# Batch Melt Furnace

## Control Through Dynamic Imaging


This white paper describes JM Canty's Dynamic Imaging system, a vision-based technology designed to continuously monitor un-melted batch materials within float glass furnaces and the benefits of this system. By combining high-resolution ExtremeTemp™ cameras with the Vector Control Module (VCM) and embedded CANTYVISION™ software, the system provides real-time measurements of batch area and forward position. These measurements are then delivered through multiple industrial communication protocols for seamless integration into plant control systems. The Canty solution operates reliably at furnace temperatures up to 3,500°F, requires minimal maintenance, and consistently delivers significant process optimization and cost-saving benefits.

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## Overview of Dynamic Imaging

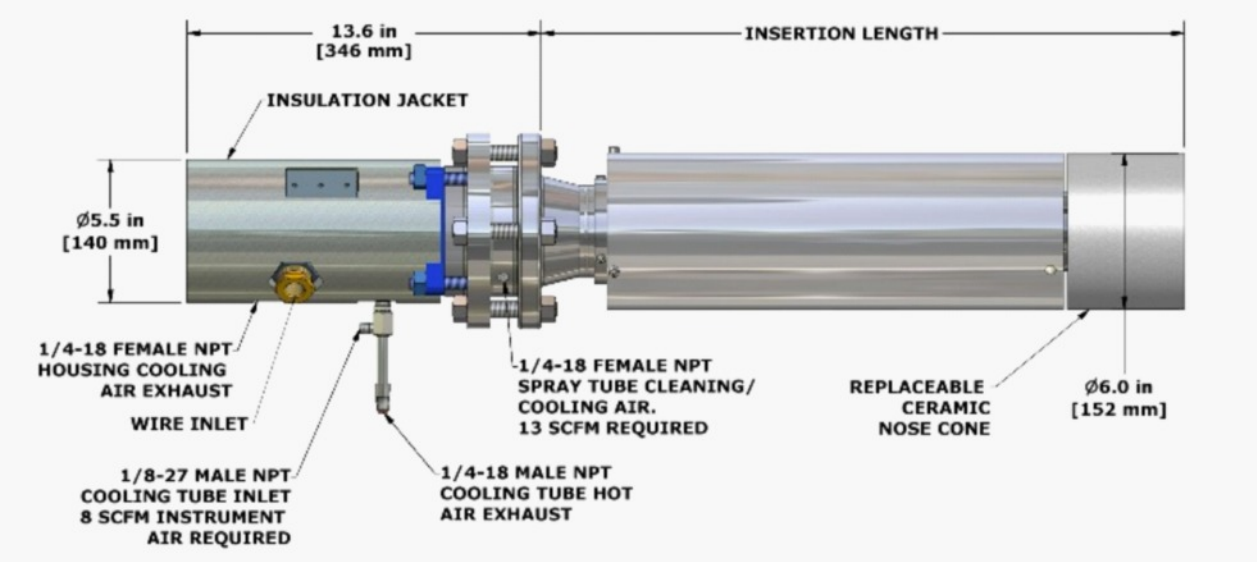
The fundamental principle of Dynamic Imaging is straightforward: high-resolution images are captured at high speed and analyzed in real time to determine the amount and position of un-melted batch material, commonly referred to as batch crust. In float glass furnace operation, controlling this material is essential for maintaining melt efficiency, preventing upset conditions, and ensuring consistent product quality. Traditional measurement methods often rely on intrusive sensors or radiation-based devices, which can be difficult to maintain and may not provide continuous or accurate data.

Canty's vision-based approach eliminates these limitations. The system captures clear, stable images of the furnace interior using ExtremeTemp™ cameras designed specifically for high-temperature environments. These images are transmitted to the Vector Control Module, where CANTYVISION™ algorithms calculate batch area and forward position on every frame. The resulting measurements provide operators with a continuous, non-contact view into the process, enabling more precise control and faster response to changing furnace conditions.

## Hardware Architecture

The Canty Dynamic Imaging system is built around three core hardware components: the ExtremeTemp™ furnace camera, the fused-glass process barrier, and the Vector Control Module.

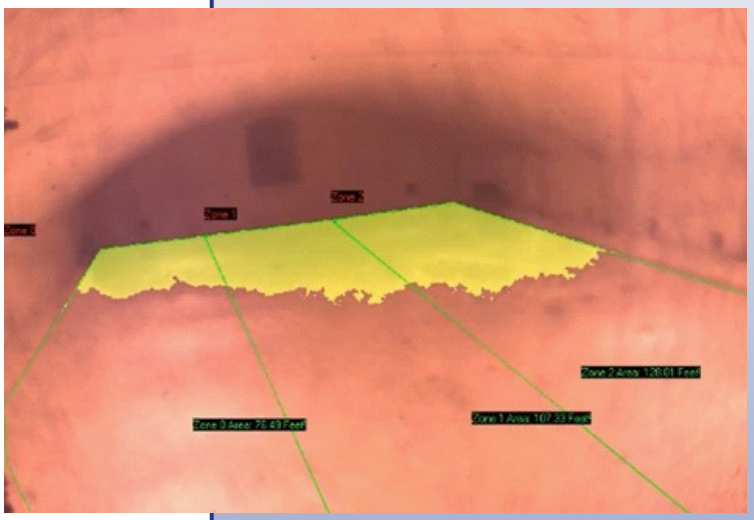
The ExtremeTemp™ camera is engineered to operate in furnaces running at temperatures up to 3,500°F. It is installed through a hole in the refractory using either collar or flange mounting options, allowing the camera to view the furnace interior while keeping the electronics protected from extreme heat. The camera's fused-glass seal provides a hermetic barrier between the furnace atmosphere and the camera internals, ensuring long-term reliability and optical clarity. A quartz shield protects the viewing window and can be cleaned periodically with standard glass cleaner. In most installations, the camera requires little to no maintenance beyond occasional cleaning, and it does not typically require re-calibration after startup.




The Vector Control Module is a compact embedded processor that replaces the need for a traditional computer. It supports up to six cameras simultaneously and performs real-time analysis using pre-installed CANTYVISION™ Industrial Toolbox software. The VCM includes password-protected administration controls, customizable operator screens, and optional wireless connectivity. Its compact design and plug-and-play configuration make installation straightforward and cost-effective.

## Software and Measurement Algorithms

The CANTYVISION™ Industrial Toolbox software is responsible for analyzing each image captured by the furnace cameras. On every frame, the software calculates the total area of un-melted batch material and identifies the forward position of the batch crust. These measurements can be divided into up to three zones, allowing operators to monitor different regions of the furnace independently. The system uses a four-point perspective calibration to convert pixel measurements into real-world units such as inches, feet, millimeters, or centimeters.



The software provides several key measurement outputs. Zone-specific area values quantify the amount of un-melted batch material in each region. A total area value represents the sum of all zones. Forward position measurements identify the furthest point of un-melted batch material within each zone, providing insight into melt progression. Additional system-health indicators include camera temperature, which reflects the temperature of the camera chip and can alert operators to cooling issues, and a camera heartbeat signal, which toggles continuously to confirm that the system is functioning properly.

These measurements are continuous, real-time, and highly repeatable. Because the system is entirely non-contact, it does not interfere with furnace operation and does not rely on radiation-based sensing. In many installations, two cameras are used to monitor opposite halves of the furnace, allowing operators to control whichever side is not firing at a given time.

The tags available to output from the software (per camera) include:

*Zone X Area:* This is the area of the un-melted batch materials in measurement zone X (where X can be 0-2). Measured in the calibrated unit squared.

*Total Area:* This is the total area (sum) of un-melted batch between all drawn zones. Measured in the calibrated unit squared.

*Front Point X:* This is the furthest forward position of un-melted batch materials in measurement zone X (where X can be 0-2). Measured in the calibrated unit.

*Camera Temperature:* This is the temperature on the camera chip, not the temperature in the furnace or in the camera housing. Often used to detect if cooling air is stopped for any reason. Measured in either °F or °C.

*Camera Heartbeat:* This is a Boolean value that is used as a general trouble alarm. The value should cycle between TRUE and FALSE and, if your system detects that the value stops changing, indicates if there is some general problem with the measurement (such as if your lost power).

These tags can be output via a variety of output methods including but not limited to analog (4-20mA), OPC UA, Modbus TCP/IP, and Modbus RTU.

## Connectivity and Control Integration

The Dynamic Imaging system integrates easily into existing plant control architectures. The Vector Control Module outputs measurement data through multiple communication standards, including analog 4–20 mA, OPC UA, Modbus TCP/IP, and Modbus RTU. These outputs can be connected directly to a distributed control system (DCS), programmable logic controller (PLC), or plant alarm system. Because the VCM is designed for industrial environments, it provides stable, reliable communication and supports long-term unattended operation.


The system's connectivity options allow operators to incorporate batch area and position measurements into closed-loop control strategies. Continuous imaging and real-time data enable more precise furnace control, faster detection of upset conditions, and improved melt efficiency. The ability to monitor system health through camera temperature and heartbeat signals further enhances reliability and reduces downtime.

## Conclusion

The Canty Dynamic Imaging system provides a uniquely powerful and reliable method for monitoring un-melted batch materials in float glass furnaces. Its combination of ExtremeTemp™ camera technology, fused-glass process barriers, and advanced CANTYVISION™ software delivers accurate, repeatable, and continuous measurements that far exceed the capabilities of alternative technologies. The system requires minimal maintenance, operates without operator intervention, and integrates seamlessly into plant control systems through multiple communication protocols.

Across the glass industry, Canty systems have demonstrated rapid payback—often within weeks—through improved melt efficiency, reduced energy consumption, and enhanced process stability. The ability to see directly into the furnace, combined with real-time analytical measurement, makes the Canty system an essential tool for achieving optimal furnace performance and ensuring the highest product quality. For these reasons, the Canty Dynamic Imaging system stands as the most advanced and effective solution available for this critical furnace application.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