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# SPECIFICATIONS

FOR

## 90" DIA. LIME SLAKER

HOLLY SUGAR CORPORATION

BRAWLEY FACTORY

GENERAL: These specifications describe a Rotary Lime Slaker in strict conformance with HOLLY SUGAR CORPORATION Inquiry dated March 16, 1983 (Requisition No. BY-1007-ED) and Holly Drawing No. A-90351-6.

The Slaker consists of a 90" diameter horizontal shell driven by a ring gear and rotating on steel tires supported by idler trunnions. Arrangement will be as shown by LUCAS ENGINEERING Drawing No. 72-953 enclosed.

OPERATING PERFORMANCE: The equipment proposed is designed to produce high quality Milk of Lime (M.O.L.) from normal calcined Lime Rock, without water burning or drowning. The internal agitating flights are interrupted to promote vigorous liquid circulation and set at a sufficiently low helix angle to prevent lifting of the solids above the liquid level.

Internal flights are arranged in four rows 90° apart, so that at least one row is immersed and agitating the M.O.L. at all times.

| | CONCURRENT OPERATION | COUNTER-CURRENT OPERATION |
|---|---|---|
| Milk of Lime: | | |
| Apparent Density | 32°Bx | 32°Bx |
| CaO, in % on Beets | 3.6% | 3.6% |
| Production Rate | 280 gpm | 280 gpm |
| Retention Time | 2.6 min | 2.6 min |
| Outlet Temp. | 180° F | 212° F |
| Reynolds No. | $6.9 \times 10^7$ vs | $7.3 \times 10^7$ vs |
| $N_{Re}$ reqd for Turbulence | $1 \times 10^4$ | $1 \times 10^4$ |

| | CONCURRENT OPERATION | COUNTER-CURRENT OPERATION |
|---|---|---|
| Calcined Lime: | | |
| Production Rate | 325#/min | 325#/min |
| Bulk Density (dry) | 50#/cu. ft. | 50#/cu. ft. |
| " " (hydrated) | 33#/cu. ft. | 33#/cu. ft. |
| Volumetric Rate | 10 cu. ft/min | 10 cu. ft/min |
| Inlet Solids/Liquid Ratio | 1:4 | 1:4 |
| Design Conveying Rate | 3.0 ft/min | 3.0 ft/min |
| Residence Time | 10 min | 10 min |
| Dross, % on Rock | 5% | 5% |

MECHANICAL DESIGN: The Slaker and all mechanical components have been conservatively designed to provide indefinite life. Individual components are as follows:

| | |
|---|---|
| Rotating Shell | 3/8" Thk A-36 Plate |
| Tires | 100" O.D. x 94" ID x 6" Face Width |
| Idler Trunnions | 13½" O.D. x 7" Face Width |
| Trunnion Shaft | 5" dia x 4" @ Brgs |
| Trunnion Bearings | Timken Type "AP" Class B (4¼ x 8) |
| Ring Gear (AGMA Class 6) | 2 D.P. x 200 Teeth x 5" Face Width |
| Pinion (AGMA Class 6) | 2 D.P. x 30 Teeth x 5½" Face Width |
| Thrust Rolls | 9" dia x 3" Face Width |

Mechanical Design parameters are:

| | Actual | Allowable |
|---|---|---|
| Tire/Trunnion Loading | 7275 lbs vs | 20250 lbs |
| Trunnion Bearings, $L_{10}$ Rated Life | 32,500,000 hrs | N/A |
| Trunnion Shaft Stress | 1371 psi | 25,000 psi |
| Pinion: Tooth Bending | 12,154 psi | 22,000 psi |
| Surface Durability | 9430 psi | 50-60,000 |

The ring gear is mounted to the shell by means of double wedges which will be adjusted in the shop to 1/16" T.I.R. (±1/32") and welded in position. The adjacent tire is located concentric with the gear by a machined pilot, so that pitch line contact of the gear and pinion is virtually independent of runout.

The pinion is arranged to dip into a reservoir of "Extreme Pressure" lubricant, providing continuous lubrication for itself and the ring gear.

Continuous lubrication of the tires and trunnions is not considered necessary, especially in the dirty lime kiln area, although it can easily be provided at the customer's option.

DRIVE: The proposed Slaker is driven by the pinion mounted directly on the low-speed output shaft of the speed reducer, driven by a V-Belt Drive from an electric motor.

Drive components are:

Speed Reducer:

Manufacturer.....Hansen
Type.....JFN Concentric Shaft
Size.....81C-Double Reduction
Ratio (Actual).....25.0:1
Service Factor.....2.6
Low Speed Shaft:
O.H. Load.....13,400 lbs. (Allowable)
" " ..... 5,408 " (Actual)

V-Belt Drive:

Manufacturer.....Dodge
Type.....Dyna-V
Belts.....Four-3V850
Driven Sheave.....10.6 O.D. w/2" Taper-Lock Hub
Driving Sheave.....5.6" O.D. w/1 5/8" Taper-Lock Hub

Motor:
Frame 254T
Size.....15 H.P.
Type.....Horizontal
Enclosure.....TEFC
Elec. Characteristics.....460V3ph 60 Hz

PAINTING: Exterior surfaces, not machined, will be painted one coat shop primer. Machined surfaces will be given one coat Rustoleum rust preventive compound.

SHIPPING AND ERECTION WEIGHTS: Shipment will be made by contract motor freight carrier for delivery to installation site.

Calculated Shipping Weights are:

| | |
|---|---|
| Shell Assy with Tires and Ring Gear | 17,800 lbs. |
| Trunnion Cradle, Drive End | 2,900 |
| Trunnion Cradle, Idler End | 1,500 |
| Speed Reducer | 680 |
| Motor | 162 |
| V-Belt Drive, w/Guard | 130 |

FIELD ERECTION: The shell will be shipped with ring gear and tires mounted true to T.I.R. (±1/32"). No further field adjustment will be necessary. Trunnion cradles will be shipped with trunnion roll faces in same plane and axes parallel. However, because field mounting on foundations will inevitably involve slight misalignment between the two cradles, some adjustment of trunnion alignment will probably be required. Jackscrews for this adjustment are provided for each trunnion bearing.

The following sequence of installation is recommended:

1. After setting slaker on trunnions, adjust thrust rollers to within 1/8" of thrust ring faces (¼" total float).

2. Check bearing of trunnion faces against tires with feeler gauges and adjust as necessary.

3. Install speed reducer and electric motor drive on shovel mount provided. Bring pinion into engagement with ring gear and adjust to .065 blacklash for preliminary tooth bearing.

4. Fill pinion reservoir with E.P. lubricant.

5. Set up dial indicator and jog ring gear one or more revolutions to locate maximum run-out, and bring that point to conjunction with pinion.

6. Increase engagement to .045 minimum backlash across teeth.

7. Rotate shell several revolutions, observing lubricant pattern for uniform bearing across tooth face and skew reducer as necessary to obtain same.

8. During step No. 7 also observe behavior of tire against thrust rollers. Correct behavior is for slaker to float between the thrust rollers, never in contact for more than a fraction of a revolution of the slaker.

9. To correct one-directional float, apply lubricant to both tires and observe pattern following trunnion contact. Back of one bearing on each cradle to obtain uniform pattern (advancing other bearing is not recommended as it may reduce backlash to unacceptable minimums).

10. Securely lock all adjustment and observe at frequent intervals for proper operation during first 24 hours of operation, and once each shift thereafter.

11. Note: Shell will expand about ¼" from 70° F ambient to operating temperature. Tires should be centered on trunnions when operating at normal rate.

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