

A complete miniature vapor power system illustrating the concepts of thermodynamic cycles, mass and energy conservation and electrical power generation



Product Summary

- Portable Educational Vapor Power System
- Simple to Operate with Automatic Safety Features Throughout
- Complete Thermodynamic Teaching Solution
- Modern Real World Steam Turbine Design
- *DigiDAQ™* Data Acquisition System Utilizing USB Technology
- User Configurable Real Time Computer Data Display
- Designed to Meet ABET Criterion 4 and 6 Objectives
- Turnkey, Nothing More to Add or Buy - Ready to Start Teaching upon Delivery
- Supplied with a Comprehensive Operator's Manual, Checklists and Safety Instructions
- Industry Leading Warranty with Unsurpassed End-User Support
- Designed and Manufactured in the USA

Description

A complete steam electric power plant designed for engineering education. All major components of a full-scale power plant are replicated for hands on study. Although miniature in scale, students are able to experience the full scope of real world thermodynamic principles.

The purpose built tube-type boiler features multiple safety devices for burner operation and system pressure. 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.

All components are pre-mounted on a portable rolling chassis allowing the entire system to be conveniently moved for use and storage. Metal surfaces are stainless steel, anodized or powder coated for durability and ease of maintenance. Controls are in plain view and intuitively arranged for ease of use.

A USB connected digital data acquisition system is fully integrated and precalibrated. Industrial grade sensors measure system parameters for real time display on the provided laptop computer. Data can be recorded for playback or follow on analysis. Data acquisition software is user configurable without programming.

A graduated beaker and boiler fill-drain system are used to accurately measure the feedwater amount before and after use as well as the total condensate collected.

A comprehensive Operator's Manual details all aspects of system operation. Complete technical and service information allows students, educators and technicians to gain a thorough understanding of system design, operation and construction. Summary operating checklists allow rapid mastery of system operation. Safety instructions address all operating conditions.

Details

Dimensions

RankineCycler™:	58 x 48 x 30 inches (148 x 122 x 77 cm)
As Shipped:	64 x 55 x 33 inches (164 x 141 x 84 cm)

Weight

RankineCycler™:	400 lbs (182kg)
As Shipped:	480 lbs (216kg)

Instrumentation

Digital:	High Speed Data Acquisition System Data Acquisition Software with Configurable Data Output Windows XP Laptop Computer for On-Screen Data Display Single Cable <i>DigiDAQ™</i> USB to PC Connection 20 Analog IN - 16 Digital IN/OUT - 4 Frequency/Pulse IN Sensors (Preinstalled and Calibrated)
	<ul style="list-style-type: none">Boiler Temperature and PressureTurbine Inlet Temperature and PressureTurbine Exit Temperature and PressureTurbine RPMFuel FlowSystem Electrical LoadGenerator Voltage Output & Current Draw

Analog: Boiler Pressure, Generator Voltage Output & Current Draw

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

Typical Laboratory or Classroom Setting	
Power:	120V single-phase 60Hz (220V upon request)
Fuel:	Liquid Petroleum

Experimental Opportunities

- Energy relationships and the First Law of Thermodynamics.
- Cycle analysis and the Second Law of Thermodynamics.
- Control volume analysis.
- Entropy analysis.
- Isentropic analysis and the study of turbine/ nozzle efficiency.
- Heat transfer analysis and the study of boiler efficiency.
- Combustion processes.
- Vapor power system fundamentals.
- Electric power generation.
- Experimental and data acquisition technique.

Purchase Specifications

- A steam electric powerplant designed for engineering education.
- Consisting of a fossil-fueled boiler, steam turbine and condenser tower mounted on a rigid, mobile frame.
- Boiler of a tube-type, flame through design with access doors to view the inner workings.
- 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.
- Generator output capable of delivering 15 Volts at 1 Amp to infinitely adjustable 15 Watt load.
- Unit to include analog boiler pressure gauge, generator voltage and generator current meters.
- 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.
- To be covered by a free two year warranty.