TurboChyll LeeF

TURBOCHYLL® LeeF

Lean energy. Earth friendly.

*... **not** purchasing one **for your** chiller could get expensive!*

TurboChyll LeeF

TURBOCHYLL® LeeF
Lean energy. Earth friendly.

Welcome to **TURBOCHYLL LeeF**, the Aftermarket Industry's only…***True Steam Turbo-Chiller Control System!***

TURBOCHYLL LeeF is not just a "control panel", but a fully integrated system of compressor and turbine actuators, valves, and chiller purification devices. Each consideration intended to take full advantage of today's energy strategy for contemporary Steam Chiller performances and expectations. Through the **TURBOCHYLL LeeF** Computer Process Control (CPU) and Program Card Processor (PCP) we can afford critically engineered and predictable performance specifically for your Steam Turbine Chiller. No guesswork or "one off" programs here. The CPU by design maintains the **TURBOCHYLL's** proven "software program" which fits neatly on a front loaded 2GB Compact Flash Card. In addition to these uniquely powerful control strategies, each PID loop is accessible for local tuning, gain and fine resolution settings without complex laptop consideration, software licensing or special program.

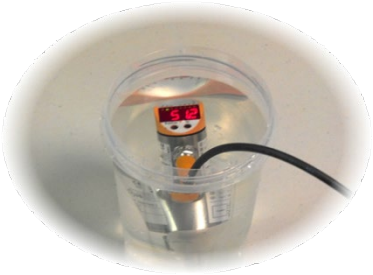
The TURBOCHYLL LeeF Control Cabinet is manufactured with the finest industrial "zero screw" components available and runs exclusively on safe Low Voltage 24VDC with less than 3amps consumption! Here you will find the brilliantly simply Swivel Docking Blocks, CPU and front loaded Program Card Processors as well as the Front Panel Mounted Graphic Controlled Color 15" Human Interface Display. The Field Mounted Sensors are critically immersed into the varying fluid streams and each maintains LED readouts of pressure and temperatures for convenient operator inspection. No longer is there the need for leaky old mechanical gauges.

Final fit of The **TURBOCHYLL LeeF** system includes exclusive retrofitting of old, absent or antiquated step controllers with fine resolution analog actuators, motorized valves, compressor vanes controllers, governors and nozzle management. The **TURBOCHYLL** family of end devices offers field fit, carriages, distill tanks, linkages and the like for a perfect final fit of your **Steam Turbo-Chiller Control System!**

Exclusive TurboJett Turbine Nozzle Control!

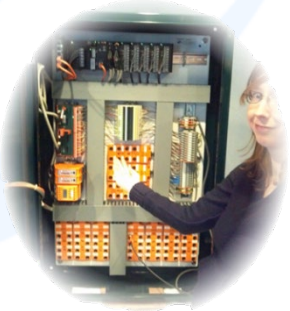
Nozzle Control Final Fit!

Clean Ergonomic, Conduit-less Final Fit!



Near Indestructible IFM Standard "Display Head" P/T Elements!

True Steam Chiller Controller, with "Factory Program Card" Logic!



TurboChyll Control Center – Fastest CPU Available Utilizing IFM Coaxial Docking Station, Safe Exclusive 24 VDC!

Industrial Distillization Systems!

TurboChyll LeeF

TurboChyll
VST - Optimized Compressor Pre-Swirl

IPLV centrifugal compressor efficiency's and capacity control are afforded through the use of the compressor's internal pre-swirl or pre rotation vane devices. While these devices offer favorable capacity reduction and efficiency in upper load regions, such performance unfavorable degrades as turndown continues. At flow regions less than 60% -this desirable and optimized preswirl of the gas begins to transition into a "dampening corruption" of gas flow -the result is a very significant impact to energy.

Fortunately, when chiller loads are reduced- so are ECWT's, now permitting "head relief" to the compressor. When such conditions are advantageously organized, the turbine drive can be "sloped and derated" favorably along an operating curve reducing overall consumption to fractions. This de-rated turbine "complimentary forces" the variable vanes open ultimately maintaining this optimized preswirl feature.

TurboChyll VST/OCP controllers are polling for this information and correcting to the same once every 1.5 seconds! This energy intended performance is not only occurring literally every moment it is graphically and dynamically displayed for the operator's evaluation. No other controller offers such features for the Aftermarket control offerings to the Steam Turbo Chiller sector.

TurboJett
Intelligent Nozzle Optimization Control

Capacity or Nozzle Control Valves are used in turbine steam chests to best or most advantageously introduce steam throughout the Turbine Load Curve.

When loads are reselected, the traditional means to obtain control would require the recognition of such condition by a standby operator, a consideration to all load functions, and a direction of intended load change then followed by a responsive and timely action to a manual valve function by the awaiting operator. Any running interval short of such operating considerations as well as other circumstances will result in wasteful energy.

TurboJett Intelligent Nozzle Optimization provides all of logic for complete and Automatic Capacity Control Valve function. Provided in an easy to use Intelligent Microprocessor Logic Controller, TurboJett includes, Electronic Self limiting Capacity Control Valves fit as standard to all Murray K Series Turbines, Graphic Color Display, Configurable Setpoints and the Engineered Consideration to avoid Turbine Stonewall, Hunt and exclude inefficiently low velocity durations.

HyperChyll
Compound Capacity Control

While affording condenser head relief (reduced entering tower water) and de-rating the driver through the use of Variable Speed Turbine and Optimized Compressor PreSwirl devices are dramatically effective approaches to energy savings-such strategies limit the total available off design capacities. In the case of a multi-chiller installation, compounding the refrigeration effect of one chiller can actually help avoid putting a second chiller on line-while maintaining and solidifying the favorable optimization of compressor preswirl!

HyperChyll Compound Capacity Control logic affords just this. When off design head relief becomes available at anytime, or to any extent our proven TurboChyll VST-OCP Logic quickly and efficiently derates the turbine capacity introducing the highly efficient preswirl effect desired for energy savings. However should the building demand ever increase by more than a single

TurboChyll LeeF

Degree Fahrenheit (leaving fluid) -HyperChyll Compound Capacity Control will activate into the control system. Essentially- an "incremental capacity rerating" of the turbine and compressor shall commence.

SMARTcharge
Integral Charge Efficiency Manager

Oil carryover in chiller systems have been a burden since the commercialization of our industry.

While necessary for mechanical compressor lubrication, this oil's quickly build in the chiller's refrigerant charge. According to one Journal article, a chiller containing even 3.5% oil may have an energy penalty of nearly 10%, and less contemporary chillers are found to average 13%. This is a cost that can exceed 20% of the chiller's energy consumption bill annually! Traditional attempts to remove these oils are often through the use of fixed motive pumps that try to "find" an assumed level. While this can work, it must "hope" that the chillers skim level is ideal.

The SMARTcharge approach instead removes the oil rich chiller charge without the use of any pumps or assumptions. The integral LeeF processor's optical sensor's permit a small transfer of refrigerant to an onboard holding tank for a superheated vapor distillization process, essentially purifying the refrigerant to untraceable oil volumes! The "found" oil now free of damaging liquid refrigerant is redirected back to its intended place in the compressor bearing system eliminating wasteful "oil topping"! No Aftermarket Steam Turbo control package affords such features to energy or the environment!

SMARTsump
Infinite Life Lube-Cycle Protection

Environmental, energy and of course cost issue's are all major components considered during any project today.

For year's service providers have "replaced" their turbine oil (as well as compressor oil and elements) according to prescheduled intervals. Albeit with justification, rarely was *oil or element quality pre-considered?*

Fundamentally a simple chore, these tasks frequently find hundred's of gallons of regulated waste oil and oil filters in the wake of a several thousand dollar service activity. *The burden of proper disposal and cost now just beginning!*It would perhaps require a contemporary sentiment to ask why?

Circulating oil's unlike combustion engine applications fortunately do not degrade- the concern is that of foreign matter, mostly moisture and (modest particulates). As particulates are accumulated and may be well managed in pleated elements-emulsified or free standing moisture is not. *It is this introduced element that historically necessitated wasteful oil replacements.* However, if oil is separated and filtered of water and moisture to levels of pre use standards- it affords renewed use. This approach is called Vacuum Dehydration Filtration (VDF), essentially a separation of the moisture (as well as tight micron filtration) via deep heated vacuum assemblies that are conveniently maintained in the Chiller MER for operators use.

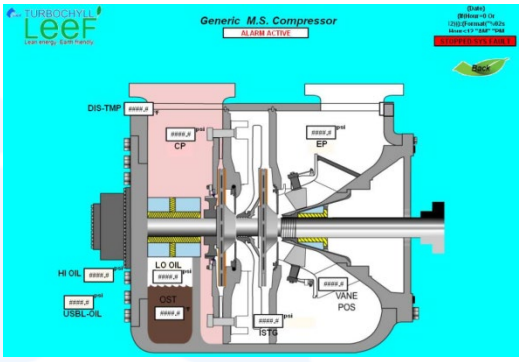
SMARTsump LeeF logic, when fitted with VDF, will toggle the filtration function in off hours at prescheduled intervals leaving the unit fully prepared for operation the following day. *LeeF*controls additionally manage filtration elements for any acute or degenerative restriction in flow through a 3yr graphic instrument provision. *With only periodic oil sampling, oil and element use may now be confidently and environmentally continued until otherwise specified!*

TurboChyll LeeF

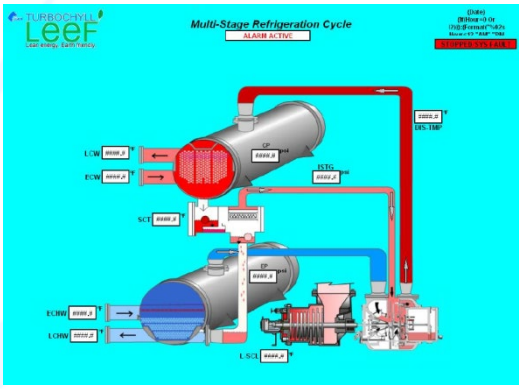
FeaturesTURBOCHYLLLeeFLean Energy, Earth Friendly

- Steam Turbine Refrigeration Appliance is available and maybe fitted, where applicable and/or specified the following LeeF Sensing End Devices.

TURBOCHYLL LeeF Cabinet and Components



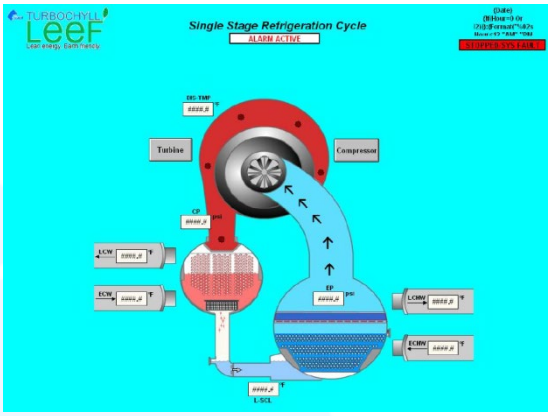
- LeeF Program Card Processor and Running FC Routine
- LeeF Human Machinery Interface
- LeeF Sensor-Device Terminal Docking Station
- LeeF Low Voltage Remote PSM, Power Supply Module
- LeeF Digital IO Interface
- LeeF Multi Stacking Relay Module
- LeeF Sensing Elements
- The Graphic Color Animated Refrigeration Cycle, including Compressor and Turbine
- The Systematic Color Sequence of Events
- TURBOCHYLL Variable Speed Turbine (VST) PART LIFT Capacity Optimization Logic
- TURBOCHYLL- HyperChyll PART LOAD Capacity Optimization Logic
- TURBOCHYLL- TurboJett Turbine VELOCITY VOLUME Capacity Optimization Logic
- TURBOCHYLL- SmartCharge Charge Management
- TURBOCHYLL- SmartSump Oil Management
- TURBOCHYLL- TurPulSonic (TPS) via Pulse Wave Sensitivity Device (PWSD) Surge Protection
- Diagnostic Display Menu and History
- User and Optimization Trending Screens

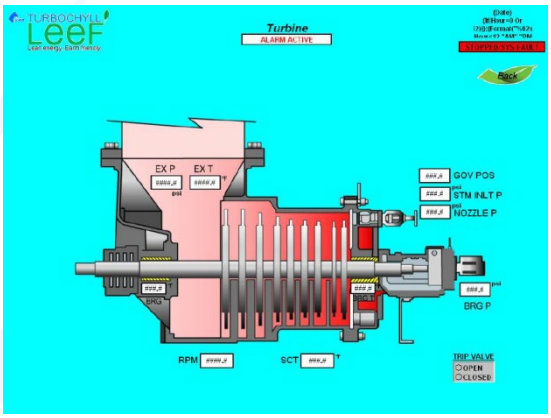


- LeeF Maintenance Screens
- LeeF Setpoints and Default Screens
- LeeF VIEW Screens
- Steam Inlet Pressure
- Nozzle Pressure
- Exhaust Pressure
- Bearing Oil Pressure
- Steam Bearing Temperature
- Exhaust Bearing Temperature
- Exhaust Temperature
- Speed Input from IFM Speed Module or Peak150 (4-20ma)
- Delta P, Turbine Lube Filter (Logic Calc)
- Evaporator Pressure
- Condenser Pressure
- Low Oil Pressure
- High Oil Pressure

TurboChyll LeeF

- Entering Chilled Water
- Leaving Chilled Water
- Entering Condenser Water
- Leaving Condenser Water
- Discharge Temperature
- Oil Sump Temperature
- Saturated Condenser Refrigerant Temperature
- Delta P, Compressor Lube Filter
- Interstage PSI
- SMARTcharge Tank Temperature
- Compressor Bearing Temperature, Tight End
- Compressor Bearing Temperature, Loose End
- Liquid Line Temperature, Subcooling
- Saturated Evaporator Refrigerant Temperature
- Usable Oil PSI
- Compressor Mechanical, Thrust Bearing Temperature
- Mechanical Lube, Compressor Differential PSI
- Low Evaporator SRT
- Low PSI Mechanical
- High PSI mechanical
- Turbine Low Oil Pressure
- Evaporator Flow Switch
- Condenser Flow Switch
- Turbine High Oil Temperature (AUX Safety Input #1)
- SMARTcharge Optical #1
- SMARTcharge Optical #2
- Trip Valve Input
- Pre Run Verification Switch
- Aux Safety Input #1
- Aux Safety Input #2
- Aux Safety Input #3
- Aux Safety Input #4
- Front Panel Start PB
- Front Panel Stop PB
- Front Panel Emergency Shutdown PB
- Front Panel Reset PB
- Surge Pulse Detection
- Sump Vent Valve
- PRV Actuator
- HGBP Actuator
- VST Speed Output to Governor
- Oil Cooler Valve
- Discharge Temperature Control (Liquid Line Variable Orifice)





TurboChyll LeeF

- Compressor Auxiliary Oil Pump
- Turbine Auxiliary Oil Pump
- Turbine Trip Solenoid/Vacuum Breaker via S/S Relay
- Turbine Aux Pump Cycling
- Compressor Aux Pump Cycling
- Compressor Oil Heater
- SMARTcharge Drain Solenoid
- SMARTcharge Fill Solenoid
- SMARTcharge Heater
- TurboJett Hand Valve #1
- TurboJett Hand Valve #2
- SMARTsump Start/Stop
- Common Alarm
- Run Status
- Front Panel Run Light
- Front Panel Alarm Light