# RankineCycler™

## Steam Turbine Power System

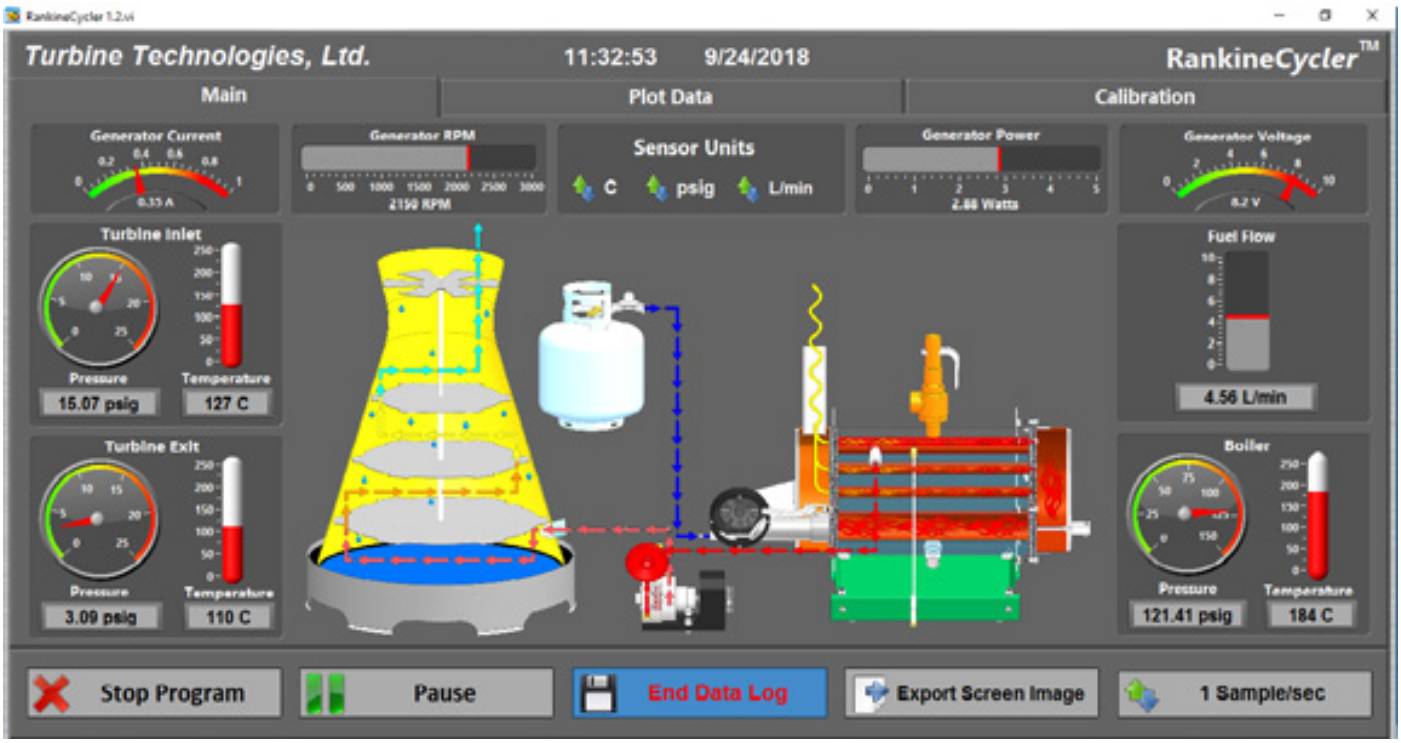

## Product Summary

- A Complete Steam Turbine Power System
- National Instruments™ Data Acquisition System Configured With LabVIEW™
- Modern Steam Turbine Design
- Complete Thermodynamic Teaching Solution
- Shipped Ready to Operate

## Students will learn: Fundamentals of steam turbine power generation and become familiar with the associated thermodynamic principles and efficiencies of the Rankine power cycle.

### *Description*

All components are mounted on a portable chassis allowing the entire system to be conveniently moved for use and storage. Visible metal surfaces are stainless steel or anodized aluminum. The steel chassis is powder coated for durability. A USB connected National Instruments™ data acquisition system is fully integrated and pre-calibrated. Sensors measure system parameters for a LabVIEW™ virtual instrument on the provided laptop computer. This system displays real time data and has interactive operator control. Data can be recorded for playback or analysis. Data acquisition software is user configurable and all source code is open. A sealed sight glass indicates boiler water level. A steam powered axial flow turbine drives a generator producing alternating current and rectified direct current at the output. The steam exhausts into a condenser tower where it returns to its original liquid state. A graduated beaker and boiler fill-drain system is provided for easy volume measurement. A comprehensive Operator's Manual details all aspects of system operation.




***Data Acquisition System Included***

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## *Details*

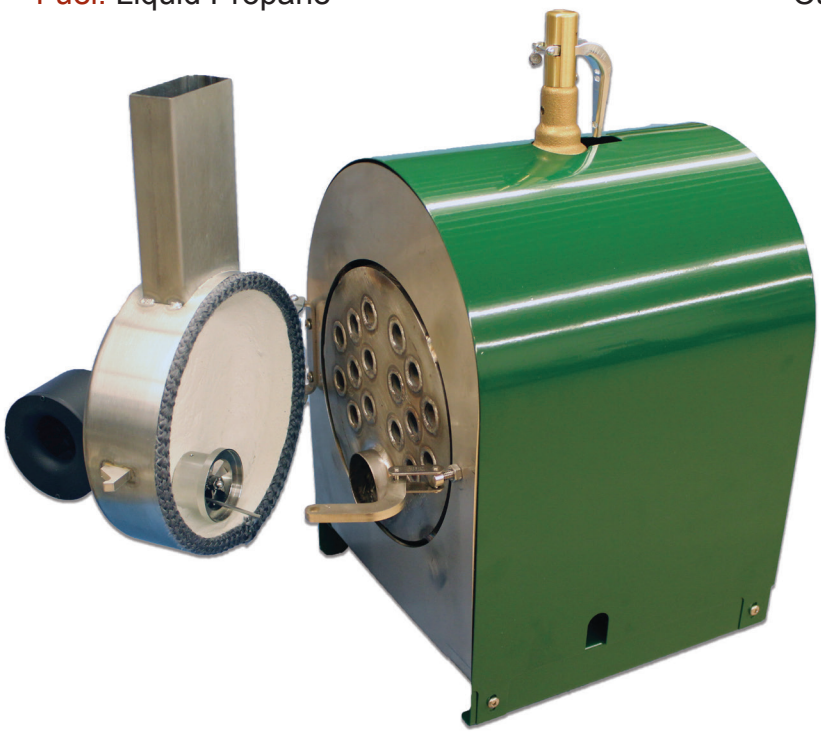
### Dimensions
RankineCycler™: 58L x 30W 48H inches
(148L x 77W x 122H cm)
As Shipped: 67L x 33H x 52H inches
(170L x 84W x 132H cm)

### Weight
RankineCycler™: 260 lbs (118kg)
As Shipped: 350 lbs (158kg)

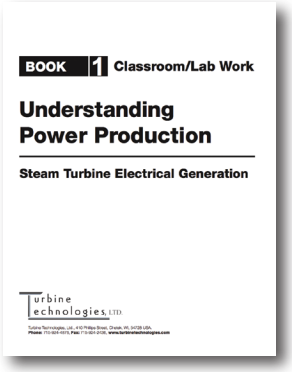
### Operating Conditions / Limitations
Boiler:
Pressure 120 psi (827 kPa)
Temperature 482 F (250 C)
Generator:
15.0 Volts, 1.0 Amp
Total Load of 15.0 Watts

### Operating Requirements
Power: 120V single-phase 50/60Hz
(220V upon request)
Fuel: Liquid Propane

### Instrumentation
Data Acquisition System:
National Instruments™ Hardware
20 Analog IN - 16 Digital IN/OUT
4 Frequency/Pulse IN Channels
Windows® Laptop Computer
(all Software Loaded and Pre-calibrated)
Single Cable USB to PC Connection
Custom Virtual Instrument Display
(Configurable Data Output)
Installed Data Acquisition Sensors and Channels:
Boiler Temperature and Pressure
Turbine Inlet Temperature and Pressure
Turbine Exit Temperature and Pressure
Turbine RPM
Fuel Flow
Generator Voltage Output & Current Draw
Analog Data:
Boiler Pressure
Generator Voltage
Current Draw



***Full Curriculum Included***



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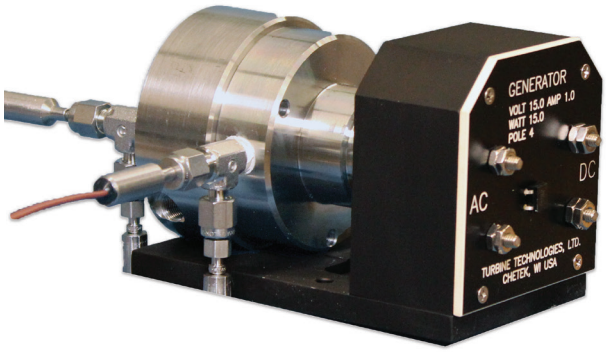
## Experimental Opportunities

Numerous experimental and research opportunities are available and readily conducted with the RankineCycler™ Steam Turbine Power System. Students can learn about basic electric power generation principles. Students can also focus on learning the idealized Rankine Power Cycle and steam-water phase changes. RankineCycler™ can be used to plot many different sets of data. The sensors on the RankineCycler™ system allow students to plot:

- Fuel Flow vs. Time
- Boiler Temperature vs. Time
- Boiler Pressure vs. Time
- Turbine Inlet/Outlet Pressure vs. Time
- Turbine Inlet/Outlet Temperature vs. Time
- Generator DC Amps Output vs. Time
- Generator DC Voltage Output vs. Time
- Turbine RPM vs. Time




***Axial Flow Steam Turbine & AC/DC Generator***

## Purchase Specifications

- A steam electric power plant designed for engineering education.
- Consisting of a fossil-fueled boiler, steam turbine and condenser tower mounted on a rigid, mobile frame.
- Boiler equipped with an over-pressure relief valve, automatic low water level shut-down and manual blow down valve.
- Steam rate adjustable through a steam admission valve, regulating turbine speed and power output.
- Axial flow turbine used to drive an alternating current generator.
- Generator output to be rectified allowing the output of direct current.
- To be supplied with a USB based digital data acquisition system complete with computer and user configurable data acquisition software capable of measuring and recording analog, digital and frequency signals.
- Equipped with calibrated transducers and thermocouples capable of measuring boiler temperature and pressure, turbine inlet and exit temperature and pressure, turbine RPM, fuel flow rate and generator load, voltage and current.
- All metal surfaces to be stainless steel, anodized or powder coated to promote durability and wear resistance.
- Provided with a comprehensive Operator's Manual with design, operation and construction information.
- Provided with summary operating checklists for all operating conditions.
- Provided with safety instructions to address all operating conditions.


**RankineCycler™ has a free two year warranty on the entire system**



**All RankineCycler™ specifications are subject to change**