Application Brochure – Back Pressure Pipe

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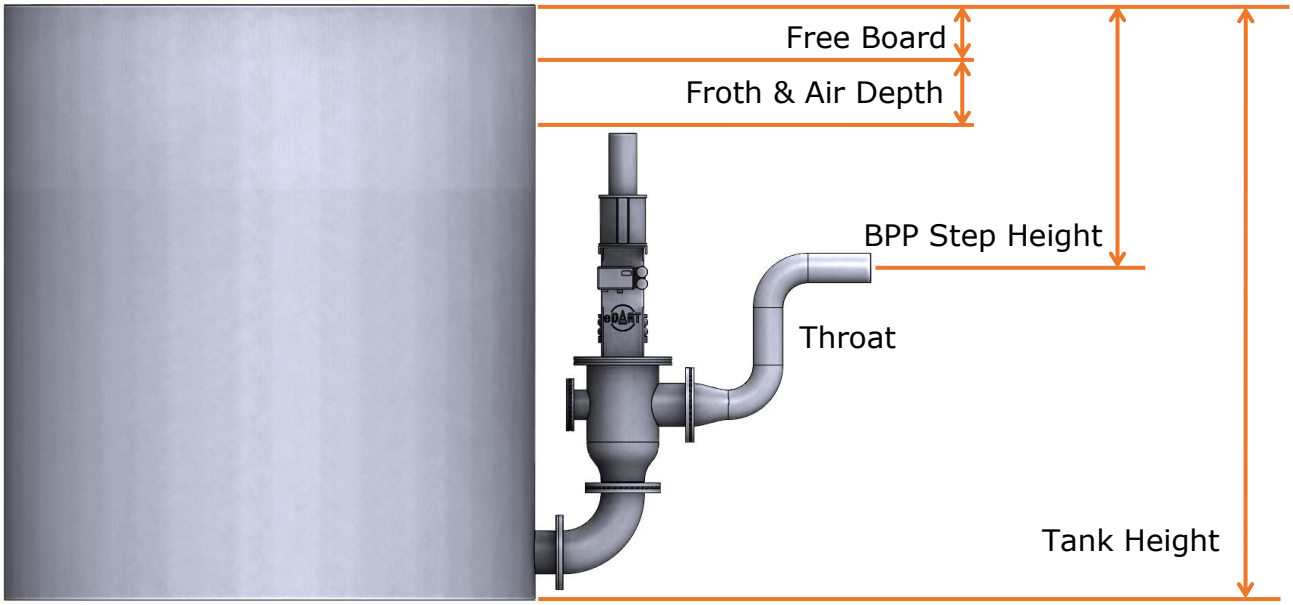
The challenge with level control on the last cell of a flotation bank is well-known: the reason is a higher pressure drop across this valve compared to the rest of the valves in the bank. The pressure drop across the valves between two tanks is a function of the step height whereas the pressure drop across the last valve is determined by the tank height which may be four or five times greater. A back pressure pipe, otherwise known as a gooseneck or riser-pipe, provides the solution by increasing the downstream pressure of the final valve by providing "back pressure" to the last valve.

The advantages of the back pressure pipe are that they:

- Generally allows the final valve to be matched to the other valves in the bank which minimises the spares requirement,
- Widens the control region on the final valve making it easier to tune,
- Reduce the height of the plant (2—3 metres) which means cost savings both building and operating the plant,
- Low profile float plant which resutls in considerable energy savings,
- Decouple the level from the sump,
- Reduce the wear on the valve components by reducing velocities within the valve.
- For existing plants it allows a cross stream tails sampler to be installed.
- Tails density monitoring is an easy optional extra.

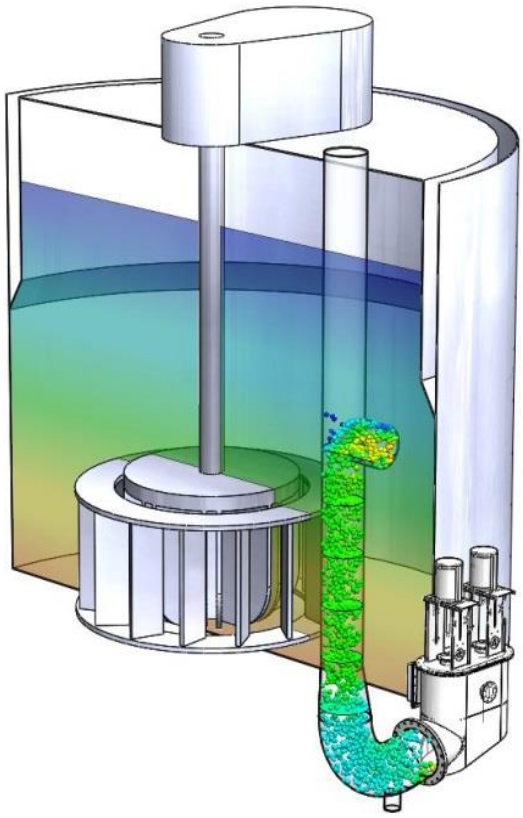
Care needs to be taken in the design to balance a number of conflicting requirements. It should not be undersized which will limit the throughput of the valve nor should it be oversized which will result in the solids settling out of suspension in the vertical section of the pipe. This is best done by modelling it with CFD (Computational Fluid Dynamics) software coupled with an extensive database of empirical data. The following terms and definitions are used:



BPP	Back Pressure Pipe.
Bottom of Tank	The bottommost slurry level in the tank.
Top of Tank	The topmost of the steel.
Launder	The level of the overflow slurry.
Free Board	The distance from the top of the tank to the launder level.
Froth Depth	The interface depth between the froth and the liquid slurry.
BPP Step Height	The distance from the Launder down to the centreline of the apex of the Back Pressure Pipe discharge.
Throat	The minimum diameter in the upwards riser section of the BPP.
Breather	Or vacuum breaker, it prevents syphoning from occurring.
Mass Pull	This is a measure of the amount of slurry that has been extracted by the bank and reduces the flow through the last valve.
Duty	This refers to the application and is used for default values of % solids, froth depth and air holdup.
% Solids	Solids Concentration by mass.
Air holdup	This refers to the amount of slurry displaced by the volume of air within a tank due to the air being blow in at the bottom.

The input variables that need to be taken into account are:

- Aeration in the final tank cell,
- Percentage solids in the slurry,
- Froth depth,
- Launder lip height,
- Maximum flow rate,
- "mass pull" (material removed during process), and
- Backpressure piping configuration.



eDART has a proud history of designing, analysing, and manufacturing back pressure pipes. As the valve is an integral part design of back pressure pipe design, eDART is uniquely equipped to supply both the valve and the back pressure pipe and model them as a single system.

The following symptoms on a flotation plant indicates that a back pressure pipe is required:

- Unstable level control on the final flotation machine in a bank.
- Excessive wear on the final valve.
- The final valve is controlling close to its seat.
- Heavy Vibration.
- The level control valve responds when the level in the sump changes.
- More than 2m of hydraulic head across the last cell.

Back Pressure pipes are always custom made for the application and for a design the following is required:

- good process data (see input parameters on previous page),
- accurate site measurements or plant drawings, and
- site photos.

eDART offers a preliminary 3D design of the selected valve and preliminary back pressure pipe. This is followed by a CFD analysis of the design. The preliminary design is then either confirmed or modified as dictated by the CFD results. Detailed engineering follows allowing for the manufacture of the back pressure pipe. eDART also offer an installation and commissioning service.

Abbreviated Reference list:

Endusers:	Project Houses, OEMs:
Nkomati (6 systems) Nickel Ngezi (3 systems) Platinum Two Rivers (5 systems) Platinum Bikoni Platinum; Bisha; Pilanesburg Plat	DRA Outotec Eriez