Network communication	Ethernet IP/Modbus/Profibus/Hard Wiring
Enclosure cooling	Filtered air cooled
Motor/VFD cooling	Air (30-150 HP)/Glycol fully enclosed (200-1000D)

CONSTRUCTION MATERIALS

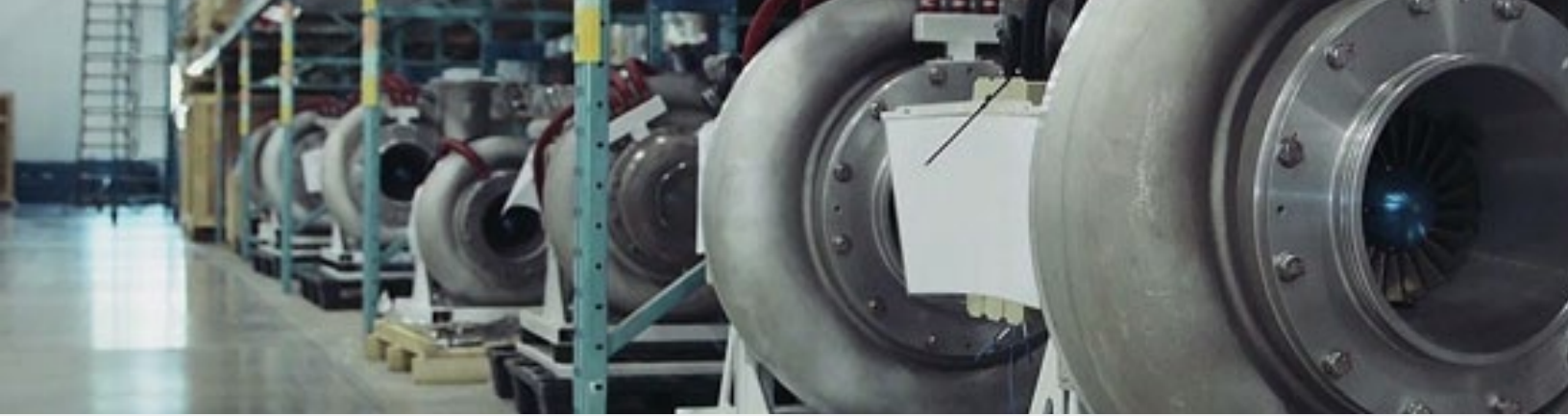
Blower casing	Aluminum Alloy
Impeller	Forged aluminum alloy (AI 7075)
Diffuser vanes	Vaneless Type
Shaft	Titanium Alloy (Ti-6Al-04V)
Air bearing	Nickel-base Super Alloy (X-750)
Motor case	ASTM 356.0 (Al Alloy)
Electrical enclosure	Powder coated steel
Blower enclosure	Powder coated steel with sound dampening material
Blower enclosure skid	Structural steel construction with fork lift access ports
Enclosure finish	Powder coating

STANDARD BLOWER PACKAGE



PACKAGE DIMENSIONS WILL BE AVAILABLE UPON REQUEST





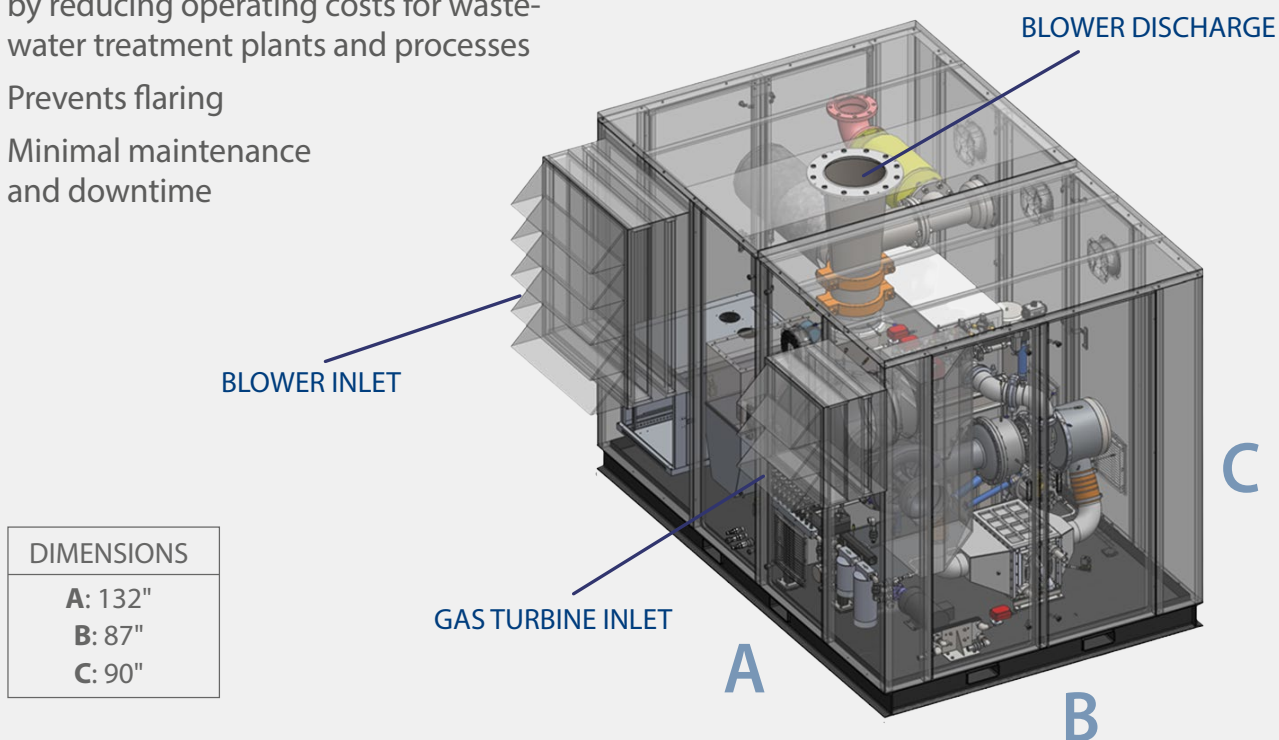
GAS TURBINE TURBO BLOWER

BENEFITS

- Provides power grid independence for wastewater treatment plants
- Can operate with natural gas or biogas
- Decreases operating costs by more than 40% for natural gas and over 80% for biogas compared to old products
- Reduces power consumption
- Reduces environmental footprint
- Lowers greenhouse gas emissions by reducing operating costs for wastewater treatment plants and processes
- Prevents flaring
- Minimal maintenance and downtime

FEATURES

- Fuel-flexible Combustor
- Remote Monitoring
- Modular Design
- High Shaft Thermal Efficiency
- Integrated Inlet Air Filters



GAS TURBINE

PERFORMANCE CHARACTERISTICS

AMBIENT CONDITIONS

Blower installation location	Indoor/Outdoor
Working fluid	Air
Ambient pressure	14.7 PSIA
Elevation	Sea Level to 8,000 feet
Ambient temperature	-25 to 118°F

DESIGN CONDITIONS

Inlet temperature	68°F
Relative humidity	65%
Pressure range	4 - 15 PSIG
Flow rate per blower range	2,300 - 9,000 SCFM

TURBO BLOWER SUPPLIED PERFORMANCE

Rated discharge pressure	7/10.7/14 PSIG
Shaft Power @ design condition per blower	230 kW/380 BHP
Maximum air flow @ duty discharge pressure/blower	9,000/6,400/4,700 SCFM
Minimum air flow @ duty discharge pressure/blower	4,200/2,300/2,300 SCFM
Turndown from maximum flow to minimum flow	>50%
Discharge temperature @ design condition	150/190/220°F
Maximum discharge pressure	17 PSIG

Note : approximate data - subject to change

GAS TURBINE PERFORMANCE

Natural Gas Flow @ design condition per blower	35 SCFM
Natural Gas heat input @ design condition per blower (LHV)	1.9 MBtu/hr
Digester Gas Flow @ design condition per blower	59 SCFM
Natural Gas heat input @ design condition per blower (LHV)	1.9 MBtu/hr
Fuel inlet pressure	134 PSIG

Note : approximate data - subject to change

LHV: lower heating value, Natural Gas LHV=47.5 MJ/kg. Digester Gas (CH₄ - 62%vol) LHV=18.9 MJ/kg

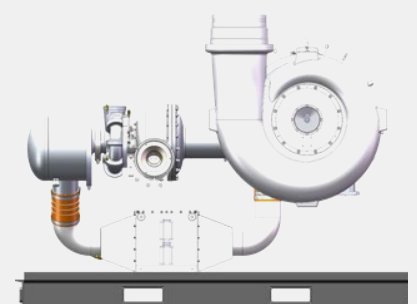
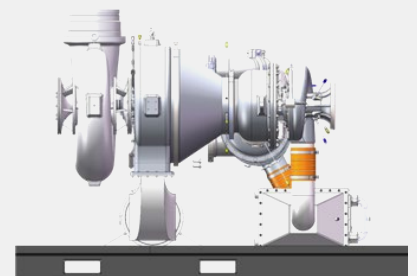
NOTES

Maximum noise level @ 3 feet	80 dBA
Dimensions per blower (length/width/height)	125/80/90 inches
Weight per blower	7,500 lbs
Gas turbine blower entry type	louwered or flanged

Note : approximate data - subject to change

OPERATING CONDITIONS & FUELS

Relative humidity	0 - 98% (non condensing)
Operating temperature	-22°F - 113°F
Atmospheric pressure range	12.3 - 14.8 PSIA
Blower pressures	7 PSIG, 10.7 PSIG, 14 PSIG
Fuel type	Natural gas or Treated biogas
Maximum allowed H ₂ S content	5000 ppmv (dry gas basis)
Maximum allowed Siloxane	5 ppbv



GAS TURBINE

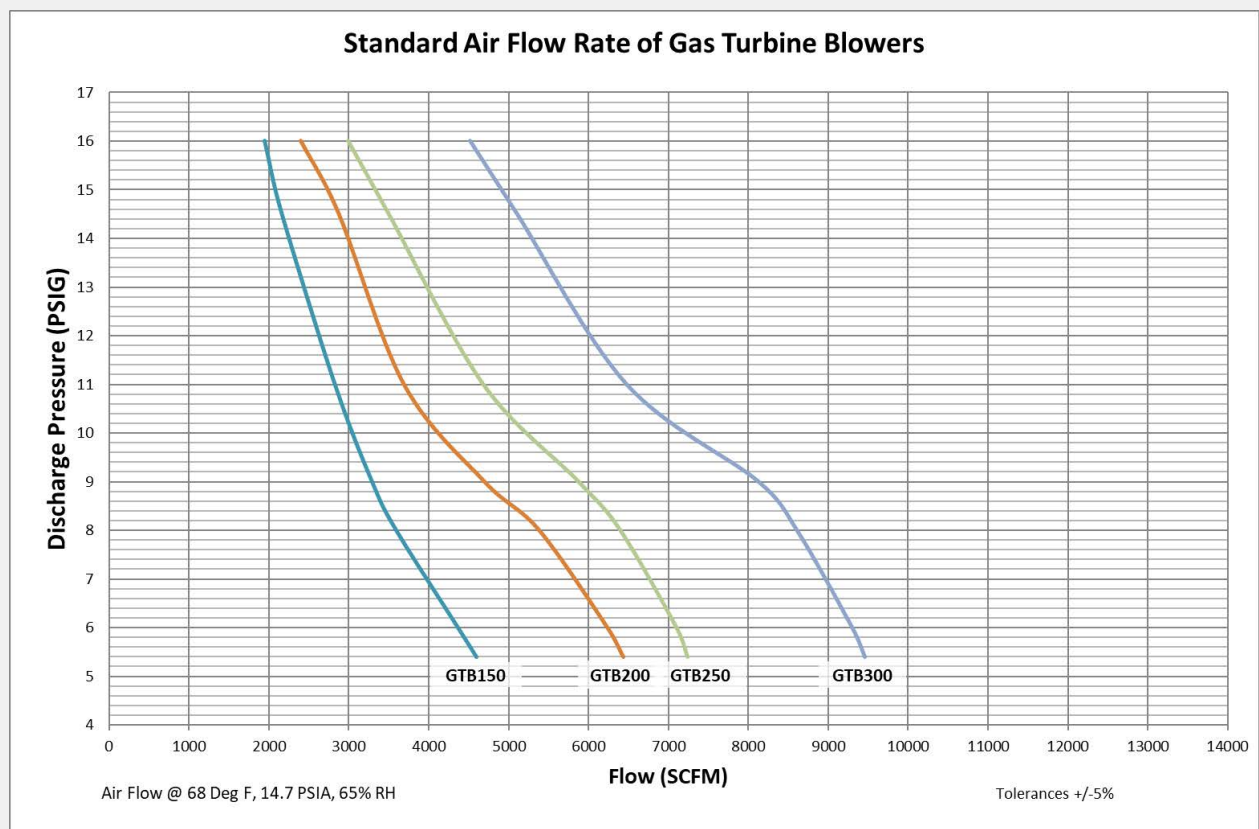
EXHAUST CHARACTERISTICS

NOx emission at 15% O2 at full power	<1.7 ppmv for natural gas and treated biogas
CO emission at 15% O2 at full power	<4.1 ppmv for natural gas and treated biogas
Exhaust emissions standards	BACT/LAER & CARB DG, California
Exhaust gas flow at full power	1742 SCFM
Exhaust gas temperature at full power	400°F
Heat rejection from inter-cooler	120 kW
Oil cooler & gas booster combined heat rejection	20 kW
Heat rejection from exhaust gas	200 kW

Note: approximate data - subject to change

When combined heat and power recovery system included

PERFORMANCE CURVE OF THE GAS TURBINE

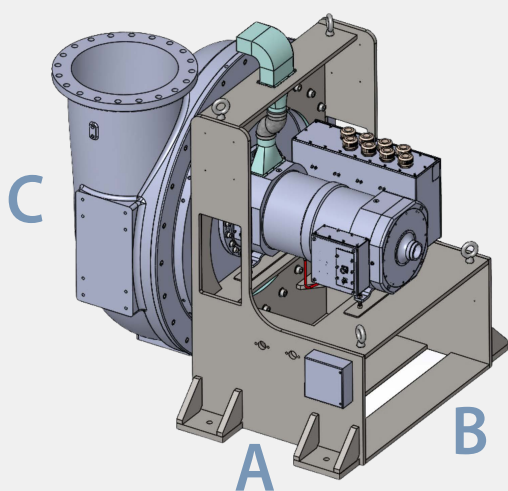




1MW BLOWER

PRODUCT BENEFITS

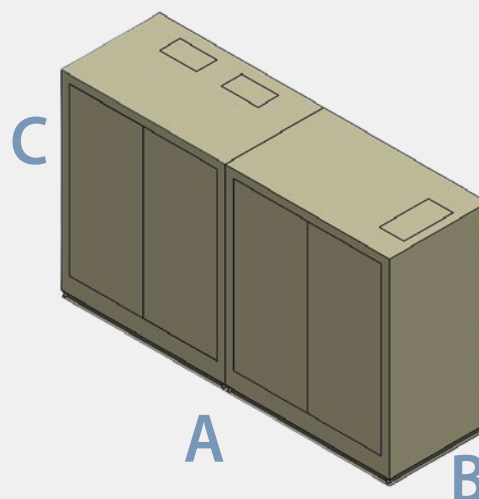
- Smaller footprint - APGN 1MW blower replaces large geared single stage blower
- Can operate at variable speeds
- Includes an oil-free active magnetic bearing
- Includes a high-efficiency single stage impeller
- High total wire efficiency
- Integrated closed-loop cooling system
- High-speed permanent magnet synchronous motor
- Built-in programmable logic controller
- Engineered for a wide range of projects



1MW TURBO BLOWER
APGN 1MW

DIMENSIONS

A: 66"
B: 68"
C: 80"



MEDIUM VOLTAGE POWER & VFD
APGN 1MW

DIMENSIONS

A: 160"
B: 48"
C: 96"

1MW BLOWER

PERFORMANCE CHARACTERISTICS

AMBIENT CONDITIONS

Application	Aeration
Blower installation location	Indoor
Working fluid	Air
Ambient pressure	10 - 14.7 PSIA

DESIGN CONDITIONS

Relative humidity	65%
Duty discharge pressure	6 - 16 PSIG
Flow	10,500 - 43,000 SCFM

PERFORMANCE ESTIMATED - PTC10

Motor Shaft Power	1,100 kW/1470 HP
Maximum Air flow @ duty discharge pressure/blower	24,500 - 43,000 SCFM
Minimum Air flow @ duty discharge pressure/blower	10,500 - 21,000 SCFM
Turndown from maximum flow to minimum flow	> 50%
Discharge temperature range	140 - 240°F
Rise to surge	> 3 PSIG

Note : approximate data - subject to change

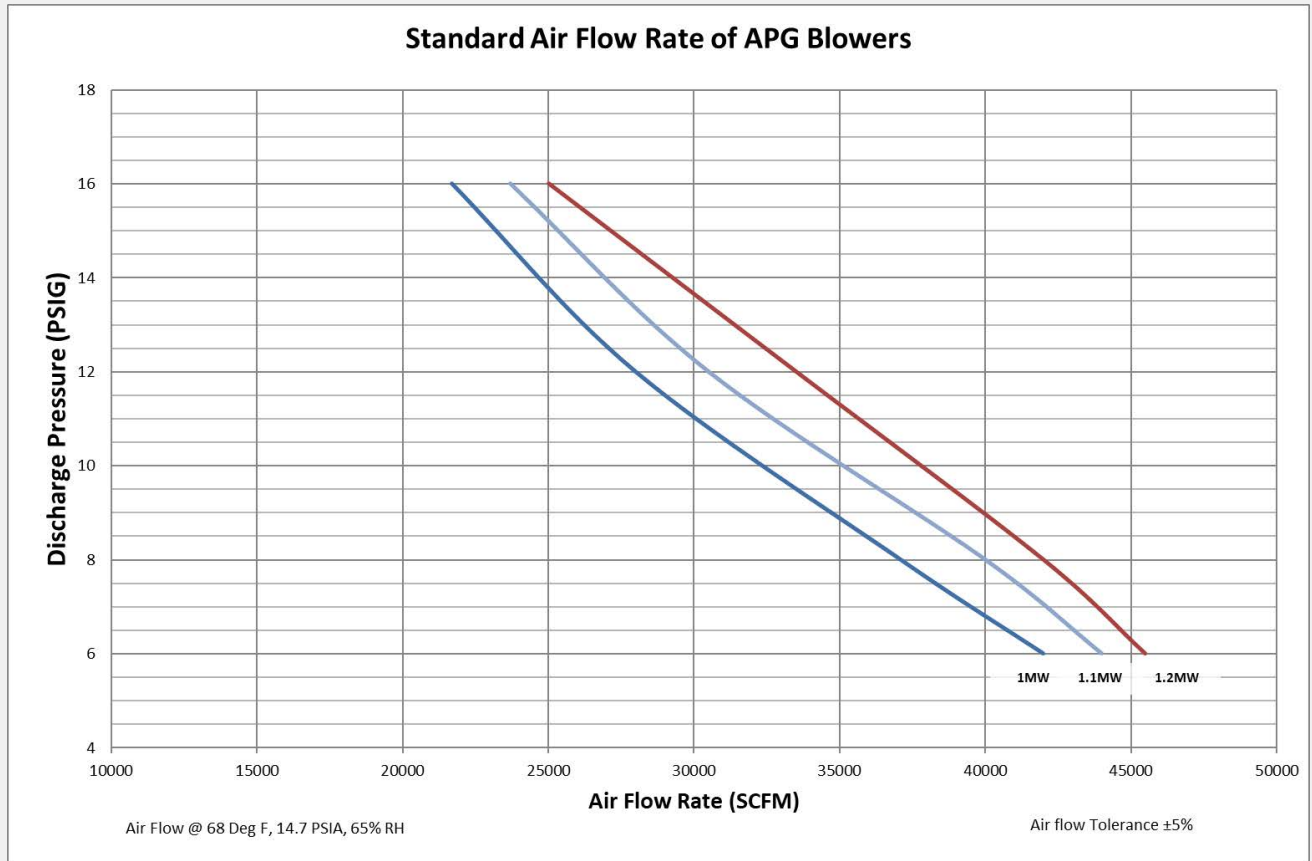
NOTES

Maximum noise level @ 5 feet	82 dBA
Dimensions per blower (length/width/height)	77/68/80 inches
Weight per unit	18,000 lbs
Heat rejection	66 kW
Input medium voltage/phase/frequency	4160/3/60 V/Phase/Hz
Full load Amperage (Medium voltage)	1 x 183 AMPS
Input low voltage/phase/frequency	480/3/60 V/Phase/Hz
Full load Amperage (Low voltage)	2 x 770 AMPS
Blower Inlet type	Flanged
Inlet flange size	24 inches
Discharge flange size	24 inches

Note : approximate data - subject to change

1MW BLOWER

PERFORMANCE CURVES



FOOTPRINT
APGN 1MW BLOWER REPLACES
LARGE GEARED SINGLE STAGE BLOWER





Brightwater Multiple Blower Installation

CUSTOMER TESTIMONIALS

- "We have had a very successful operational results and very impressive feedbacks from clients regarding the APG-Neuros High Speed Turbo Blowers. They were very happy with the operation of the blowers – I would certainly recommend this type of blower."

- Khalil Kairouz, Ph.D., P.E., LEED AP, Carollo Engineers, Moreno Valley, CA

Model #: NX300-C060 (4)

Since June 2009 & January 2010

- "Everyone is very happy with the performance of your unit. The smoothness and quietness of the unit astounds everyone that sees it. We have informed our leadership of the unit so the word can be spread to other locations for potential future projects."

- Michael Born, Neenah Nonwovens Facility, Kimberly-Clark Corp.

Model #: Dual Core NX500-C100

Since October 2010

- "These blowers are far superior to anything else that we have used. Most importantly, we have worked closely with APG-Neuros to ensure the installation meets, in fact exceeds, our expectations."

- Allen K. Lucas, Utilities Engineer, Ravensview, Kingston, ON

Model #: NX150-C100 (4) & NX150-C070 (2)

Since October 2007 & December 2008 Respectively

- "APG Neuros' Turbo Blowers are the greatest thing that came long in a long time. It's a great and easy to use blower that runs flawlessly and requires minimal maintenance. We dealt with a lot of competitors' blowers and this one is by far the best product out there"

- Jonathan Lane, Wastewater Operator, Benicia, CA

Model #: NX75-C80 (3)

Since November, 2008

- "I want to tell you that I was very impressed with the facility in Plattsburgh, and that you have assembled an excellent staff at that location. Overall I thought the PTC-10 and functional tests of the blowers went very well. I'm looking forward to having them installed and running in the plant, and expect to have many years of trouble free aeration. Thank you very much for all your assistance over the last few weeks."

- Harry P. Butland, Marlborough West Plant

Model #: NX75-C060 (2) & NX100-C060 (2)

Since November 2010

Company Overview

APGN, Inc.

Doing business as APG-Neuros

Business: Manufacturing, Sales, Service, Design

Products: Turbo machinery and wastewater control systems

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