

TYPICAL SPECIFICATIONS

BULK SODA ASH SYSTEM **SOLUTION TANK TYPE**

Part 1 - GENERAL

1.01 Scope

The contractor shall furnish all labour, materials, equipment and incidentals required and deliver, and place into satisfactory operation, one complete Bulk Soda Ash System as specified herein and as shown on the plans.

1.02 Related Work

- A. Concrete work is included in Section ()
- B. Electrical Work is included in Section ()
- C. Instrumentation is included in Section ()
- D. Piping, valves and appurtenances, except as specified herein is included in Section ()
- E. Instrumentation, except as specified herein is included in Section ()
- F. Painting is included in Section ()

1.03 Submittals

The contractor shall obtain from the system supplier and submit as a minimum the following information for the Bulk Soda Ash System:

- A. Data Sheets and Shop Drawings for approval per Section ():
 - General Arrangement
 - Process and Instrumentation
 - Single Line AC Control System Schematic
 - Three Line AC Control System Schematic
 - Field Wiring Diagram
 - Description of Sequence of Operation
 - Shop Drawings for custom fabricated items
 - Cut Sheets for Standard items
- B. Operation and Maintenance Manuals per Section (), to be submitted upon shipment of equipment giving:
 - General Description
 - Active Components - Detailed Description
 - Controls and Electrical Schematic
 - PLC Programming Logic

Startup and Operation Instructions
Individual Component O&M Manuals
List of Manufacturer's recommended spare parts

1.04 Reference Standards

- A. National Building Code NBC 1990
- B. Universal Building Code (UBC, 97)
- C. National Electric Code (NEC)
- D. American National Standards Institute (ANSI)
- E. Canadian Standards Association (CSA)
- F. American Society of Manufacturing Engineers (ASME)

1.05 Quality Assurance

- A. The equipment shall be the product of a manufacturer who is regularly engaged in chemical feed system design and supply.
- B. The major components of the Bulk Soda Ash System shall be furnished by a single supplier to ensure full coordination of all units and to establish a single source of responsibility and control over the system
- C. The manufacturer must have installed and had in satisfactory operation for a period of not less than five (5) years a minimum of ten (10) installations of similar size.
- D. The drawings and specifications covered by this section are based on the equipment manufactured by Stanco Projects Ltd.

Part 2 - PRODUCTS

2.01 Design Requirements

The bulk soda ash system shall be designed to receive, store, feed and prepare soda ash solutions ready for use by the owner. The intent of this specification is to provide a complete operating system that will automatically respond to changes in process conditions. As a minimum the system shall be designed for the following:

- A. Capacities:
 - Usable Storage Silo Capacity : _____ Cu.Ft.
 - Soda ash Feed Rate: _____ lbs/hr design
 - Soda ash solution Concentration _____ %
 - Soda ash solution temperature _____ deg. F min.
 - Soda ash solution feed rate _____ usgph
- B. Electrical classification for the area is "Unclassified"

The system shall receive soda ash in bulk quantities from self-unloading trucks equipped with pneumatic conveying equipment. Conveying air shall be vented through the bin vent filter. Truck operator shall initiate the filter operation at the truck fill panel; an alarm shall sound automatically when the silo reaches a high level condition.

Flow of soda ash from the silo shall be assisted by means of a vibrating bin activator into a rotary airlock valve. The rotary airlock valve shall feed the soda ash into a transition feed hopper operating in response to level signals in the hopper. The volumetric feeder shall draw from the transition hopper and meter soda ash at an adjustable rate into the solution make down system.

a) For constant solution feed a constant volume of solution will be pumped to the application point. Variable amounts of soda ash shall be metered into the solution in response to customer supplied signals on **pH/Flow**.

OR

b) For variable solution feed a variable amount of a constant batch strength solution will be metered to the process. Soda ash solutions shall be prepared automatically in response to level signals from the solution tank. Variable volumes of this solution will be metered to the process in response to customer supplied signals on **pH/flow**.

A main control panel shall control and indicate the status of components in the system. With exception of silo filling, all activities of the bulk soda ash system shall be operable in an automatic mode without supervision.

2.02 System Components

The bulk soda ash system shall consist of, but not be limited to, the following components;

- 1) Soda Ash Storage Silo
- 2) Bin Vent Filter
- 3) Silo Level Sensors
- 4) Bin Activator
- 5) Rotary Airlock Valve
- 6) Transition Hopper
- 7) Volumetric Feeder
- 8) Solution tank
- 9) Pumps
- 10) Piping and Valves
- 11) Control System
- 12) Accessories

2.02.1 Soda Ash Storage Silo

Soda ash Silo shall be of *welded/bolted* construction c/w a 60 degree cone bottom outlet elevated to provide sufficient clearance for the feeding and pumping equipment. Silo to be *skirt/leg* supported with 2'8" X 6'8" door(s) in the skirt. Accessories shall include a 20" diameter combination pressure/vacuum relief manway, filter flange, level sensor connections, OSHA approved full height caged ladder and perimeter guard rail, 4" /Sch. 40 fill line with long radius elbows and Kamlock type truck hose fitting with dust cap.

Silo shall be designed for storage of soda ash at 65lb/cu.ft., seismic zone, ___ per UBC, 100 mph wind load and ___ PSF ground snow load. Minimum working volume shall be _____ cu. ft.

2.02.2 Bin Vent Filter

Bin vent filter shall be supplied for mounting on the silo roof to vent the conveying air. Bin vent filter shall be of the pleated cartridge type with stainless steel construction, complete with Teflon coated polyester felt cartridges with a minimum of 250 sq.ft. filter area, air backwash cleaning mechanism, solid state adjustable time, solenoid and purge valves, plant air manifold, side access door, bird screen, vent hood, air lubricator, filter and pressure regulator.

The bin vent filter shall use a maximum of 6 SCFM of compressed air supplied by others for filter cleaning.

2.02.3 Silo Level Sensors

One only capacitance type point level sensor shall be provided for indication of high material level in the storage silo, c/w a stainless steel probe, solid state integral sensing electronics, DPDT contact and NEMA 4 enclosure. Rotating paddle wheel type level sensors shall not be acceptable. Probe is to be located in the roof of the silo with a cable extension sized to suit the silo high level design point.

For continuous level measurement a *reflex radar/ capacitance/ load cell* device shall be provided. The device shall be capable of providing a continuous 4-20 ma signal to indicate level in addition to up to 5 selectable set points each with a DPDT contact.

2.02.4 Bin Activator

A vibrating bin activator shall be provided to assist in flow promotion of the silo contents. The bin activator shall have a diameter of at least 1/3 of the silo diameter. The bin activator shall be fabricated of carbon steel and be c/w a secondary inverted internal cone assembly to minimize the head load on the discharger. The bin activator unit shall be mounted to the silo with isolation hangars and be equipped with a dust tight inlet flexible skirt. Unit shall be supplied with an integral gyrator motor, and flexible discharge chute.

Silo shall be equipped with a _____ inch discharge isolation gate valve located below the bin activator with a *handwheel or chainwheel* actuator, material displacement pocket and flexible discharge transition to allow positive isolation of silo contents for service of equipment downstream.

2.02.5 Rotary Airlock Valve

A rotary airlock valve shall be provided beneath the isolation gate valve to control flooding. Valve shall be sized to feed ___ lbs/hr soda ash at a constant rate into the transition feed hopper. Valve body shall be cast iron, with fabricated steel rotor, adjustable blade tips, fully outboard bearings, minimum ___hp TEFC drive motor, gear reducer, chain drive and guard, inlet and discharge transitions as required.

Rotary valve shall operate in response to level signals in the transition hopper.

2.02.6 Transition Hopper

A transition hopper fabricated of painted carbon steel shall be provided with a minimum capacity of 5 cu. ft. The hopper shall be designed to ensure free flow of soda ash and be equipped with an external electromagnetic vibrator to prevent product bridging. The hopper shall be furnished with a hinged, gasketed access door and a vent sock.

Two only capacitance type point level sensors shall be provided for indication of material level in the hopper, c/w stainless steel probes, solid state integral sensing electronics, DPDT contact and NEMA 4 enclosure. Rotating paddle wheel type level sensors shall not be acceptable.

2.02.7 Volumetric Feeder

___ only volumetric feeder(s) shall be provided, one for mounting beneath each vented transition hopper for feeding of soda ash into the slurry makedown sytem.. The volumetric feeder shall be of the screw type, sized for feeding from ___ to ___ cu.ft./hr of soda ash. Feeder shall be of *carbon steel/stainless steel* construction, complete with full flight spiral feed screw, helical conditioning screw, flanged inlet, variable speed ___ hp DC drive motor, gear reducer and SCR drive controller with 4-20mA receptacle for remote speed control.

OPTION:

___ only loss-in-weight volumetric feeder(s) systems shall be provided, one for mounting beneath each vented transition hopper for feeding of soda ash into the make down sytem.. The volumetric feeder shall be of the screw type, sized for feeding from ___ to ___ cu.ft./hr of soda ash. Feeder shall be of *carbon steel/stainless steel* construction, complete with full flight spiral feed screw, helical conditioning screw, flanged inlet, variable speed ___ hp DC drive motor, gear reducer and SCR drive controller with 4-20mA receptacle for remote speed control. A loss in weight controller shall be provided c/w totalizer, instantaneous and cumulative feed registers, programmable monitoring and alarm devices.

2.02.8 Solution Tank

A ___ usg *painted carbon steel/ FRP* soda ash solution tank shall be provided for mixing of soda ash and water. Tank shall be c/w interior baffles, a hinged gasketed access manway, overflow, drain c/w valve, and flanged discharge connections. Tank design shall include provision for dust control.

A ___ hP low speed centre mounted agitator shall be provided to ensure positive mixing of the tank contents under wetting conditions. Maximum agitator speed is 350 rpm. Agitator shall be supplied with stainless steel shaft and impellers.

An ultrasonic level device shall be provided to monitor and control the make down procedure. Indicator to provide an analog output c/w a minimum of 4 digital relays. Set points shall be programmable by the supplied handheld programmer.

Water system addition assembly shall be supplied consisting of an isolation gate valve, dilution water control valve c/w pneumatic actuator and solenoid, pressure gauge and a flow meter with adjusting valve. Supply water to be supplied by others at a constant regulated pressure.

2.02.9 Soda Ash Feed Pumps

a) Constant Solution Feed

____ soda ash solution pumps shall be provided with one operating. Pumps shall be of the centrifugal recessed impeller type and be provided with a positive sealing arrangement. Gland seal water arrangements shall not be permitted. Each pump shall be sized to suit the system requirements and shall be complete with an overhead mounted TEFC drive motor, V-belt drive, guard and base plate.

Pumps shall be manifolded together such that either pump can be used. Each pump shall be supplied with suction and discharge shut off valves. Valves to be Saunders diaphragm type or equal.

Each pump shall be equipped with a **manual/automatic** flushing system.

b) Variable Solution Feed

____ soda ash metering pumps shall be provided with one operating. Pumps shall be of the positive displacement, mechanical diaphragm type. Each pump shall be sized to suit the system requirements and shall be complete with a variable speed AC/DC drive motor and manual adjustment capability of the stroke length.

Pumps shall be manifolded together such that either pump can be used. Each pump shall be supplied with suction and discharge shut off valves. A calibration chamber _____ cc cap. , pressure relief valve and pulsation dampener shall be provided..

Each pump shall be equipped with a *manual/automatic* flushing system.

Design data

| | |
|-----------------------------|--------------|
| Feed rate soda ash solution | _____ usgpm |
| TDH | _____ ft. |
| Line size | _____ " |
| Solution concentration | _____ % |
| Solution temperature | _____ deg. F |

2.02.10 Piping and Valves

Piping shall be supplied as shown on the drawings. Piping material shall be Sch. 40/80 PVC with a diameter of ____". Care shall be taken to minimize changes in direction. Where bends are required they shall be long radius bends.

2.02.11 Control System

Electrical components, shop wiring and design shall be system suppliers standard with the following minimum requirement for control panels: Power supply to be ____v/3 phase/____ cycle with a minimum ____ amp. service

A. Truck Fill Panel

For mounting adjacent to silo fill pipe, one only fill system control panel complete with the following features:

- NEMA 4 enclosure
- Silo high/low indication lights
- Silo High level alarm and silence pushbutton
- Bin Vent Filter H/O/A selector switch and indicator light
- Control Power on/off indication light
- Circuit breakers or fuses as required

B. Main System Control Panel

For mounting adjacent to soda ash solution tank, one only main control panel complete with the following features:

- Graphic system representation
- Main Disconnect Switch
- Transformer
- Circuit breakers or fuses as required
- H/O/A and status indication lights for the following:
 - Bin activator
 - Rotary Airlock Valve
 - Volumetric feeder
 - Soda ash Slurry Agitator
 - Solution pumps
- Status indication light for the Bin Vent Filter, silo levels, transition hopper levels and solution tank levels.
- Allen Bradley SLC series programmable logic controller, factory programmed for automatic control of all sequences.
- Motor starters as required for equipment supplied.

Alarm lights, audible alarm, and silence pushbutton for the following conditions:

- Soda Ash Silo high level
- Transition hopper low level
- Slurry tank high high and low low levels

It “**is/is not**” intended for the PLC to communicate to the in plant SCADA system via Modbus or equal protocol. Provide program documentation to the Consultant with a list of appropriate variables and parameters to be monitored on the plant HMI.

A plant **flow/pH** signal shall be provided to the system supplier to enable the soda ash system flow/pH based control.

2.02.12 Accessories

The following accessories shall be provided with the system;

- a) Lightning protection for the silo
- b) Insulation and cladding of silo skirt area with R-10 rigid insulation and 26 ga. prepainted steel cladding

- c) Skirt exhaust fan 150 cfm min. Exhaust fan motor shall be 1/10 hp, 115 v, single phase, 60 Hz. Provide a wall mounted on/off switch.
- d) Skirt electric heater 10 kw min. c/w contactor and temperature controller.
- e) Shower and eyewash assembly
- f) Lighting for the skirt area consisting of a minimum of ____ high intensity light fixtures.
- g) Spare parts sufficient for 2 years operation at design rate. As a minimum these parts will consist of the following:

2.03 Painting

- 1. The equipment described herein shall be factory primed and painted in accordance with the manufacturer's recommendations.
- 2. Silo surfaces shall be steel grit blasted to SSPC-SP 6 standards, with one coat baked epoxy primer, 1.5 mil min. DFT and exterior only baked enamel finish coat. Hopper interior area to be coated with Arlon low friction coating 1.5 mil DFT for flow promotion.
- 3. Machined and polished surfaces, stainless steel, or non-ferrous or galvanized metals are not painted. Drive units and motors are not painted.

2.04 Concrete and Grout for Support Pads

- A. Concrete: Class 1; Follow Section ()
- B. Grout: Non shrink, non corrosive; Follow Section ()

Part 3 - EXECUTION

3.01 Installation

The contractor shall assume full responsibility for installation of the soda ash system, including sub-assembly of major components, field piping, interconnecting wiring and all supports and miscellaneous hardware not specifically stated herein. This work shall include bringing sources of power, water and compressed air to system supplier's termination points

3.02 Manufacturer's Representative Services

The contractor shall make an allowance in his bid for the performance of startup and operator training by the system supplier or his representative. As a minimum, this allowance shall include for ____ separate trips to the site for the purpose of ____ days for startup and ____ days for operator training.