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Alternative fuel systems engineered for cement kilns

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AUTOMATED MID-KILN TIRE FEED SYSTEM MANUAL

LAFARGE CANADA

Brookfield, Nova Scotia

by

AFS Technology

Project #1642

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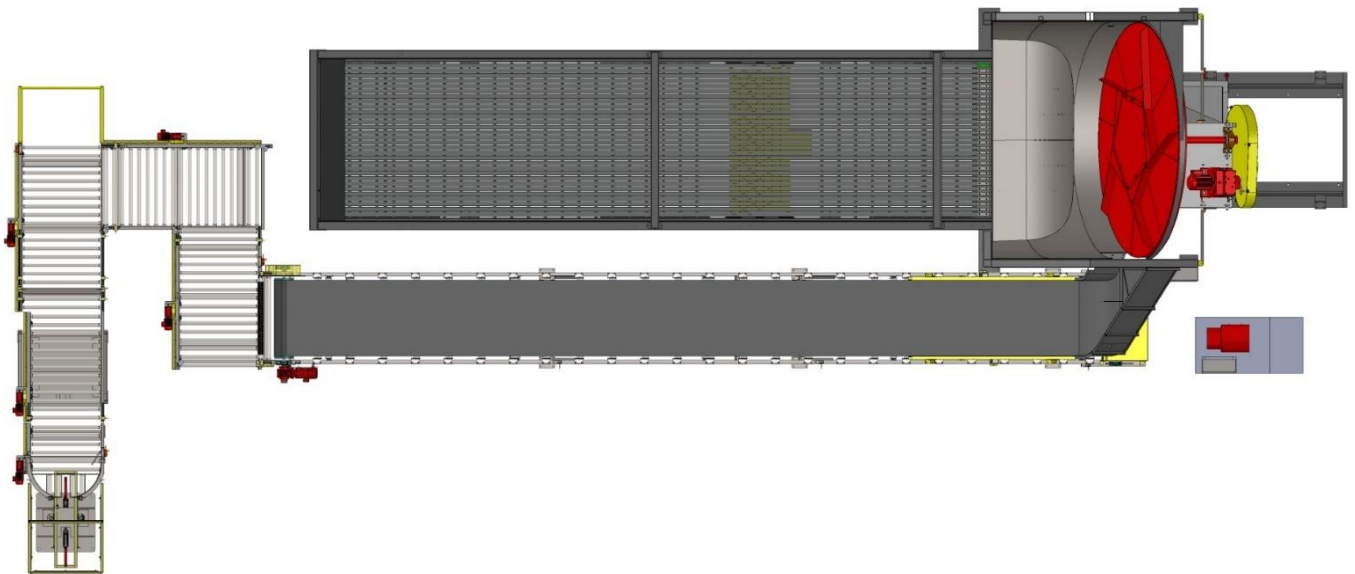


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RECOMMENDED SPARE PARTS

CLASS I - SHOULD BE STOCKED AT ALL TIMES
CLASS II - MAY REQUIRE REPLACEMENTS WITHIN 2 YEARS

CLASS	TOTAL QTY	REC SPARES	DESCRIPTION	EQUIPMENT DESIGNATION
GEARMOTORS				
I	1	1	SEW EURODRIVE R137DRN132M4/DH – 10hp	TIRE SEPERATOR
I	1	1	SEW EURODRIVE FA107DRN100LM4/RS/DH – 3hp	HOOK ELEVATOR
I	4	1	SEW EURODRIVE S47DRN80M4/DH - 1hp	BDLR CONVEYORS
I	1	1	SEW EURODRIVE SA77TDRN100LM4/RS/DH – 3hp	BELT CONVEYOR
I	1	1	SEW EURODRIVE ST77TDRN100LM4/RS/DH - 3hp	BELT CONVEYOR
CONVEYOR BELTS				
I	1	1	Gates 8MGT-4400-21 Polychain Carbon Belt	BDLR CONVEYOR
I	1	1	Gates 8MGT-544-21 Polychain Carbon Belt	BDLR CONVEYOR
I	1	1	Gates 8MGT-3280-21 Polychain Carbon Belt	BDLR CONVEYOR
I	1	1	Gates 8MGT-896-21 Polychain Carbon Belt	BDLR CONVEYOR
II	1	1	Conveyor Belt 2-Ply - 48" Long x 48" Wide	STAGING CHUTE
II	1	1	Conveyor Belt 2-Ply – 105' Long x 54" Wide	BELT CONVEYOR
ELECTRICAL COMPONENTS				
I	2	1	Telemecanique XCSA503 Safety Limit Switch	TIRE SEPERATOR
I	2	1	Telemecanique XCSZ05 Safety Latch (key)	TIRE SEPERATOR
I	3	1	Allen-Bradley 440E-L13043 LifeLine 4 Cable Pull Switch	BDLR CONVEYOR
I	9	2	Inductive proximity sensor V3T1-R0-3Q with E18449 AC Micro Cable	VARIOUS
I	15	3	Banner S30RW3REQ1 12mm Photosensor Receiver/Emitter	VARIOUS
I	30	6	Banner MQAC-430RA 4-Pin Microfast Cable - 30' Long	VARIOUS
I	1	1	Turck NI60-K90-AZ3X-B2131 60mm Proximity Mid-Kiln Sensor	CAM
PNEUMATICS				
II	1	1	Festo DCBC-100-250-PPVA-N3 Air Cylinder 100mm Bore 250mm Stroke	STAGING CHUTE
II	1	1	Festo DCBC-100-400-PPVA-T1 Air Cylinder 100mm Bore 400mm Stroke	CAM
BEARINGS				
I	2	1	Dodge P2B-SC-60M - 2-Bolt Pillow Block Ball Bearing for 60mm Shaft	BELT CONVEYOR
I	2	1	Dodge P2B-SC-50M - 2-Bolt Pillow Block Ball Bearing for 50mm Shaft	BELT CONVEYOR
I	2	1	Dodge F2B-SC-50M - 2-Bolt Flange-Mount Ball Bearing for 50mm Shaft	CAM
I	2	1	Dodge F4B-SC-50M - 4-Bolt Flange-Mount Ball Bearing for 50mm Shaft	CAM
I	2	1	Dodge P2B-SCM-207 - 2-Bolt Pillow Block Bearing for 2-7/16" Shaft	STAGING CHUTE
I	2	1	Dodge F4B-LT7-300 - 4-Bolt Square Plain Sleeve Bearing for 3" Shaft	MID-KILN VALVE
I	2	1	McGill CCFH4SB Crowned Cam Follower Roller	MID-KILN VALVE
I	2	1	Jones JE5415F - 4-Bolt Solid Pillow Block Bearing for 4-15/16" Shaft	TIRE SEPERATOR
I	2	1	Jones JE2315F - 4-Bolt Solid Pillow Block Bearing for 3-15/16" Shaft	HOOK ELEVATOR
I	2	1	Jones JT9-2215 - Take-Up Block Bearing for 2-15/16" Shaft	HOOK ELEVATOR
I	186	4	Tritan UCFL205-25MM - 2-Bolt Flange Bearing for 25mm Shaft	BDLR CONVEYOR
PULLEYS & IDLERS				
II	1	1	Drum Pulley DCEMA-1457CFXT3014s 14" Dia - 57" Wide	BELT CONVEYOR
II	1	1	Drum Pulley DCEMA-1257CFXT3014s 12" Dia - 57" Wide	BELT CONVEYOR
I	20	2	Phoenix Idler Pulley 31350100 - 3.5" Steel Flat	BDLR CONVEYOR
I	1	1	Pulley Wire for Lifting, 3/4" Dia	CAM
I	30	3	Idler Roller C5-RET-54 - 54" Wide	BELT CONVEYOR
I	50	2	Idler Bracket 32-000019 – 4.25 Rise	BELT CONVEYOR
I	10	2	Idler Bracket 32-000020 – 1.5 Drop	BELT CONVEYOR
CHAINS & SPROCKETS				
I	1	1	ANSI 50 Roller Chain 5' L	BELT CONVEYOR
I	1	1	ANSI 50 Chain - 60 Teeth Roller Chain Sprocket	BELT CONVEYOR
I	1	1	ANSI 50 Chain - 15 Teeth Roller Chain Sprocket	BELT CONVEYOR
I	1	1	Tsubaki US200-RIV-68 Roller Chain x 68 Pitches	TIRE SEPERATOR
II	1	1	Roller Chain Sprocket 200BS21HT - 3-5/8" with KW & 2SS	TIRE SEPERATOR
II	1	1	Roller Chain Sprocket SP200B54 - 4-15/16" with KW & 2SS	TIRE SEPERATOR
II	1	1	Webster Sprocket WH106C19 - 3-15/16" with KW 2 SS	HOOK ELEVATOR
II	1	1	Webster Sprocket WH106C13 - 2-15/16" with KW 2 SS	HOOK ELEVATOR
II	1	1	Webster WH106 Chain Link 90' L	HOOK ELEVATOR
II	108	10	Gates 8MX32S21 Polychain 21mm Belt Sprocket - 8mm Pitch, 32 Teeth	BDLR CONVEYOR
HYDRAULICS				
I	2	2	Insert Grainger 29HZ19	HOPPER
I	2	2	Coupling Insert Grainger 29HZ13	HOPPER
I	2	2	Breather Vickers BR110	HOPPER

EQUIPMENT DESCRIPTION

Hook Elevator

- a) The Hook Elevator is a free standing, laterally stable structure to properly support and maintain alignment of the Actuation Cam and Staging Chute.
- b) The elevator is designed to elevate the tires from Centering Conveyor to the Tire Staging Chute above the kiln. The height from the centerlines of the tail sprocket to head sprocket is approximately 14.0 meters.
- c) The elevator has guards on all moving parts, in addition to basket guarding for tires.
- d) The head assembly includes a 900mm diameter chain sprocket mounted on a 90mm diameter shaft with type C pillow blocks and tapered roller bearings. The chain sprocket is driven by a shaft mounted 5.5kW SEW-Euro-drive gear motor. The head guide is lined with UHMW polyethylene. Discharge rollers are slave driven from the head sprocket shaft.
- e) The tail assembly includes a 700mm sprocket mounted on a 75mm diameter shaft with 4-bolt flange bearings mounted in a screw take-up frame.
- f) The elevator chain is a 152mm pitch Webster chain.

Centering Conveyor

- a) This conveyor is designed for centering the tires for pick up by the AFS Hook Elevator and includes the following:
- b) One (1) BDLR conveyor 1.5 meters long with an effective width of 1270mm.
- c) The egress roller has a left-hand and right-hand opposing steel spiral fighting to force each tire towards the center.
- d) One (1) centering frame, designed to mate with the hook elevator - which includes dual diverting arms and a half-circle back stop with a radius of 1.22 meters.

Weigh System

- a) The weigh system consists of a belt-driven live roller conveyor (BDLR) mounted on a platform scale with a structural steel support frame and a locally mounted display/controller. The display/controller consists of a GSE or Schenck digital weight controller or equivalent.
- b) The programming of the Weighing System will use weight error tracking of each tire fuel charge in the Tire Staging Chute. Tires are added or "not added" to the staging chute based on the accumulated weight error per kiln revolution.
- c) The location of the Weighing System is at ground-level for easy access for maintenance and stability from windy conditions. The weights of each tire are tracked up the Hook Elevator to the Tire Staging Chute.

Above-Kiln Tire Staging Chutes

- a) The above-kiln tire staging feed chute allows the accumulation and staging of up to 3 tires.
- b) The discharge of the feed chute includes a pneumatically actuated gate, which is synchronized to open as the mid-kiln valve passes.

Mid-Kiln Valve Actuator Cam

- a) The mid-kiln valve actuator cam is mounted above the kiln and supported by the mid-kiln tower structure.
- b) The cam is pneumatically actuated to engage with the cam follower during tire feed cycles and disengage during non-feed cycles.
- c) The cam follower is mounted on the shaft of the flap gate of the mid kiln valve.
- d) The profile of the cam surface is based on kiln outside diameter rotating at a specified speed.

Mid-Kiln Valve

- a) The valve includes a single flap-gate with lip seal with adequate clearance for heat expansion of the gate.
- b) The shaft of the gate pivots on two graphite bearings mounted in custom-made steel pillow block housings.
- c) The opening of the valve includes a tapered chute opening, which extends approximately 1 meter out from the valve opening.
- d) A tube casting extends into the kiln approximately 1.6 m and is made of Super 22-H alloy rated for temperatures up to 1230 degrees C.

Live Bottom Hopper

- a) The AFS live bottom hopper is designed to be loaded from the westside by a customer supplied front-end loader. The hopper interior dimensions are 2.64m high x 2.9m wide x 12.2m long - providing a total volume of 93.4 cubic meters.
- b) The unit incorporates one 12.2m long live floor powered by a 15 kW, 460 VAC, 3PH, Hallco 3200 series hydraulic floor system. This live floor will be supported by a structural steel tubular frame as specified by Hallco engineering.
- c) The hydraulic pumping unit is to be mounted to a 380 liter oil reservoir with oil heater and high temperature switch.
- d) The expected duty cycle to feed the separator is less than 10% of the system run time.

Rotating Disk Tire Separator

- a) The Rotating Disk Separator has a 4.27m diameter flat face disk, with five radial flights equally spaced on the front face surface of the disk. It has a receiving hopper and curved ramp leading up to the discharge of the Live-Bottom Hopper. It is powered by a SEW Euro drive variable speed 7.5 kW drive arrangement. The maximum feed rate is 12 -14 tires per minute. The speed of the separator is dependent on the number of tires accumulated in the Accumulation Refinement Conveyor directly following the discharge of the Separator.

Tire Separator Discharge Conveyor

- e) General: 1370 mm wide x 14.9 m long c/c belt conveyor at a variable speed of 10 - 30 m per minute to handle a maximum 10 TPH of whole tires, having a weight of 9 kg each, up a 15° incline.

- f) Head Section: One 350 mm diameter x 1450 mm crowned face drive head pulley with 6 mm plain lagging, mounted on 60 mm diameter SAE 1045 steel shaft, TG&P set in 60 mm ball bearing pillow blocks. Mounted and aligned in a structural steel weldment, nip guard included and mounted at head pulley. Includes (3) slave-driven discharge rollers.
- g) Drive: One 2.25 kW shaft mounted SEW Euro drive motor with backstop, completely assembled and mounted on the head section.
- h) Intermediate Sections: Intermediate weldments of 260 mm deep structural channel with angle cross bracing.
- i) Tail Section: One 300 mm diameter x 1450 mm crowned face drum tail pulley mounted on 50 mm diameter SAE 1045 steel shaft, TG&P set in 50 mm diameter ball bearing pillow blocks, and pulley guard, mounted and aligned in a structural steel weldment.
- j) Idlers: One lot of 130 mm diameter flat belt carrying idlers for 650 mm spacing and additional idlers in loading area, frame pre-punched. One lot of 130 mm diameter return idlers for 3 m maximum spacing, channel frame pre-punched.
- k) Belting: 1370 mm wide, 400 kg/10 cm, "Smooth-Top" medium oil resistant conveyor belt with 3 mm x 2 mm covers and mechanical splice.

Separation Refinement and Inspection System

- a) This consists of 6 Belt Driven Live Rollers (BDLR) Conveyors arranged in a series of turns to refine the separation of tires, inspect and reject tires outside preset dimensional specifications.
- b) Each zone of BDLR Conveyor has an effective width of 1400 mm with 63.5 mm diameter rollers made of 3 mm thick steel with a solid shaft and externally mounted 2-bolt flange bearings mounted on 152.4 mm centers. The rollers for each zone are externally driven by a serpentine belt drive using a Gates or Goodyear belt and pulley system. Each zone is driven by a 0.75 kW SEW-Euro drive electric gear motor. The conveyors speeds will be variable from 10 - 30 meters per minute.
- c) Turns in the refinement configuration will incorporate a vertical turning post to aid the tire through each corner.
- d) Also included will be a Tire Reject Bin 1.5 m x 1.5 m x 2.1 m high with access door and fork truck lifting capabilities.

Platform for Separation Refinement and Inspection System

- a) This will be a structural steel platform elevated approximately 2.3 m above grade and specifically designed to support the above Separation Refinement, Inspection and Weighing Conveyors. The platform will include handrail and one stairway access.

GENERAL MAINTENANCE

1) Bearings

- a) Bearings need periodic lubrication. See recommended lubrication schedules in the Lubrication Section. Routine inspection should be performed to detect wear and/or fatigue.

2) Photoelectric Sensors

- a) Occasionally clean by wiping the lens with a damp cloth.

3) Proximity Switches

- a) Occasionally clean by wiping the lens with a damp cloth.

4) SEW Eurodrive Gear Motors

- a) The gear motor requires lubrication. Refer to the Lubrication Section of this manual for details of lubrication type and capacities.

5) Routine Maintenance Schedule

- a) All equipment should be included into your routine plant maintenance schedule.