Script for Keith Diamond Tool Bit Automation DVD
By Steve Mortensen

Slide = Composite graphic image

Video = digital video footage

All others are high-resolution photographs with pan and zoom

- Fade from black -

Scene 1 – Title Slide

Scene 2 – Wendell Introduction - Video

Hello, I'm Wendell Keith. The Keith Company has had the pleasure of working with most of you in the PDC oil tool industry for the past 35 years. Today I'm delighted to show you something new that represents the state of the art in fully automated bit processing. The system you're about to see includes performance enhancements in key areas, and solves problems you may already be trying to solve yourselves. So let's get started.

Scene 3 – Master System Left

Several years ago, Keith introduced its first fully integrated and automated system for processing diamond tool bits. The newest generation of this system has just been completed, which features major improvements in the cooling system technology . . .

Scene 4 – Master System Right

. . . has a smaller footprint, achieves faster mold transfer times between stations, enhanced control capabilities, and many refinements that make maintenance more convenient. The entire system has been engineered to deliver tighter process control, more flexibility in operation, and highly consistent results that can be duplicated virtually anywhere in the world, wherever identical systems like this are installed.

Scene 5 – Loading Table and Preheating Bell

The process begins at the preheating station.

Scene 6 – Loading Table Grid

Heating elements are mounted below a heavy-duty support grid allowing rapid heating of a new mold assembly that will soon be transferred to a 2100 F furnace car.

Scene 7 – Mold on Loading Table

Before the automatic process begins, an operator places a mold assembly onto the preheating station support grid.

Scene 8 – Inside of Preheating Bell

The preheating bell is insulated with energy efficient ceramic fiber, and contains more heating elements that can be controlled as an independent zone for maximum temperature uniformity. Together, heating elements in the base and preheat bell will heat a new mold assembly to 500-600 F before it is moved to the furnace.

Scene 9 – Lowering Preheating Bell – Video

To begin the fully automated processing cycle, the operator selects a program or recipe associated with a specific bit type and size. Each type of bit processed can have different processing variables. The automatic process begins as the preheating bell lowers over the mold, which will heat it to a preset temperature.

Scene 10 – Raising Preheating Bell – Video

At the end of the preheat cycle, the preheating bell is raised . . .

Scene 11 – Pushing Mold to Cook Block Begin – Video

. . . and the preheated mold assembly is smoothly and quickly pushed to the furnace cook block . . .

Scene 12 – Pushing Mold to Cook Block End – Video

. . . with an improved variable-speed transfer mechanism.

Scene 13 – Pusher Retract – Video

The pusher arm then retracts from the cook block so the mold can be raised into the furnace.

Scene 14 – Mold on Furnace Cook Block

The furnace cook block includes a special cook block with drain holes to help contain and manage binder leaks. The cook block also mates with a removable furnace bottom that also facilitates cleaning up bad binder spills that can otherwise cause significant damage to the furnace insulation.

Scene 15 – Chain Drive Elevator System

A rugged chain drive lifting system with double the capacity needed is constructed with redundant chains and a brake motor that engages whenever the drive stops for maximum operator safety.

Scene 16 – Raising Cook block Into Furnace – Video

With the mold located in the center of the cook block, it is quickly and automatically raised into the furnace to commence the firing process.

Scene 17 – View Inside Furnace Over Mold

Today, all our furnaces are designed with more kilowatts of heating power so mold assemblies may be heated faster, enabling the furnace to achieve higher daily production volumes.

Scene 18 – Lowering Cook block From Furnace – Video

At the conclusion of the furnacing stage, a fully heated mold assembly is lowered . . .

Scene 19 – Puller Arm Coming Down – Video (quick fade to scene 20)

. . . and the mold is quickly moved from the furnace cook block to the first available quench station.

Scene 20 – Pulling Mold From Cook block – Video

(Previous sentence spans Scene 19 and 20)

Scene 21 – Cooling Base Plate

A heavy-duty steel cooling base plate is mounted over a large cooling water tank that may be connected to city water, or a plant water recirculation system. Directional cooling and solidification is employed, cooling molds from the bottom to the top.

Scene 22 – Pulling Mold Onto Base Plate – Video

The mold is automatically positioned in the center of the quench table which is directly . . .

Scene 23 – Looking Up From Mold on Base Plate

. . . beneath the selected cooling bell.

Scene 24 – Single Cooling Bell Turntable

Up to five differently sized cooling bells can be mounted on a rotating turntable located above each cooling station. Optimally sized cooling bells can be selected in the process recipe for each of your mold sizes.

Scene 25 – Two Turntables on Movable Structure

Because cooling requires the longest stage of bit processing and is also the most critical stage, this system includes two cooling stations for maximum automated throughput. While one mold of a specific size is cooling at one station, another mold of a different size can be cooled at the other station.

Scene 26 – Inside of Cooling Dome

Cooling domes are insulated to help regulate the controlled cooling process. This system is specifically designed for differential cooling from the bottom to the top, and from the outside to the inside.

Scene 27 – Lowering Cooling Dome – Video

With a mold moved into cooling position, a cooling dome is lowered over the hot mold, which initiates the precisely controlled cooling process.

Scene 28 – Raising Cooling Dome – Video

When the mold assembly is precisely cooled to the programmed temperature, the cooling dome is raised . . .

Scene 29 – Driving Mold to Conveyor – Video

. . . and moved toward a final segment of conveyor track.

Scene 30 – Pulling Mold onto Conveyor – Video

The mold is pulled onto the track . . .

Scene 31 – Puller Arm Up – Video

(no dialog, short scene)

Scene 32 – Mold Rolling on Conveyor – Video

. . . which enables the mold to be easily moved to the break out area.

Scene 33 – Cooling Bell Structure on Right Side Detail

To conserve floor space, the two cooling stations are mounted in a structure that automatically moves left and right to feed the single roller conveyor track.

Scene 34 – Overview of Cooling Bell Structure at Right Position

While a mold is cooling in the left cooling station, the structure moves so the right cooling station will be ready to immediately receive the next hot mold to come out of the furnace.

Scene 35 – Transition to Cooling Bell Structure at Left Position

When a fully cooled mold assembly is ready to be moved from a cooling station to the break out conveyor, the entire structure automatically moves into the corresponding position.

Scene 36 – Cooling Dome Structure on Left Side Detail

A major benefit of this fully integrated and automated system is that it can manage up to 4 mold assemblies at the same time. One mold can be in the preheating bell, a second in the furnace, a third in the left cooling station, and a fourth in the right cooling station.

Scene 37 – Visual Alarm While Moving - Video

Audible and visual alarms accompany the slow movement of the structure for operator safety.

Scene 38 – Main Control Panel Master

Primary controls for the entire system are located in a master control panel that is generally located within 50 feet of the system.

Scene 39 – Zooming to Main Control Panel

The control system allows operators to control each element of the process remotely, precisely, and repeatedly.

Scene 40 – Main Control Panel Detail

The primary operator interfaces for the entire control system are a touch screen panel for data entry, and a paperless recorder for data collection and monitoring.

Scene 41 – Inside Control Panel

Keith is a UL panel shop, and provides the highest quality control equipment designed for safety, reliability, and user friendliness. All wires are clearly labeled to match a corresponding set of electrical drawings for the entire system.

Scene 42 – Tap Switches on Power Panel

A tap changing transformer with tap switches are provided to allow the furnace to operate at the lowest possible electrical cost as the heating elements age over their life cycle.

Scene 43 – Individual Element Monitoring

Power to each heating element series is monitored so heating elements that are operating inefficiently or that have burned out can be easily identified and more quickly replaced.

Scene 44 – Master Mechanical System Switches

In addition to central PLC control of all mechanical functions, manual switches are also included for maintenance purposes.

Scene 45 – Quench Platform Manual Switches

Each of the two cooling stations also includes manual over ride switches . . .

Scene 46 – Preheat Station Manual Switches

. . . as does the preheat station. Thus, all mechanical systems can be operated automatically from the PLC program, manually from the master touch screen user interface, or manually from independent over ride switches located near each subsystem.

Scene 47 – Furnace Heating Element Replacement

Access to the furnace heating elements is through sliding side panels.

Scene 48 – Preheat Station Element Replacement

The heating elements in the preheating base and bell are also designed for convenient access and maintenance.

Scene 49 – Master System View 1

The complete bit furnacing, cooling, and associated material handling is managed automatically, eliminating the possibility of human error, and reducing the potential for an accident. The ability to have perfectly repeatable bit processing that can be accurately reproduced is essential for optimum process and quality control.

Scene 50 – Master System View 2

Transfers are faster for production efficiency, and the heating and cooling systems provide better heating and cooling control than ever before and are more durable. This complete system also requires less floor space than its predecessors.

Scene 51 – Wendell Close – Video

We hope you've seen something here that can solve a problem you may face. If so, we'd welcome the opportunity to discuss your needs, and explore solutions. Thank you for watching, and we look forward to speaking with you soon.

Scene 52 – Contact Information Slide

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