



**Tecumseh IntelliCOOL™**

# Variable Capacity Cooling Solutions



*Tecumseh*



# Tecumseh IntelliCOOL™

## Energy Savings, Performance, Connectivity and Reliability

The Tecumseh IntelliCOOL™ technology platform encompasses world-class innovations in variable speed cooling, intelligent control and energy management to provide compact, quiet and superior commercial refrigeration performance.

Tecumseh IntelliCOOL matches compressor capacity to the refrigeration system's cooling demand. The speed of the compressor continuously adapts to ensure the refrigerated cabinet is maintaining optimal temperature while using the lowest amount of energy.

Our IntelliCI (Compressor Inverter) is also equipped with built-in intelligence, TAL (Tecumseh Adaptive Logic), an algorithm that enables the system to benefit from the energy-optimization of the variable speed compressor without the need for an electronic system controller.

Tecumseh IntelliCOOL utilizes hydrocarbon and A2L refrigerants and is designed specifically to meet current and future energy requirements.



**Variable Speed  
Compressor**

+

**Case  
Controller  
Tecumseh IntelliSC**

+

**Compressor  
Inverter  
Tecumseh IntelliCI**

**Energy Savings,  
System Performance,  
Connectivity, Serviceability  
and Reliability**



## ENERGY SAVINGS

### Adaptive Defrost

Defrosting the evaporator coil with fixed speed compressors consumes excess energy and raises the temperature inside the refrigerated cabinet. Tecumseh IntelliCOOL constantly monitors temperature of the refrigeration system and determines when and how long the defrost function is needed. The result is a refrigeration system that precisely maintains the perfect temperature, while optimizing energy usage.



## SUPERIOR SYSTEM PERFORMANCE

### Precision Temperature Control

Tecumseh IntelliCOOL delivers precise temperature control essential to food safety, marketability and freshness. With perishable foods such as fruits, vegetables, dairy products, meats, fish and poultry, maintaining a specific temperature range is an absolute necessity.

Tecumseh IntelliCOOL monitors and controls the evaporator and condenser fan motors, in conjunction with the compressor speed, to precisely control cabinet temperature.

As the cabinet temperature varies, programming logic determines the speed the compressor requires to maintain temperature, while minimizing temperature over-shoot and rapid cycling.

### Power Conditioning

The quality of power supplied to the cabinet is critical to the long-term performance and reliability of the compressor, controls, and fans. Tecumseh IntelliCOOL monitors the power source and protects these components from high and low voltage conditions and over-current conditions.

A wide voltage input range allows refrigeration systems to be used in regions with poor power quality. The same refrigeration system can be used in various regions across the globe, allowing for model reduction and standardization.



### Quiet Operation and Low Vibration

Noise and vibration produced by compressors, fans and other rotating devices can be bothersome especially when refrigeration equipment is close to where people are socializing, dining, shopping or relaxing.

Tecumseh IntelliCOOL reduces noise and vibration by adapting motor speeds based on cooling demand. This eliminates noise fluctuations and extremes typical of on/off operation.



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## CONNECTIVITY & SERVICEABILITY

### On-Board Communications

Using simple protocols, Tecumseh IntelliCOOL transmits information related to operating conditions, faults, and alarm states from the compressor, variable speed controller and various sensors connected to the Tecumseh IntelliSC (electronic system controller.)

Information can be used to configure the system to optimize the balance between energy usage and performance.

### Local and Remote Diagnostics and Alarms

Tecumseh IntelliCI includes an array of diagnostics and fault information related to both the refrigeration system and compressor performance.

This information can be accessed through the communication interface (i.e. serial port) for use by technicians to diagnose performance issues.

This data integrates with IoT, smart building networks, and other remote monitoring and data collection networks to oversee system performance, conduct preventative maintenance and dispatch service technicians.



## RELIABILITY

### Electronic Protection

Tecumseh IntelliCOOL protects refrigeration system components using high performance electronic circuits and intelligent software algorithms.

Electronic protection is fast and precise, resulting in minimal exposure to abnormal environmental and electrical conditions that can adversely affect the long-term reliability of the refrigeration system and components.

### Motor Soft-Start

Tecumseh IntelliCOOL's soft-start function applies the required amount of current to the compressor motor during start-up, reducing start-up noise and motor stresses and ensuring reliable starting at both high load and low-voltage conditions.

Automatic optimization of motor start-up current saves energy and prevents over stress of electrical wiring and circuit protection devices.



## Introducing TAL™

TAL uses an artificial intelligence based algorithm, embedded in the inverter, to determine the best speed and capacity of the compressor given the ambient temperature and various thermal load conditions.

The algorithm is intended to work with an on/off thermostat, minimizing the need for changes to the cabinet when converting from fixed speed compressor technology to variable speed compressor technology.

### TAL Features:

- ▶ Rapid temperature pull-down
- ▶ Rapid temperature recovery after energy faults
- ▶ Thermal load temperature maintenance
- ▶ Robustness against ambient temperature variation
- ▶ Self-adapting refrigeration capacity algorithm



# CASE STUDY

We worked with an OEM customer to integrate Tecumseh IntelliCOOL into a two-glass-door merchandiser with a bottom-mounted refrigeration system. By combining various components of the Tecumseh IntelliCOOL technology platform, we provided an environmentally friendly, integrated condensing unit solution allowing our customer to meet Energy Star requirements, improve performance, manufacturing and serviceability.

## Energy Savings Using R-290, Variable Speed Complete Refrigeration System (CRS) for Beverage Cooler Application

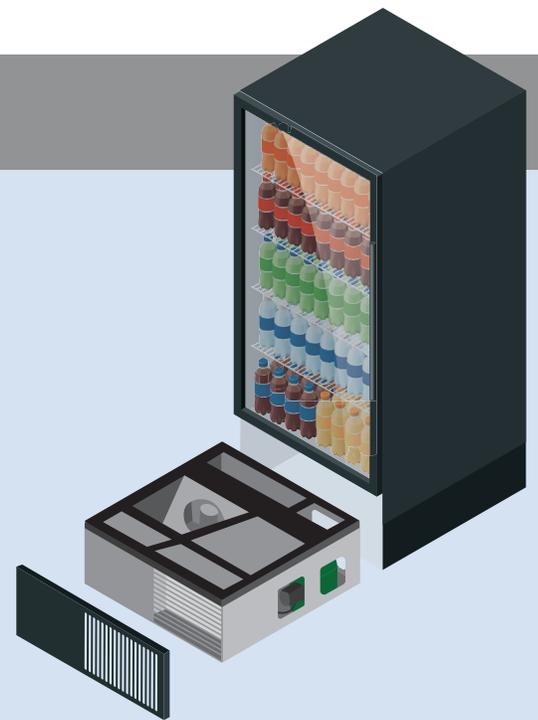
The Tecumseh CRS is a custom plug and play system that typically uses an R290 fixed speed compressor. In this case study, we developed a CRS with our Series VTC, R-290 variable speed compressor.

			Fixed Speed (ON/OFF)	Variable Speed	Improvement vs Baseline
			Baseline THA0412Y** (R134a)	VTCX 360U (R290)	
			Test Results	Test Results	
1	No load pull down - slug temps 40°F+/-1 (Amb 90°F)	Pull down time (PDT)	66 min	49 min	26%
		Energy consumption for PDT	0.32 kwh	0.14 kwh	56%
2	Full load pull down - prod temps 38°F+/-1 (Amb 90°F)	Pull down times (PDT)	17 hrs, 27 min	15 hrs, 12 min	13%
		Energy consumption for PDT	4.52 kwh	3.04 kwh	33%
		Product temp span at stabilization	7.2	6.8	6%
3	Half re-load pull down product temps 38°F+/-1 (Amb 90°F)	Pull down time	10 hrs, 43 min	10 hrs, 07 min	6%
		Energy consumption	3.48 kwh	1.89 kwh	46%
4	Energy Star 4 Test ASHRAE 72	Energy consumption	3.46 kwh	1.24 kwh	64%

### RESULTS SUMMARY

#### IntelliCOOL Benefits:

- ▶ Increased merchandising space
- ▶ Lower refrigerant charge
- ▶ Reduced energy consumption
- ▶ Rapid pull down
- ▶ Simple transition to R290



## Interview

**with Akash Bhatia**  
 Director of NA Systems Engineering  
 Tecumseh Products Company

### Why did you take on the challenge to design a new, variable speed CRS system?

We heard from our OEM customers that display space and efficiency are becoming increasingly important to customers. Therefore, we set out to improve upon a system already in use with bottle coolers, a highly important type of merchandiser.

### What are the key benefits to variable speed in this type of system?

The variable speed compressor performed exactly as we had anticipated. It delivered superior performance in all areas and the smaller size enabled the merchandiser to add an additional display shelf!

### Why should a customer consider a Tecumseh IntelliCOOL CRS system?

We are experts at customizing our value-added systems to meet any specification for an OEM. The IntelliCOOL cassette will provide a quiet and highly efficient solution that will ?????



# Tecumseh

*Cooling for a Better Tomorrow™*

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