

GEORGIA INSTITUTE OF TECHNOLOGY

ENGINEERING EXPERIMENT STATION

ATLANTA 13, GEORGIA

April 19, 1962

Mr. J. W. Dickens, Agricultural Engineer
Box 5906
N. C. State College
Raleigh, N. C.

Subject: Final Report - Contract No. 12-25-010-2651
Design and Testing of Mechanical and Structural Components
of a Pneumatic Sampler for Farmer's Stock Peanuts

Dear Mr. Dickens:

A final report is hereby rendered on the subject project. In preparing the following, the paragraphs were numbered to refer to similar items on pages 2 and 3 in the original contract.

1. The experimental sampler at Dawson, Georgia, was studied in detail. Conferences were held with interested persons and the reliability of performance, ease of operation, useable life, repair, and other design factors were considered in order to develop design criteria for the sampler.
2. On the basis of the design criteria developed in the foregoing phase, specifications were developed for a pneumatic sampler. These specifications embraced ease of operation, simplicity of design, ease of repair, economical cost with adequate sampling capacity, and the maximum assurance of providing a representative sample.
3. Using the specifications developed a unit was designed. The necessary liaison work required to assist a contractor to build a prototype and to have the prototype sampler installed at the Dothan Oil Mills, Dothan, Georgia, was furnished. This liaison included assistance in the selection of a contractor, close contact with the contractor during construction of the unit, and close supervision of the erection of the unit in Dothan. It also included liaison with the Dothan Oil Mills personnel as to site selection and specifications for the necessary footings.
4. After erection the unit was fully tested and all mechanical and structural components were thoroughly checked. The unit was deemed suitable for long term testing.

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5. In conjunction with the Federal State Inspection Service tests were formulated to determine wear and usage factors of the sampler in an accelerated life test. The unit was used to obtain some 3600 samples which is the equivalent of one year's operation.
 6. After the sampling operations the unit was carefully inspected and all major wear points examined. Operating personnel were questioned and comments, suggestions, and criticisms noted.
 7. The analysis of the data, comments of the operators, performance of the machinery, and suggestions of the Southeastern Peanut Shellers Committee were all considered and where applicable included in the final set of drawings and specifications.

As a general indication of corrective actions taken the following items are given:

- (a) All motors except the fan were specified to be of the encapsulated type.
- (b) A safety switch was added so that the bridge and crab could not be moved while the sampling tube was embedded in the peanuts.
- (c) Lights were added to the crab for night or late afternoon operation.
- (d) Cyclone diameter was increased to prevent sample shelling.
- (e) Safety guards were placed on bridge wheels (on stair side).
- (f) The hopper was changed to a round shape.
- (g) The hopper door and latch were redesigned.
- (h) Sampler and sample bags were reworked for maximum operator efficiency.
- (i) Hinges on control box were relocated.
- (j) Night locks for unit were installed.

In general the unit has performed well and there is no indication that any major component will wear out within two years of operation. The tube brake lining will probably have to be replaced more often; however, it has been designed for quick, easy, and economical restoration. With good maintenance the samplers should give relatively trouble free operation.

The Federal State Inspection Service should thoroughly train the operators in regards to how to use the unit. This training should include both mechanical operation and sample drawing and handling.

Mr. J. W. Dickson

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The submission of this final report together with a set of tracings to you and a set of prints to Suggs Machine Shop, Butler, Georgia, completes our requirements for this contract. We have enjoyed working with you on this engineering and development project.

Very truly yours,

Thomas A. Elliott
Project Director

Approved:

Thomas W. Jackson, Chief
Mechanical Sciences Division

Enclosure: Specifications
Tracings

SPECIFICATIONS FOR PNEUMATIC PEANUT SAMPLER

A-580-D-1; D-2

Foundations, Columns, Braces, Rails

These show combinations of welded and bolted structures. The top bolt flange for the 3" structural pipe may be welded to the H-Beam post at erection. All members may be welded if the contracting party agrees.

Bridge stops to be welded at all ends of tee bars $3/8 \times 4 \times 12$.

X-Braces $5/8$ D. Rod and Turnbuckles - Tee beams $2\frac{1}{2} \times 2\frac{1}{2} \times 3/8$.

A-580-D-3; D-4

Bridge Details

All parts shown bolted -- production models may be welded where possible.

X-Braces $5/8$ D. and Turnbuckles.

Tee beams $2\frac{1}{2} \times 2\frac{1}{2} \times 3/8$.

Wheel guards on stair side only.

A-580-D-5; D-6

Sample Tube Details

Standard aluminum irrigation pipe. Shims must be provided between the 3" OD aluminum tube and the KP49BK Fafnir bearing so that no air escapes in or out at this point. A gasket sealing material must be applied to both bearings at assembly.

Spacer bearing of stainless steel. Machine spacer bearing. Use pan head rivets. Vickery slip clutch for sprocket. Tube raise interlock switch frame welded to inner side of tube rotate motor.

A-580-D-7

Crab Frame

Floor of crab to be $3/4"$ #9-1 @ 1.71 lbs. per sq. ft. flattened expanded metal.

Sides and door to be covered with $1\frac{1}{2}$ #14-16 @ .46 lbs. per sq. ft.

Door to swing inward only and latch in closed position.

Crab drive motor to be mounted outboard (space angles to accommodate motor reducer used) see A-580-D-9.

One crab safety bracket to be placed at each corner.

A-580-D-8; D-9

Tube brake pedal and brake liner. Brake liner is mounted to 16 ga. backing and is mounted to outer shoe by 10-32 screws.

Flange bearings, fafnir LCS with G-KLLB bearing.

D-9 shows general locations of happer, crab drive motor, cyclone, and details of probe tube night locking arrangement.

A-580-D-10

Crab safety brackets are to be of 3/8 plate and to be bolted to crab frame at each corner as shown.

The schematic electrical diagram shows the necessary electrical components. All wiring to be encased in water proof electromechanical tubing. The main box should be raintight and all connections entering should be raintight. Tube and crab and bridge safety inter lock switch is for the purpose of preventing damage to the tube by moving either crab or bridge while tube is in the load. This is accomplished by using switch as shown which has a weight on the end of the chain. The weight should extend 3" below end of the tube so that when the weight rests on the load the switch PA SU-2 is open and power to crab and bridge drive is cut off. When tube is raised and clears load the weight on chain closes switch and allows crab and bridge drive to be activated.

A-580-D-11

Perspective drawing

A-580-D-12

This drawing shows the stairs enabling operator to ascend to bridge and crab.

A-580-D-13

Hopper door latch details.

A-580-D-14

Crab wheel mount details and tube brake details.

Drives and Sprocket Sizes

All motors US encapsulated (Everseal)

All motors 220V three phase 60 Cy.

Tube Rotation

1/3 HP, -190 RPM - Parallel shaft US Type GR, Frame #56-5

Drive Sprocket 32T RC-40

Driven Sprocket 32T RC-40

Bridge Drive

1/2 HP, 20 RPM - Worm gear drive US Type GWR

Drive sprocket 20T RC-40

Driven sprocket 18T RC-40

Crab Drive

1/2 HP, 36 RPM - Worm gear drive US Type GWR

Drive and driven sprocket 20T RC-40

Tube Life

1/3 HP, 30 RPM, Parallel shaft US Type GD, Frame #56-10

Divider Drive

1/3 HP, 68 RPM, Worm gear drive US Type GWR

Blower

Buffalo 3 RE 21 $\frac{1}{2}$ wheel

5 HP 3 phase 220 V 60 Cycle

Drip proof 3600 RPM

or equivalent blower and motor to furnish 650 CFM @ 27" S.P.

Other Items

Suction hose to be 13 $\frac{1}{2}$ ft. long

Thermoflex special grey water suction hose (Southern Belting Co.,
Prod. Code 91300000)

Return hose - 3" "Flexhaust" hose 12 $\frac{1}{2}$ feet long (Eastman Atlantic Co.)

1 $\frac{1}{2}$ gate valve to be stubbed or welded to outlet of blower.

Metal flex hose from cyclone outlet to fan inlet.

Hose support sleeves are required to mount counterweight cables.

All counterweight cables are 3/16 air plane control cable.

Orifice is to be inside suction hose at the top of the tube rotating mechanism.

Other Items (continued)

Counterweight cable guides are required for two hose and tube counter weights. A suitable bolted stop should be at the bottom of each counter weight tube as a safety to prevent the counterweight from falling to the ground in the event the cable should break.

Pulley guides at tube counterweight guide and for hose counterweights should be nylon (outboard steering pulleys) and brass.

Hose counterweights 1. Flex haust 4 lbs. 2. Thermoflex 9 lbs.

ELECTRIC WIRING

A disconnect box will be mounted on the center post of the rail support structure (by others). From this box a 4 conductor cable should run to a junction box at the edge of the bridge. Wiring from this junction box to center of the bridge shall be in E. M. tubing.

All wiring which does not move should be in E.M. tubing and all junction boxes are to be rain tight.

Two 4 conductor cables from the bridge center junction box should be mounted so that as the crab moves the cable will not fall on the bridge drive motor. This cable should loop enough so that it will be 10% longer than straight line distance when the crab is at the extremities of travel. A spring of the type used to support air lines on tractor trailer trucks should be used to take up slack in this line.

4 lines of the 8 conductor cable will be to carry main voltage the other four will be to control the bridge drive motor.

Location of main control panel is to forward right of crab 36" from crab floor.

All 3 phase wiring is to be #10 - 4 wire General Cable Super service Type SO Cord Extra tough neoprene. All other wiring is to be #12 wire size Type SO Super Service.

All wiring shall be fastened to steel frames by cable clamps, cable clips or appropriate fastening devices.

PAINTING

The unit shall be solvent sponge cleaned with methylene chloride prior to painting. Procedures as specified in SSPC1-52-T.

The unit after solvent cleaning shall be painted with two coats of Dupont primer 1004-773 zinc chromate iron oxide primer.

The unit shall be finish painted with 1 coat of Dupont 5105-520 bronze green paint.

All paint applications shall be in accordance with SSPC-PA-1-53T.