

# Case Histories & Applications for CAST-X Circulation Heaters

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*Precision-Engineered Solutions, from Concept to Production*

ENGINEERING EXPERTISE

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Cast Aluminum Solutions  
Jeffrey Awe, Marketing Director  
Tel: 630-482-5325  
Email: [jawe@castaluminumsolutions.com](mailto:jawe@castaluminumsolutions.com)

[www.castaluminumsolutions.com](http://www.castaluminumsolutions.com)  
Main Line: 630-879-2696

# Bottle Washer Equipment Contamination Problem

## Problem

- Customer was using a screw plug immersion heater in a reservoir to heat water for a bottle washing process
- The heater failed and contaminated the product with Magnesium Oxide from tubular heater element

## Solution

- Customer replaced the screw plug immersion heater with a CAST-X 1000 which was more reliable
- The risk of contamination was eliminated because the CAST-X utilized indirect heating; **the heater element never contacts the fluid being processed.**

## Notes

- This case illustrates a key CAST-X benefit:
- **Media being heated stays sequestered inside the stainless steel flowpath tube...never contacting the hot element or other heater components**
- **This is a very important safety and contamination feature**



# Paint Heating System

## Problem

- Customer was using a heat exchanger to heat paint and was using an external boiler to provide heat
- The system required excessive amounts of solvent to clean it during change-overs to different color paints

## Solution

- Customer selected a CAST-X 2000 heater which eliminated the need for the boiler
- Since the heater was constructed of coiled stainless steel tubing it was easier and quicker to clean, plus used significantly less solvent



# Vaporizing Isopropyl Alcohol (IPA) In a Lab Test

## Problem

- An R&D lab needed to select a compact heater to vaporize liquid IPA for an experiment
- The conventional circulation heater in use was too large due to watt density limitations and uneven heating

## Solution

- Customer selected a CAST-X 2000 heater
- The aluminum mass maintained the IPA at desired temperature without it overheating



This customer chose the middle option: CASTS-X 2000 with a NEMA 7 electrical enclosure. At left is the ATEX Enclosure and right is the NEMA 1.

# Safe Heating of Solvents In a Cleaning System

## Problem

- Customer had a solvent cleaning system consisting of heated reservoir and pump
- Silicone rubber heaters were being used to heat the reservoir
- Based on incidents of fire in similar applications, customer decided that he needed a different approach to make system safe

## Solution

- Customer installed (in line with pump) a CAST-X 3000 heater with an Explosion Rated enclosure and snap-action high limit thermostat, which was compatible with hazardous environments
- An insulation jacket was selected to keep exposed surfaces of the heater below the flash point of the solvent and for personnel safety

## Notes

- CAST-X Circulation Heaters are available with a number of enclosure options, from NEMA 4 (moisture resistant) to NEMA 7 and ATEX (explosion proof), and simple dust-resistant NEMA 1 enclosures.



# Heating Ultra Pure Nitrogen For Silicon Wafer Drying

## Problem

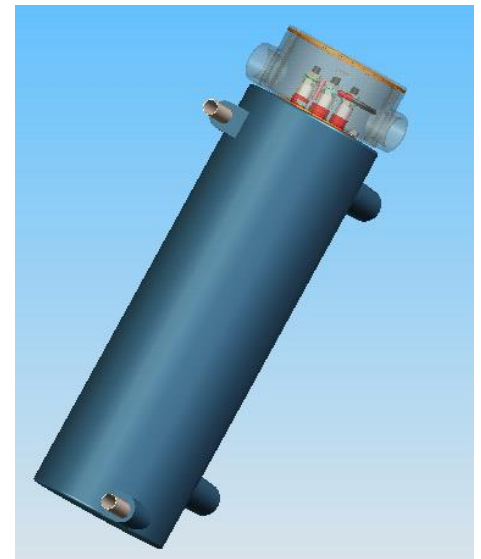
- Customer was drying sensitive Semiconductor parts with Nitrogen after cleaning
- The original heater was generating particulates due to the vibration of heater against the tank
- The particulates were contaminating the parts and causing quality problems down stream of the process

## Solution

- The customer used a CAST-X 2000 which solved the problem due to its smooth walled, seamless 316 Stainless steel tube
- The tube provided a wetted surface which did not produce particulates

## Notes

- All CAST-X Circulation Heaters are equipped with 316 Stainless Steel seamless flowpath tubes: our standard tube material
- However, for we do offer options for Passivated, Electro-polished, Inconel and special alloy tubes



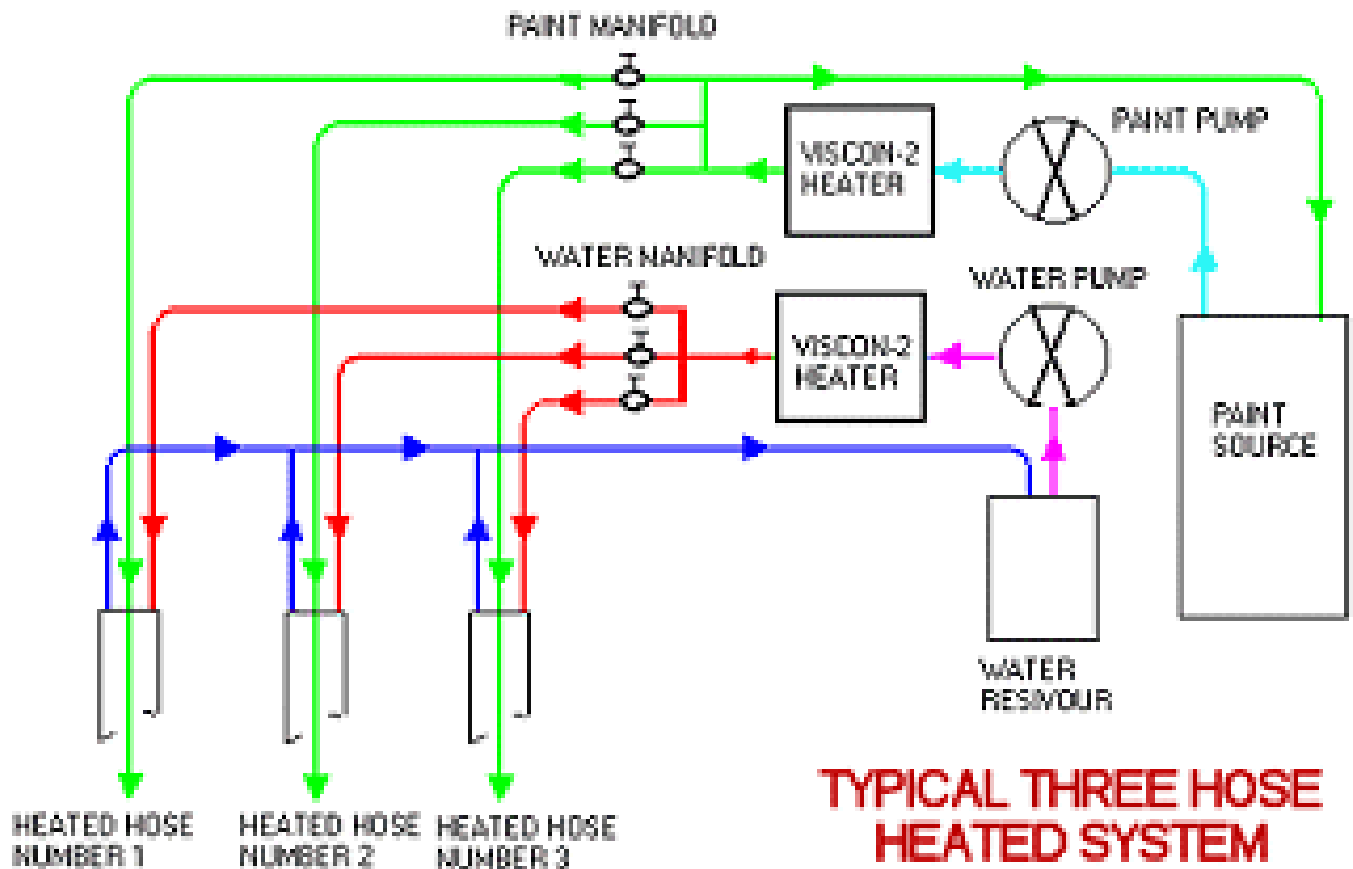
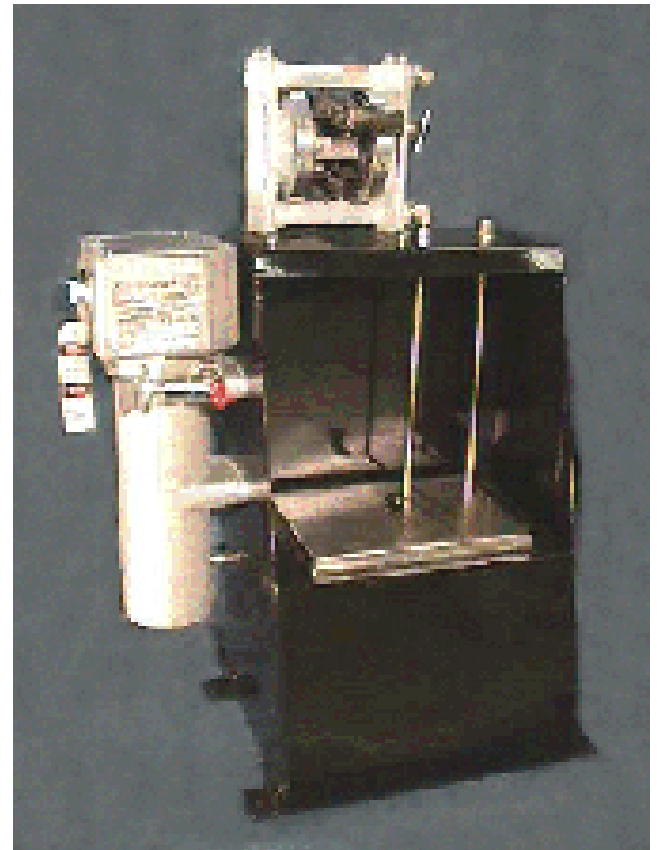
# Replacing Higher Cost Heat Exchangers in Paint System

## Problem

- Customer was using an expensive heat exchanger / heat transfer system for a commercial painting operation
- System was expensive and heat exchanger had to be maintained frequently

## Solution

- Customer replaced heat exchanger and heat transfer system with a CAST-X 2000 heater
- System took up less floor space, cost less and required less maintenance



# Lower Cost Compact Solution for Fuel Cell Test Stand

## Problem

- Customer was using a traditional circulation heater made of stainless steel in a Fuel Cell test stand as part of a heat transfer loop
- The heater took valuable real estate and was expensive

## Solution

- Customer selected a CAST-X 3000 heater, which was much more compact
- A snap action high limit thermostat was used to replace an expensive electronic high limit control.

## Notes

- CAST-X Circulation Heaters are available with many different options for high limit switches, thermostats, and thermocouples.
- Plus they can be wired in Wye, Delta and Parallel configurations





# Hot Water Solution For Coffee Kiosk

## Problem

- Customer was required to have hot water available at coffee kiosk per a health department requirement for hand washing
- They were using a traditional steel booster circulation heater which caused rust to be introduced every morning when water was dispensed

## Solution

- Customer selected a CAST-X 500 heater with standard 316 Stainless Steel fluid path: this immediately eliminated the rust problem

## Note

- Even though the CAST-X 500 is less than 8 inches tall, it generates an incredible amount of heat with a small footprint: another CAST-X advantage



# Application Problems in Spray-On Truck Bed liner Application

## Problem

- Portable spray-on truck bed lining equipment was having problems with application of urethane coatings
- Cold application of the material was non-uniform; it spattered, dripped and ran when applied

## Solution

- CAS designed in two CAST-X 1000 heaters to heat each component of the urethane
- The heaters provided *uniform heating* and operated at *high pressure*
- Also: cleaning after each application was easier due to the smooth nature of the CAST-X's stainless steel tubes

## Notes

- CAST-X heaters are perfect for “high pressure” applications: our standard stainless steel tubes can handle 2500 – 4000 PSI, depending on model/size



Before CAST-X: uneven results:

Hot Application (LEFT), Cold Application (RT)

After bringing the CAST-X Heater on board, the urethane application process & cured results were much more consistent.

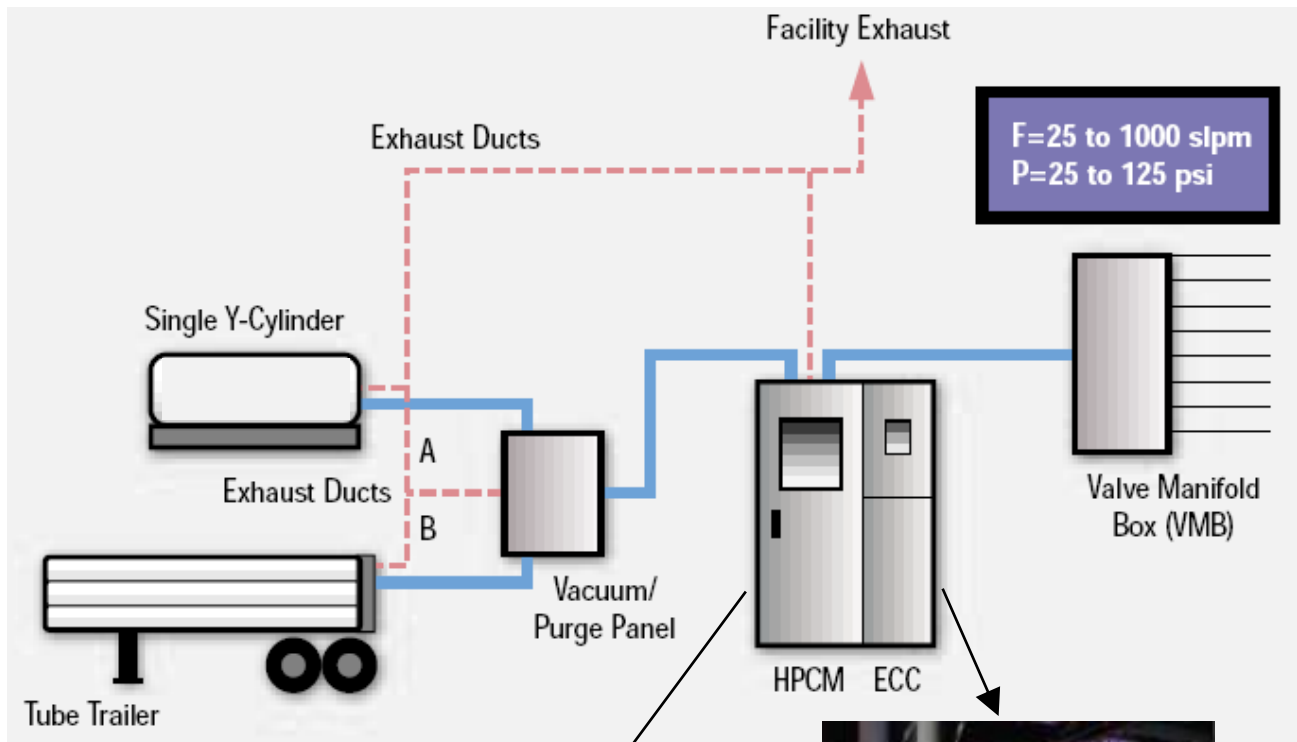
# Valve Freezing Problem in Bulk Gas Delivery System

## Problem

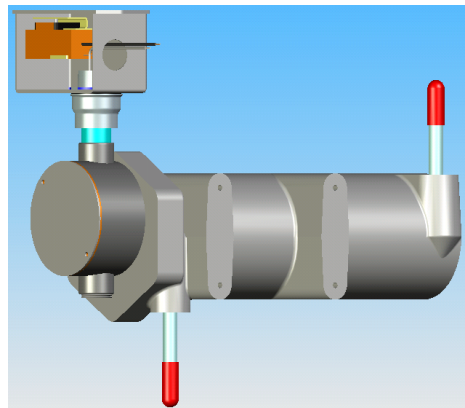
- Semiconductor bulk gas delivery system was experiencing a valve freezing problem when compressed gases were expanding from bulk tanks (Joules Thompson Effect)

## Solution

- Customer installed multiple CAST-X 2000 heaters into gas cabinet to solve the problem
- The ability of the CAST-X heater to run clean, operate at high pressure, and provide excellent temperature control contributed to a successful and much improved application



CAST-X Heater  
Inside Cabinet



Gas  
Delivery  
Cabinet



# Antiseptic Packaging Application

## **Problem:**

- Customer needed to vaporize a mixture of Hydrogen Peroxide and Nitrogen at 250°C for sterilization of cartons and bottles before being filled

## **Solution:**

- A CAST-X 2000 circulation heater was used with “stand off enclosure” to safely handle the higher process temperature
- The smooth internal surfaces of the CAST-X’s stainless steel process tube, combined with the “no contact design” (the liquid or gas being heated never touches the heating elements) worked to minimize the risk of process contamination
- The heater size was minimized due the high power output and compact construction of the CAST-X design



RT: CAST-X 2000 with standoff enclosure.



# Aircraft Lavatory Hot Water Heating

## **Problem:**

- Customer was using high watt density cartridge heater in tank
- The heater was failing prematurely; it also had calcium buildup

## **Solution:**

- A CAST-X 500 was introduced
- This “cast-in construction” allowed the heater to run cooler and hence have a longer lifespan.
- Calcification was eliminated: Because the media being heated never contacts the heating element
- The heater was also able to run dry without risk of failure. A high limit disc style thermostat was added to enhance safety.



This traditional cartridge heater didn't work well for our customer.

This CAST-X 500 was a better solution. The silver ends indicate inlet / outlet tubes. Control wires are located at the top, sealed in a NEMA 4 'moisture proof' enclosure. The black hole is for a special waterproof cable gland.



# Ink Heating for Large Photo Printing Equipment

## **Problem:**

- Customer needed to heat inks to 100-115°F (40-45°C) to maintain printing consistency and enhance drying
- Important product features were temperature uniformity, cleanliness, and to prevent the ink from overheating

## **Solution:**

- A CAST-X 1000 circulation heater was used for indirect heating of the ink
- The customer liked the ease of cleaning and temperature consistency



A commercial printer needed inks heated.  
CAST-X 1000 to the rescue!

The customer loves these small footprint,  
easy cleanup, self-draining heating units.



# Medical / Home Kidney Dialysis Instrument

## Problem

- Medical device manufacturer needed precise temperature and flowrate control, plus the electro-polished and passivated stainless steel tubing
- Also wanted replaceable heating element

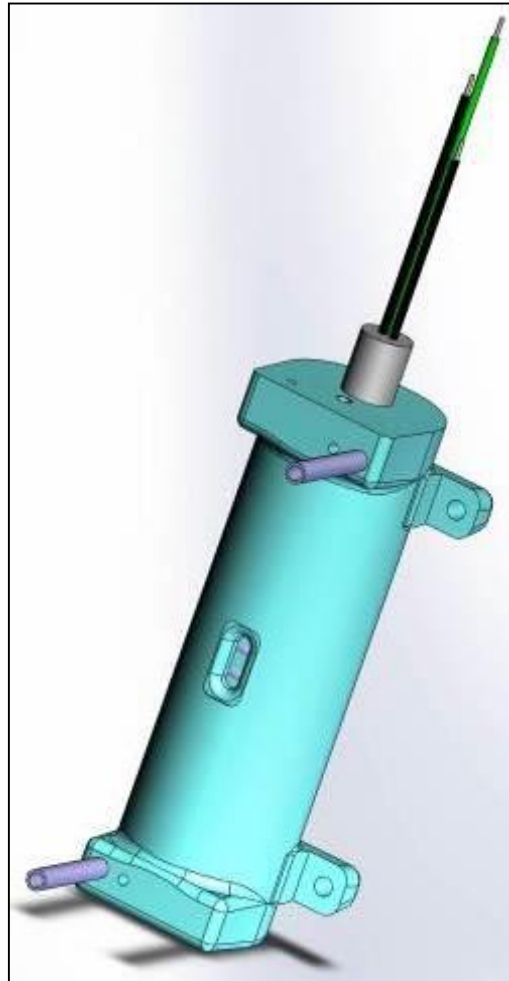
## Solution

- A custom solution was developed by the CAS Engineering Team
- Based on the CAST-X 500, these new heating units had a replaceable cartridge on a 'cast-in' design
- The tubing chosen was both electro-polished and passivated, to ensure sterility and cleanliness
- Special mounting bosses were also engineered into these semi-custom units

This medical equipment OEM demanded a “semi-custom” design.

It featured special tubing and a removable cartridge heater in a CAST-X 500 base.

The CAS Engineering Team can easily modify and develop customizations if needed.



# Heating of Dyes for Shoe & Boot Market

## Problem

- Customer needed a “small footprint” way of heating dyes for a name-brand shoe manufacturing line
- Dyes for shoe, leather & synthetic fabrics needed to be quite hot in order to achieve proper impregnation into materials

## Solution

- A CAST-X 2000 was installed, with outstanding results





# Dry Gas Seal Applications

## Overview

- A CAST-X 3000 Circulation heater is provided to the Oil and Gas Industry for FPSOP (Floating Production Storage Offshore Platforms) and can be used for dry gas seal applications
- The gas seal can be heated using the CAST-X 3000 or CAST-X 4000, and both of these units can withstand the high pressures associated with this application: Inconel tubes can be used instead of SS, if necessary
- Safety is enhanced because the dry gas seal stream never comes in contact with the CAST-X heating element: gases are relegated to the inside of the CAST-X flowpath tube
- The seamless, non-welded flowpath tube also minimizes the possibility of leakage
- Certified NEMA 7 and ATEX (explosion proof) electrical enclosures are available.
- Due to their relatively small size and high output ratios, the CAST-X 4000 and CAST-X 3000 are suitable for dry gas seal applications on land or offshore rigs



◀ CAST-X 3000 with  
ATEX Electrical  
Enclosure

CAST-X 4000 with  
ATEX Electrical  
Enclosure ▶



# Petroleum Mud Testing Labs

## Upstream Oil Drilling & Testing

### Overview

- Off-shore and on-shore testing laboratories often have requirements for heating of petro-infused muds and sludges
- Heating these slurries is a critical step in determining the makeup and component ratio of drilling muds (soil evaluation)
- The CAST-X line of Circulation Heaters fits nicely into this environment: the size required somewhat depends on the volume of material being heated. Generally the CAST-X 2500, 3000, or 4000 are utilized.
- Features relevant to this application include:
  - Compact size
  - Explosion-proof enclosures
  - Leak-proof, non-welded components
  - Self-draining flowpath tubes
  - “No-Contact” design (indirect heat) means fluids never touch heating elements: *this is an important safety feature*

The CAST-X features a smaller footprint than the typical, larger 12 to 15 foot pressure systems.

These units deliver clean process heating with very little maintenance.



# LNG, Industrial Gas, Cryogas Applications

## “Trim Heating” & Moisture Removal

### Trim Heating & Moisture Removal

- Liquid Natural Gas (LNG) and industrial gases must be “moisture-free”
- However, especially in winter and cold environments, condensation will add moisture to tanks and devices, making the gases dangerous to deploy
- CAST-X Circulation Heaters can be utilized to heat these gases, removing excess moisture (trim heaters / air condensate heaters / thaw heaters)
- Due to the small footprint and high output of the CAST-X family, they can be deployed at remote sites or large industrial gas processing facilities

### Liquefying and Distilling for Air Separation

- In addition to the moisture removal applications listed above, air separation processes include several heating and cooling processes that remove CO2 and hydrocarbons (a complex series of applications involving condensation, liquefying, distillation and catalyzation)
- The CAST-X Circulation Heater can be used as a ‘regeneration heater’ (heating of waste nitrogen in a molecular sieve)



The CAST-X 2500 is a good place to start when looking at LNG and air separation applications.

It’s a nice “small dual tube.”

You can always go bigger (CAST-X 3000 or 4000) or smaller (CAST-X 1000 or 2000).

# Pre-Heating of Jet Fuel

## plus Diesel Fuel and other Flammable Media

### Overview

- CAST-X Circulation Heaters are often used to pre-heat rocket & jet fuels, diesel fuel, and other flammable liquids and gases
- Many fuels require pre-heating to a specific temperature in order to induce optimum combustion
- CAS currently works with several customers using the CAST-X in these applications

### *Features relevant to this application include:*

- Explosion-proof enclosures
- Ability to heat liquids or gases
- Leak-proof, non-welded design
- Self-draining design
- “No-Contact” design (indirect heat) means fuel never touches heating elements: *this is an important safety feature*



### CAST-X can heat:

- Rocket Fuel
- Aircraft Fuel
- Diesel Fuel
- Hydraulic Oil
- Food Oils
- Fuel Oil (homes)
- Generator Oil
- Compressor Oils (especially in cold weather conditions)



## Creating Solutions from Concept to Reality

ENGINEERING EXPERTISE      SPEED TO MARKET      OPERATIONAL EXCELLENCE

The CAS Team hopes these case studies are helpful in furthering your understanding of how CAST-X Circulation Heaters fit into popular processes & applications.

If you, your sales & distribution peers, or customers have further questions, do not be afraid to contact CAS directly.

The CAS Team is always available to help you with everything from wattage, flowrate and Delta-T calculations to pricing and turnaround data.

Start by Contacting our Sales & Marketing Dept.:

Jeffrey Awe, Marketing Director  
Tel: 630-482-5325  
Email: [jawe@castaluminumsolutions.com](mailto:jawe@castaluminumsolutions.com)

Jerry Carlson, Sales Director  
Tel: 630-482-5319  
Email: [jcarlson@castaluminumsolutions.com](mailto:jcarlson@castaluminumsolutions.com)

[www.castaluminumsolutions.com](http://www.castaluminumsolutions.com)  
Main Line: 630-879-2696