

THEORY OF OPERATION FOR DUNCAN KILN #DA 1029-2

THEORY

IN A VERTICAL KILN WITH HEATING ELEMENTS ON THE SIDE WALLS, THE TOP & BOTTOM ELEMENTS HAVE THE ADDITIONAL JOB OF HEATING THE TOP & BOTTOM WALLS. TO COMPENSATE FOR THIS AND ATTEMPT TO ACHIEVE TEMPERATURE UNIFORMITY, THE POWER OUTPUT OF THE TOP AND BOTTOM SET OF ELEMENTS IS INCREASED. SINCE HEAT TENDS TO RISE, THE BOTTOM ELEMENTS USUALLY HAVE MORE POWER THAN THE TOP SET. SINCE THE WORK BEING HEATED MAY VARY IN DENSITY OR THICKNESS FROM TOP TO BOTTOM, INFINITE CONTROL SWITCHES ARE PROVIDED TO TRIM THE HEAT PROFILE TO MORE CLOSELY MATCH THE LOAD.
FINALLY, SINCE ALL KILNS VARY IN PERFORMANCE, EXPERIENCE WILL ASSIST IN LOADING THE KILN TO MATCH THE HEATING PROFILE.

OPERATION

EQUIPMENT FUNCTION

- A
- 1 — THE TOTAL TIME FOR THE HEATING CYCLE IS CONTROLLED BY THE KILN SITTER / LIMIT TIMER (KSLT)
 - 2 — THE RATE OF HEAT RISE IS CONTROLLED BY THE CYCLE TIMERS IN CONJUNCTION WITH THE POWER RELAYS.
 - 3 — TEMPERATURE PROFILE CAN BE MODIFIED BY THE INFINITE CONTROL SWITCHES.
 - 4 — THE BOTTOM ELEMENTS ARE DIRECT CONNECTED TO THE POWER SUPPLY AND CANNOT BE TRIMMED.

SET-UP

- B
- 1 — BE SURE THE POWER CORD IS PLUGGED INTO A PROTECTED (FUSED OR CIRCUIT BREAKER) POWER SUPPLY WITH THE REQUIRED VOLTAGE AND AMPERAGE AS SPECIFIED ON THE WIRING DIAGRAM.
 - 2 — SET THE SAFETY TIMER FOR AT LEAST 1/2 HR LONGER THAN THE ANTICIPATED CYCLE TIME.
 - 3 — THE KILN SITTER SHOULD BE CALIBRATED PER THE DETAILED ADJUSTMENT INSTRUCTIONS WHICH ARE IN THE KILN OWNER'S MANUAL.
 - 4 — INSERT A PYROMETRIC BAR OR SMALL CONE IN THE KILN SITTER. CHECK TO BE SURE THE TRIGGER MECHANISM IS OPERATING FREELY. (REFER TO THE KILN SITTER INSTRUCTION MANUAL.
 - 5 — RAISE THE WEIGHTED LEVER TO ENGAGE THE "CLAW" AND DEPRESS THE PUSHBUTTON. THIS WILL ADMIT ELECTRICAL POWER TO THE KILN CONTROL CIRCUITRY.

OPERATING MODE

AUTOMATIC

- C
- 1 — DEPRESSING THE KSLT PUSHBUTTON WILL ADMIT POWER TO THE REPEAT CYCLE TIMER (RCT) AND THE FIXED INTERVAL TIMER (FIT) ALSO THE POWER WILL FLOW TO THE COMMON (COM) CONTACTS ON THE POWER RELAYS.
 - 2 — ASSUMING THE 3-POS ROCKER SWITCH IS PUSHED TO THE RIGHT, POWER WILL FLOW THRU THE TIMERS AND THEN TO THE LI (B) CONTACT ON THE POWER RELAY COILS. THIS WILL ENERGIZE BOTH RELAY COILS, THUS OPENING THE POWER LEAD CONTACTS AND CUTTING OFF POWER TO THE ELEMENTS.
 - 3 — THIS CONDITION WILL EXIST FOR ONE (1) MINUTE UNTIL THE THE RCT TIMES OUT, THE SWITCH BETWEEN 2&3 ON THE RCT OPENS, AND POWER TO THE POWER RELAY COILS IS CUT OFF. THIS ALLOWS THE POWER LEAD CONTACTS TO CLOSE POWER IS ADMITTED TO THE ELEMENTS.
 - 4 — AFTER ONE (1) MINUTE, THE RCT TIMES OUT AGAIN, THE CONTACTS (2-3) CLOSE AGAIN. POWER IS RESTORED TO THE RELAY COILS OPENING THE POWER LEAD CONTACTS WHICH INTERRUPTS POWER TO THE ELEMENTS. THIS PROCESS REPEATS (HENCE RCT) AS LONG AS POWER IS SUPPLIED TO THE #2 CONTACT ON THE RCT EITHER THRU THE FIT OR BY THE 3 POS ROCKER SWITCH BEING PLACED IN THE LEFT OR MIDDLE POSITION.
 - 5 — AFTER 2 HOURS, THE FIT WILL TIME OUT OPENING THE SWITCH BETWEEN 1 & 2. THIS WILL PERMANENTLY INTERRUPT POWER TO THE RELAY COILS ALLOWING THE NC CONTACTS TO CLOSE. THIS ENABLES THE ELEMENTS TO FIRE FULL TIME UNDER CONTROL OF THE INFINITE SWITCHES UNTIL THE POWER IS CUT OFF BY EITHER THE KILN SITTER CONE OR THE SAFETY TIMER .

LOW

D

- 1 — MOVING THE 3-POS ROCKER SWITCH TO THE LEFT POSITION DIRECTS LI POWER DIRECTLY TO THE #2 CONNECTION ON THE RCT THUS KEEPING THE CIRCUIT IN A CONTINUOUS ON/OFF CYCLE. THIS RESULTS IN A LOWERED HEAT INPUT.
- 2 — THIS CONDITION WILL REMAIN UNTIL THE SWITCH IS MOVED TO THE CENTER POSITION (MANUAL) OR THE KILN SITTER SHUTS THE KILN DOWN.

MANUAL

- E
- 1 — MOVING THE 3-POS ROCKER SWITCH TO THE MIDDLE POSITION CUTS OFF THE LI POWER TO THE RELAY COILS. THIS ALLOWS THE POWER LEAD CONTACTS TO CLOSE, ADMITTING POWER TO THE ELEMENTS. THE ELEMENTS WILL HEAT CONTINUOUSLY. THE ONLY CONTROL WILL BE BY THE INFINITE SWITCHES ON THE TOP TWO (2) SETS OF ELEMENTS
 - 2 — THE ELEMENTS WILL CONTINUE IN THIS MODE UNTIL SHUT DOWN BY THE KILN SITTER OR TIMER. MOVING THE 3-POS SWITCH TO THE LEFT OR RIGHT POSITION WILL RE-ESTABLISH THE LOW OR AUTOMATIC MODE FROM THE START OF THE CYCLE.

ORIGINAL ISSUE	DATE	BY	DESCRIPTION
11-5-98		NJM	

SERVICED BY
PARAGON INDUSTRIES, INC
 2011 SOUTH TOWN EAST BLVD
 MESQUITE, TEXAS 75149-1122

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PART NO

TD1029-2

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