



Product Summary

- Gas Turbine Engine Designed and Manufactured to Aerospace Standards
- Three Phase Electric Generator with Adjustable Rotor Excitation
- Engine Operations Instrumented for Temperature and Pressure Measurement
- Gas Turbine Auto Start and Auto Shutdown System
- National Instruments™ Data Acquisition System Configured With LabVIEW™
- Shipped Ready to Operate

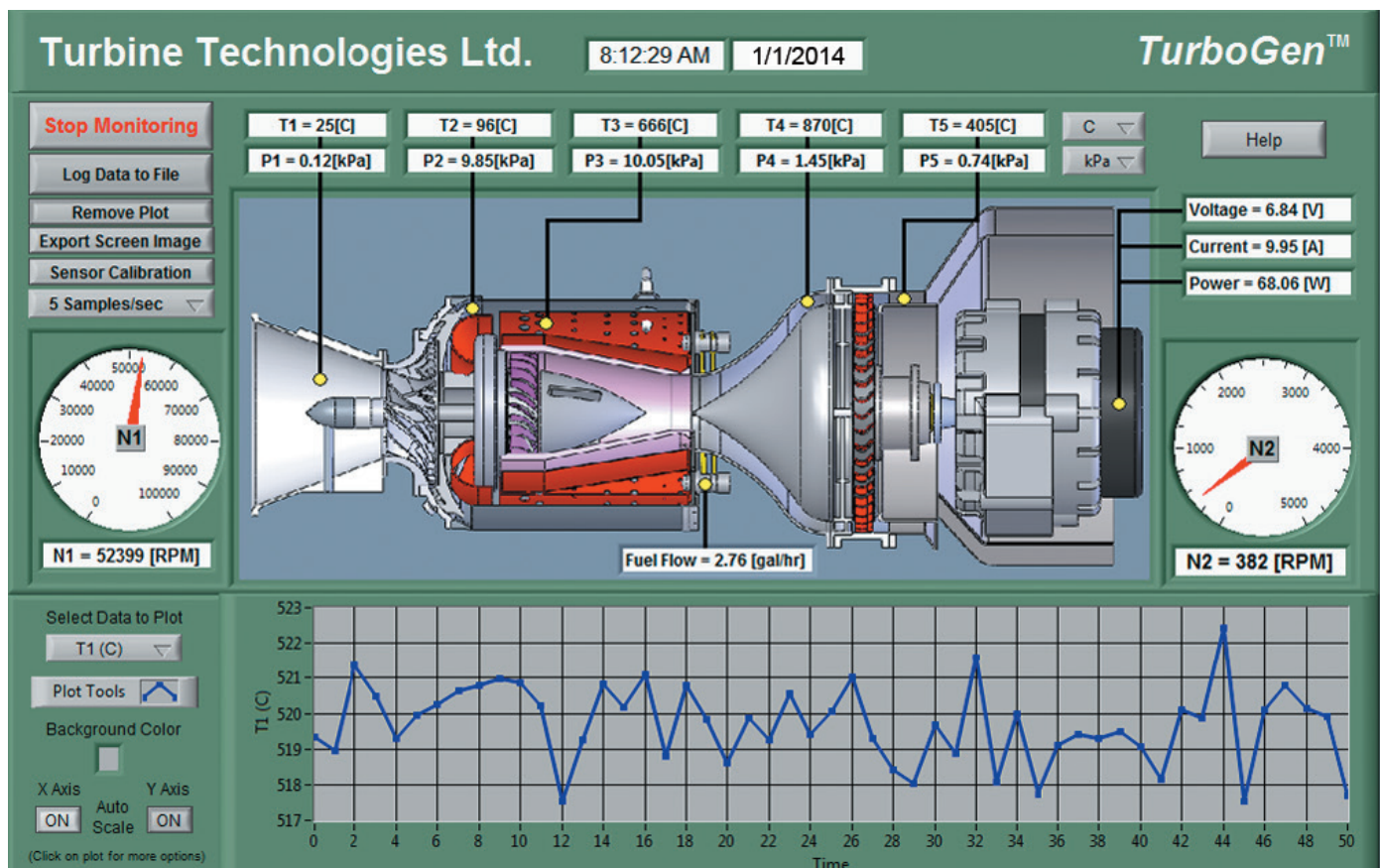
Students will learn: Fundamentals of electrical power generation using a two-spool turboshaft engine. The system's free power turbine design allows studies involving variable loading of the onboard 3-phase generator.

Description

The compact jet engine gasifier core is representative of all major gas turbine types and entails an axial flow turbine stage, reverse flow annular combustor and radial flow compressor stage. This allows textbook analysis of the air equivalent Brayton Cycle.

The electric power generation section features a thrust driven free power turbine directly coupled to a three phase liquid-cooled electric alternator. The generation circuit is base-loaded with an integrated fixed-value resistance module. An adjustable-rate excitation current controller allows wide-range alternator loading through the complete speed range of the generation system. The electrical power system can produce up to 14.4 volts, with a maximum rated power output of 2.1 kW. A jet thrust driven exhaust fan effectively expels heat and exhaust from the engine/generator compartment.

Fifteen sensors report directly to an installed National Instruments™ DAQ platform. LabVIEW™ displays that data on the provided laptop computer. Data is configurable for output via numerous export options which include .txt and .csv file types. A comprehensive Operator's Manual details all aspects of system operation. Safety instructions address all operating conditions.



Data Acquisition System Included

Details

Dimensions

TurboGen™: 40 x 42 x 62 inches (102 x 107 x 158 cm)
As Shipped: 48 x 54 x 70 inches (122 x 137 x 178 cm)

Weight

TurboGen™: 640 lbs (290 kg)
As Shipped: 715 lbs (324 kg)

Operating Requirements

Master Switch, Keyed - Secured control of equipment usage
Green Start Button, Push - Initiates Engine Start, Multiple Functions
Red Stop Button, Push - Initiates Engine Shutdown, Multiple Functions
T-Handled Power Lever - Controls Engine RPM
Integral LCD Display - Real Time System Status

Operating Requirements

Typical Laboratory Setting Power
Power: 120V single-phase 60Hz
(220V 50Hz upon request)

Operating Requirements

Design Maximum Thrust: 40 lbf (178 N)
Approved Fuels: Jet A, A-1, B; JP-4, 5, 8; Kerosene, Diesel, Fuel Oil #1 or #2
Exhaust Gas Temperature: 1328 °F (720 °C)
Ignition System: Air gap, high voltage capacitor discharge type hermetically sealed ignition coil and igniter plug
Compressor Type: Single Stage Centrifugal (Radial Outflow)
Turbine Type: Single Stage Axial Flow
Design Maximum RPM: 87,000
Engine Mount: Pivot bearing support allowing direct thrust to be obtained by a load cell
Engine Compression Ratio: 3.4
Engine Pressure Ratio: 30.0
Specific Fuel Consumption: 1.2
Approved Oils: MIL-PRF-23699F-STD

Generator Limits

Regulated Volts: 13.1 Volts
Maximum Current: 194 Amps
Maximum Power: 2541 Watts
Maximum RPM: 10,000

Gasifier Limits

Mass Flow: 1.1 lbs/s (0.5 kg/s)
Turbine Inlet Temp: 1328 F (720 °C)

Instrumentation

Digital: High Speed Data Acquisition System

Data Acquisition Software with Configurable Data Output

Windows® Computer for On-Screen Data Display
Single Cable National Instruments™ USB to PC Connection

Sensors (Preinstalled and Calibrated)

- Compressor Inlet & Exit Temperature and Pressure
- Turbine Inlet Temperature and Pressure
- Turbine Exit / Power Turbine Inlet Temperature and Pressure
- Power Turbine Exit Pressure and Temperature
- Fuel Flow
- Gasifier & Generator Rotational Speed (RPM)
- Generator Current & Power

Digital and Analog: As provided on the Operator Panel

- Digital Turbine Inlet Temperature (TIT)
- Digital Exhaust Gas Temperature (EGT)
- Digital Engine Rotational Speed (RPM)
- Analog Oil Pressure
- Analog Engine Pressure
- Analog Air Start Pressure



**Variable 3-Phase Generator
and Resistive Load**

Auto Start system enables a single green push button for engine start. System parameters are monitored during engine operation and out-of-limit conditions results in the safe shutdown of the engine. A LCD panel alerts the operator to any system faults. Total run time and cycle counts are digitally recorded. A single red push button safely shuts the system down.



Single Push Button Start

Experimental Opportunities

Experimental and research opportunities include scientific, engineering, thermodynamic and environmental investigations. With a wide array of sensors, experiments relating to secondary education physics and chemistry through graduate level fuels and combustion research are readily performed using an electrical generation performance benchmark. Standard courses in engineering thermodynamics, fluid mechanics and three-phase electrical power generation benefit from textbook direct examples conducted and measured in real time. The limitations of theoretical models and the variability of experimental technique can be experienced first-hand. In addition to academics, the TurboGen™ is ideally suited for general gas turbine electrical generation familiarization, jet engine driven electrical power generation operational training for diverse power generation professionals, as well as alternative fuels, emissions and scaled-jet engine power generation testing and research.

Purchase Specifications

- A complete micro turbine genset to consist of an engine/generator combination designed and manufactured specifically for engineering education.
- Engine must utilize an axial flow turbine stage, a reverse flow annular combustor, a free power turbine stage and a centrifugal compressor stage.
- System to include a USB connected laptop computer interfaced with National Instruments™ hardware and customized LabVIEW™ VI displays.
- System sensor package to entail 15 data reading points to include compressor inlet temperature and pressure, compressor stage exit temperature and pressure, turbine inlet temperature and pressure, power turbine inlet temperature and pressure, power turbine exit temperature and pressure, fuel flow, engine core RPM, power turbine RPM, generator current and power.
- Engine to be of current manufacture and consisting of all new components.
- Traceable and verifiable material to be used throughout engine.
- All elements comprising the system to be contained in a rigid steel chassis mounted on rolling castors.
- Complete system not to require permanent facility modification or additions.
- Complete genset to be mounted behind transparent protective shields allowing clear view during operation.
- Fully automatic engine start and operational health monitoring system provided with LCD status readout and cumulative run-time cycle count.
- Representative engine components and technical data optionally available for teaching use and training aids.
- Manufacturer to guarantee spares availability and provide technical support services for core engine and power system.



TurboGen™ has a free two year warranty on the entire system

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All TurboGen™ specifications are subject to change