Last Field Erected CHP Project-
Calpine Clear Lake, TX 1999
Evolution of Packaged Concept

500,000+ tons

Revolutionized packaged chilled water plant concept for comfort, industrial process, district cooling and the power generation industries.

Cumulative TAS History

- TAS installed a total of 78,180 tons and averaged 6,900 tons per year before packaging.
- Since 2000 TAS has sold 434,480 tons and manufactured an average of 72,400 tons of packaged plants per year.

The leading provider of packaged, efficient chilling products.

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Factory Packaging Initially Applied to LM6000 Gas Turbines & Their TIC Systems
Later Applied to Combined Cycle F-Class Gas Turbines

EASY INSTALLATION
TIC Process Overview

Inlet Air Coils (Heat exchanger)

Ambient Air

Cool Air

Combustion Turbine

Compressor

Turbine

Chiller

Evaporator

Expansion Valve

Condenser

Refrigerant – R-123

Heating Rejection via Evaporation

Makeup Water

Power (kW)
Packaged Solutions Markets: Casino Applications
Data Center Applications

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Global Opportunities for U.S. Manufacturers…

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60,000 Ton Packaged Central Plant
Jumeriah Beach Resort, UAE
120,000 Ton Packaged Central Plant
Palm Island, Dubai UAE
Packaged CHP Systems

The Next Step for the Packaged Evolution
Inlet Filtration & Cooling Module

Austin Energy-DOE
4.5 MW & 2500 Ton CHP Project
Burns & MacDonnell
GT Exhaust Management Skid
Absorber Exhaust
Stack Skid
Process Skid
Control Room / Process Skid
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Inside Control Room
PLC Controls Integrated with GT and Absorption Chiller Controls
Dell Childrens Medical Center

- Solar Turbine Mercury 50 GT
- HRSG to supply hospital and absorber steam
- 900 Ton Trane 2stg Steam Absorber
- Packaged 1500 Ton Centrifugal Chiller Plant w all pumps, Cooling towers, controls
- 8000 Ton-Hr TES Tank
The Future for the Package: Advanced Heat Recovery (AHR) Systems

Basic process diagram

- **Coil**
  - 250-300 °F Exhaust

- **Exhaust**
  - 800-1000 °F

- **Liquid Process In**

- **Vapor Process Out**

- **Pump**
- **Generator**
- **Turbine**
- **Condenser**

**Electrical Power Out**
The Future for the Package:
Advanced Heat Recovery (AHR) Systems
TIC Process Overview

Inlet Air Coils (Heat exchanger)

Ambient Air → Cool Air → Combustion Turbine

Cool Air

Compressor

Turbine

Chiller

Evaporator

Expansion Valve

Condenser

Refrigerant – R-123

Power (kW)

Makeup Water

Heat Rejection via Evaporation

Coil Condensate

Heat Rejection via Evaporation
A.H.R. Process Overview

Combustion Turbine

Exhaust Air Coil (Evaporator Heat exchanger)

Hot Exhaust

Warm Air

AHR Package

Heat Rejection via Evaporation

Cooling Tower

Pump

Condenser

Expander

Refrigerant

Power (kW)

Makeup Water

Condenser

Expander

Refrigerant

Power (kW)
Easy Installation & Minimal Field Engineering
Modular Construction

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2 X 5500 Ton Central Plant
Integrated Switchgear & Controls
Industrial Quality Fabrication

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Schedule & Commitment Plan

✓ Project cash flows reduced & delayed
✓ Total delivery period is reduced dramatically
✓ Site installation period is reduced by 50%
✓ Site construction scope & risk are much reduced
Net Present Cost Comparison

Field Erected

Packaged

>10% Efficiency Improvement

> 20% Net Present Cost REDUCTION

10-15% Total Installed Cost Reduction

Equipment  Electricity Usage  Electricity Demand  Water Usage  Maintenance
Summary

✓ Reduced first cost
✓ High efficiency plant & guaranteed performance
✓ Industrial quality
✓ Reduced footprint
✓ Shortened construction cycle
✓ Minimal site interference / maximum safety
✓ Enhanced value proposition
✓ Improved Mkt acceptance
ARCHITECTURAL DESIGN OPTIONS

attractive screen designs; customizable for any site

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## The Packaged Advantage

Compared to traditional field erected plants….

<table>
<thead>
<tr>
<th>Feature</th>
<th>Advantage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed to Market</td>
<td>30 - 40% Savings in schedule</td>
</tr>
<tr>
<td>Reliability</td>
<td>Fully tested premium and redundant equipment</td>
</tr>
<tr>
<td>ISO 9001:2000</td>
<td>Rigorous documentation &amp; quality process</td>
</tr>
<tr>
<td>Efficiency</td>
<td>Up to 20% more efficient</td>
</tr>
<tr>
<td>First Cost</td>
<td>15 - 20% Initial savings</td>
</tr>
<tr>
<td>Maintainability</td>
<td>10 - 15% O&amp;M cost savings</td>
</tr>
<tr>
<td>Installation Safety</td>
<td>75% Less site construction time</td>
</tr>
<tr>
<td>Guarantees</td>
<td>Ability to guarantee output, efficiency, cost &amp; schedule</td>
</tr>
<tr>
<td>Flexibility</td>
<td>Moveable—Leasing Attractiveness</td>
</tr>
<tr>
<td>Aesthetics</td>
<td>Customizable architectural options</td>
</tr>
</tbody>
</table>

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