OPERATING INSTRUCTIONS Ver7 (Rev07/10)

RDN MODEL 2.0 & 3.0 PVS VACUUM SIZER

U.S. PATENT #5,008,051

UNCRATE & INSPECT

This machine has been carefully crated to assure safe arrival to your plant. It is important that you immediately inspect the equipment upon arrival at your plant and report any possible damage incurred in transit to the trucker.

It is suggested that you uncrate the equipment as soon as possible so that any concealed damage may be discovered.

Compare the packing list with items received and in turn cross check the items with your purchase order and report any discrepancies immediately to RDN MFG. CO., INC. at the address or phone number listed above.

Note: the (2) drain gate valves and brass nipple are removed for shipment. They must be installed before filling the PVS with water. See picture.

DESCRIPTION

Vacuum sizing tanks provide a means of cooling and sizing the extrudate after it exits the die. They are essential for sizing most hollow rigid shapes. The Model 2.0 PVS includes features which allow close tolerance sizing of tacky polymers such as flexible PVC and urethane. The vacuum compartment is a sealed water bath that operates under vacuum with the vacuum system as part of the unit.

In standard vacuum sizing a hollow mandrel tool, referred to as vacuum sizing sleeve, is mounted inside the extrudate inlet of the tank. The mandrel is machined to the outside shape of the profile or pipe. The mandrel can be in the form of a solid sleeve or stacked wafers. The extrudate passes through the mandrel and vacuum pulls the profile into contact with the inner wall of the mandrel. At the same time, the water in which the mandrel is immersed removes the heat from the extrudate.

This tank also provides an additional calibrator/quench assembly with sizing tooling which is mounted on the entrance of the tank for sizing flexible polymers. It consists of (1) a presizing sleeve mounted within a water well to provide a film of water on the tube as it enters, (2) a quench chamber, which provides pre-cooling and seals the vacuum compartment and (3) a vacuum sizing sleeve lubricated by water being drawn in with the extrudate from the quench well. Three separate manual water valves are provided for flow control to the above described.

The cooling/sizing tank is 12-gauge stainless steel and is divided into three compartments. The upstream section, which is six feet long, is equipped with a clear gasketed hinged lid, and a water level control, and operates as a vacuum sizing compartment. The second compartment, which is 12 inches long, provides additional cooling of the extrudate and more importantly provides a water seal for the exit of the vacuum compartment. The final compartment, 8 inches long

provides for drain and water stripping. The unit is equipped with a stainless steel drain collector the full length of the sizing tank.

The sizer is equipped with an air water separator system that provides very stable vacuum levels. The system utilizes a reservoir in which the air and water are separated and the vacuum level is equalized with the lower tank. The vacuum is created and controlled by a variable speed blower with its suction port coupled to the air volume in the vacuum sizing compartment. The blower is driven by a D.C. motor with solid-state control. The vacuum level is regulated by a feedback control system utilizing a vacuum transducer.

The electrical controls include start/stop buttons for pumps, scroll buttons for vacuum level control and digital readouts for vacuum level and water temperature.

A handwheel with a telescoping assembly allows movement of the tank in the extrusion direction. A handwheel and enclosed gear arrangement at each end of the tank provides vertical height adjustment. A micrometer adjustment handwheel is used for fine lateral adjustment.

The units are mounted on four grooved casters and four height adjusting leveling screws are provided.

INSTALLATION

The Vacuum Sizer is equipped with "V" groove casters and can be mounted on the floor or on inverted "V" track. The floor or tracks should be level to provide good support, and the machine should be centered to the extruder output centerline, and aligned parallel to the extrusion direction. Move the vacuum sizer to the position, which will provide the proper distance between the upstream end of the tank and the extruder die. Adjust the jack screws to level the frame and remove the weight from the casters.

Plumbing and electrical connections should be made as follows:

***NOTE**:* All part reference numbers refer to the circled numbers on the Vacuum Sizer drawing attached ï B4028 ver7.

1. Fill the open portion of the Process Water Reservoir (13) with clear mineral free water. A plumbing connection and float valve for the water supply are provided in the reservoir. Adjust the fill float so that the water level is just above the inlet filter to the closed section or about 4ò from the bottom. This water will be drawn into the closed portion of the reservoir when the vacuum system is operating.
2. Connect the supply and return chilled water plumbing to the Recirculation System Heat Exchanger (16).

3. Plug the line cord into an outlet with the proper line voltage. This outlet must be protected by a branch circuit disconnect switch fused in accordance with the National Electric Code and any applicable local codes.

WATER COOLING SYSTEM
(REFER TO SYSTEM DIAGRAM)

The water recirculation/heat exchanger system for process cooling water consists of a stainless steel reservoir with an open compartment (13) and a closed compartment (33); a water pump (17); a heat exchanger (16); a water manifold (27) with manual valves; and a drain pan (28).

Plant water enters the open compartment (13) of the reservoir through manual valve (30) and float valve (31) which serves to control the level of water in this compartment. Overflow drain (29) also serves to control the amount of water in the system if an excessive amount is allowed to enter. The water is transferred to the closed compartment (33) of the reservoir through float valve (32) which controls the amount of water allowed to pass from compartment (13) to compartment (33). The water pump (17) draws water from the reservoir and pumps it through the heat exchanger (16) to manifold (27). Manifold (27) distributes the water to the quench chamber (26), the vacuum sizing spray ring (25); the vacuum chamber (23) and the cooling chamber (21). Overflow water from the quench chamber (26) and the cooling chamber (21) returns to the open compartment (13) of the reservoir through the drain pan (28). Water from the vacuum compartment (23) returns to the reservoir closed compartment (33) through stand pipe (22) which controls the level of water in the vacuum compartment. Heat is removed from the process water by chilled water from a separate source, which flows through the other side of the heat exchanger (16).

VACUUM SYSTEM
(REFER TO SYSTEM DIAGRAM)

The Vacuum System consists of a variable speed blower used as a vacuum pump (14), closed reservoir compartment (33), the vacuum chamber (23), vacuum transducer (34), PLC (35), and operator interface (36).

The vacuum pump (14) draws air from the upper portion of vacuum compartment (23) and also from the reservoir closed compartment (33) through stand pipe (24) and exhausts the air to the atmosphere. The vacuum pump (14) includes a variable speed control. As the voltage applied to the vacuum pump speed control is varied by the PLC (35), the vacuum pump speed changes and thus controls the level of vacuum in the vacuum compartment.

A closed loop control is included to regulate the level of vacuum. The Scroll Buttons (6) are the operator control set-point which is the voltage signal for vacuum level control. The vacuum level in the vacuum compartment is monitored by vacuum transducer (34). The vacuum transducer produces a voltage proportioned to the vacuum level. The transducer voltage and set-point vacuum reference voltage are compared by the PLC (35). The resulting difference between the

two voltages is amplified by the PLC (35) and applied to the vacuum pump control to control the pump speed and thus regulate the vacuum level.

NOTE: Water and air flow through separate stand pipes (22) and (24) to the reservoir closed compartment (33). This prevents fluctuations in water flow from creating fluctuations in air flow which would in turn create changes in vacuum level.

AUXILIARY OUTPUT

The Auxiliary Output ON/OFF toggle button (37) is used to turn ON/OFF a set of dry contacts. An example would be to wire a thermolator unitôs ON/OFF switch to these contacts. This button will become highlighted (white letters on dark background) when the Aux. Output is on.

Refer to the wiring schematic for hook-up.

EXTERNAL VACUUM SET-POINT 'OPTION'

This refers to the REF. INT. /EXT. toggle button (38). When in the INT. mode (dark letters INT REF on white background) it uses the vacuum set-point from the scroll buttons (6). When in the EXT. mode (white letters EXT REF on dark background) it will accept a 0-10VDC signal from external source. This signal is then converted to the vacuum set-point. Refer to wiring schematic for hook-up. Where 0vdc = 0ò water vacuum and 10vdc = 50ò or 100ò water vacuum.
Note: If you are in external set-point and you go back to internal set-point the internal set-point value will match the externals value. This will does not work from Internal to External. The set-point will simply change to a value equal to the 0-10vdc signal.

OPERATION

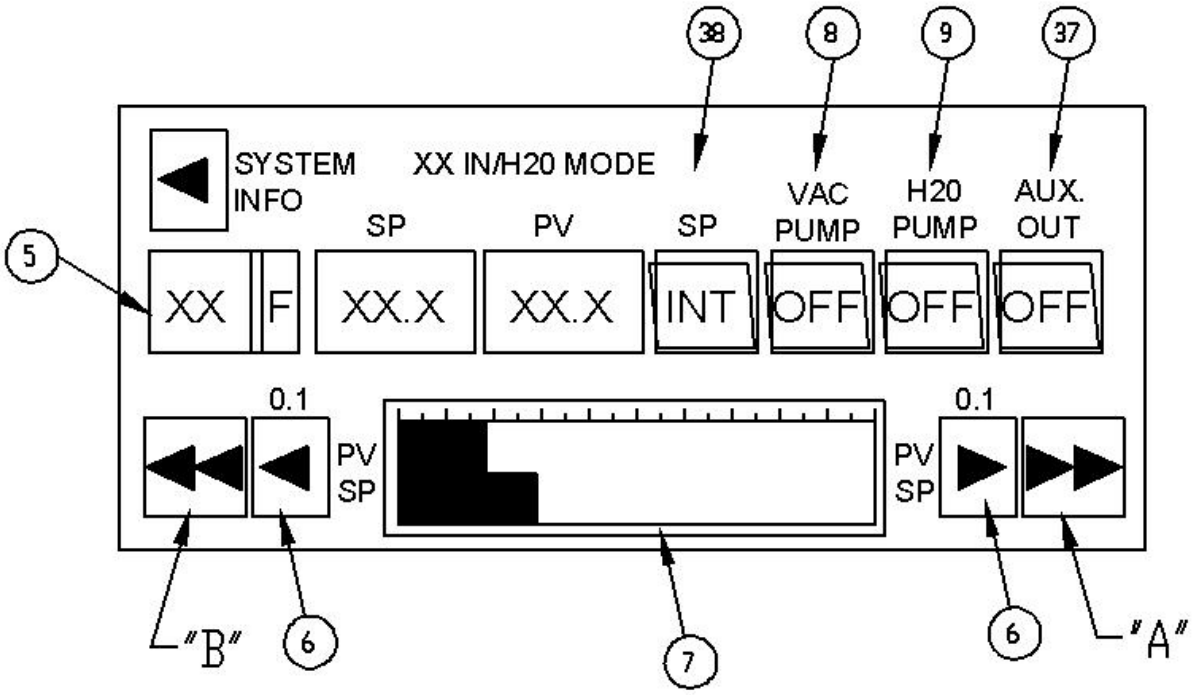
In the case of some rigid or semi rigid polymers, the vacuum sizing sleeve for each profile or tube is mounted to the inlet end of the tank using a gasket plate and gasket. Each bulk head between compartments must be fitted with a rubber gasket and gasket mounting plate. The through opening of the gasket should be the shape of the extrudate and slightly smaller in order to insure a good seal between compartments.

For flexible or tacky polymers a quench chamber which skins and lubricates the extrudate is mounted on the entrance end of the tank. In this case solid sleeve vacuum tooling is mounted at the entrance of the tank. The tooling may or may not include a spray feature depending on polymer being extruded. The tooling is slightly larger than the finished size of the part which allows lubrication water to be drawn into the tank from the quench chamber. The bulk head seal plates at the exit of the vacuum chamber and the exit of the second chamber are machined from stainless steel (do not use flexible seal gaskets when using tacky polymers) and the through opening is again slightly larger than the finished part. This allows the part to float through on a film of water. Prior to string up open the Water Ring Supply Valve (1) and the Water Well Supply Valve (2) and, to slightly lubricate the surface if a vacuum tool with spray feature is used,

open the Vacuum Tool Spray Supply Valve (3) and, to fill the tank, open the Vacuum Tank Water Fill Valve (4).

OPERATOR INTERFACE PANEL

The Operator Interface (36) has 2 display screens: Main, System Info

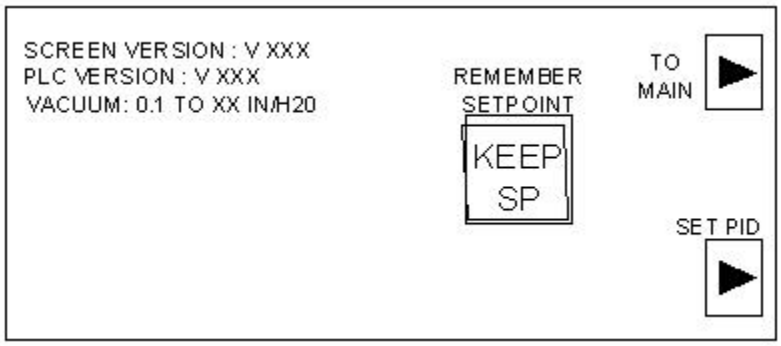


Main Screen

1) From Main Screen (36) you can switch to other screens (SYSTEM INFO (18) and OPS DISPLAY (19)), turn on/off vacuum (VAC OFF/ON (8)) and water (WATER OFF/ON (9)) pumps and auxiliary outputs (37), switch between internal and external vacuum set-point ñoptionsò (38). Internal set-point is from touch screen. External set-point is from a 0-10vdc input to the PLC.

2) From Options Display you can turn on/off vacuum pump (VAC OFF/ON (8)), switch back to Main Screen (button MAIN) and set level of vacuum, if internal vacuum set-point ñoptionò turned ON with INT REF button on Main Screen .
There are {3} ways to change the vacuum set-point.
{1} Arrow up or down buttons (6) is used to precisely change the set-point.

{2} To quickly adjust the setting of desired vacuum use area ñAò (UP) and ñBò (DOWN) of the graph display (7).
{3} Press the set value SP (this is also a button), a keypad will appear. Type in desired value and press enter.
Note: As the vacuum is increasing or decreasing, if you press arrow up or down button. The vacuum set-point will change near the actual value.
The set-point and actual vacuum in the upper vacuum compartment (23) shown on the graph display (7) and numerical windows. The set-point of the vacuum depends whether it is from the Internal or (optional) External set-point. Memory of control system keeps last internal set-point number until the power is shut off.
There is informative display of water temperature (5) on the OPS DISPLAY.
If you press the F (Fahrenheit) it will change to C (Celsius)



3) SYSTEM INFO screen provides machine and contact information.
Software version for touch screen and PLC.
Vacuum max level 50ò is standard 90ò is optional.
Remember Setpoint if KEEP is selected the internal mode set point will remain when starting/stopping the vacuum pump.
If RESET is selected the internal mode set point will reset to zero when starting/stopping the vacuum pump.

Turn the Water Pump ON/OFF button (9) on. The extrudate is initially collapsed and strung through the quench chamber (if used), the sizing tool and tanks and fed through the puller. When the vacuum blower is OFF the set-point is automatically set to ó0ô

Increase the puller and extruder screw speeds to approximately production rates with the puller speed set to provide an O.D. slightly smaller than finished O.D. Turn on the Vacuum Blower ON/OFF button (8) and close the lid.

Adjust the quench compartment Water Supply Valve (2) so that there is some overflow at the top opening. The quench chamber opening should be straight up or slightly over to one side at approximately 11 or 1 o'clock position. Adjust the Water Ring Supply Valve (1) to apply a slight

film of water on the part. Open the Second Chamber Water Fill (11) and adjust to completely submerge the extrudate at the exit plate from the vacuum compartment.

Adjust the Vacuum Set-point (6) for the desired vacuum level. Make final water valve adjustments and set proper position of tank using Longitudinal Handwheel Adjustment. Also make final puller speed and extruder speed adjustments for finished part dimensions.

A Manual valve (10) is provided for releasing the vacuum quicker from the upper compartment.

A Manual valve (15) is provided for draining water from the vacuum compartment after shutdown.

LID SEAL ADJUSTMENT

The lid includes an adjustment to insure that the gasket seals adequately. The rod that extends the length of the lid is threaded at each end. Adjusting the hex nuts at each end of the rod flexes the plexiglass lid, which will reseal the lid if a gap exists between the gasket and the tank top.

LUBRICATION AND MAINTENANCE

PREVENTIVE MAINTENANCE.
There is a spool valve in the lower reservoir, inside the closed section. This valve must move up and down freely. If it gets corroded it may stick open, causing the closed section to flood. Or the float material may get saturated over the years and need replacement (RDN part #A6796)

If the closed section floods water level will rise up the two return hoses and cause the upper tank to flood. Once the upper tank floods the vacuum pump will suck in water, shutting down the pump on over load.
The best thing to do if the vacuum pump gets wet is to open the lid on the upper tank and turn on the vacuum pump (you may have to wait a couple minutes for the thermo overload to cool down). The pump will go into a feedback loss and runaway, blowing itself dry.

1. Vacuum Pump - Refer to manufacturer's catalog sheets, which are part of this manual.

2. V" Groove Wheels - Grease fittings. Re-lubricate on the plant maintenance schedule using Lithium Base Ball Bearing Grease.

3. Tank Vertical Adjustment (Two) - Grease fittings. Re-lubricate on the plant maintenance schedule using Lithium Base Ball Bearing Grease.

4. Tank Vertical Guide Rod (Four) - Oil filler cap. Re-lubricate on the plant maintenance schedule using SAE 40 oil.

5. Periodically inspect the lid gaskets for proper sealing.

6. ***NOTE***: We do not permit any repairs or modifications of motors or controls. Any tampering of the motor or control contravenes the warranty and the U.L. Recognition and C.S.A. Certification.

LOCKED ROTOR PROTECTION:

If the vacuum blower does not start for any reason it will turn itself off. To reset the blower turn off the vacuum blower switch, correct the problem, and turn the blower on again.

CAUTION

BE SURE TO PLUG THE VACUUM PUMP PLUG INTO THE CORRECT PINS.
NOTE THE KEY IN THE PLUG.