**Environmental Control Plans**

**PLAN 2**

**Cooling Jacket**
- Use with single seal or dual seal to control seal chamber temperature
- Maintains or elevates box temperature to prevent product solidification with polymers, resins, tars
- Lowers seal chamber temperature in hot environments
- Common heat transfer fluids:
  - Water
  - Thermal oils
  - Steam
- Close tolerance throat bushing is required for optimum efficiency

**PLAN 11**

**Discharge Recirculation**
- Use with single seal or dual seal
- Increases circulation
- Increases pressure in seal chamber
- Clean fluids only
  - Solids can erode seal
- An orifice can be used to reduce flow and pressure
- Close tolerance throat bushing is required for optimum efficiency, but is optional in slurry applications
PLAN 12

Discharge Recirculation with Strainer
- Use with single seal
- Cools seal
- Increases pressure in seal chamber
  - Throat bushing optional
- Clean fluids only
  - Solids can erode seal
  - Solids can clog seal when bushing is used
- An orifice can be used to reduce flow and pressure

PLAN 13

Suction Recirculation
- Vents air and prevents dry run
- Prevents clogging
- Lowers pressure in seal chamber
- Cools seal
- Reduces seal-generated heat
- Use caution with low vapor pressure liquids
**PLAN 14**

**Suction and Discharge Recirculation (Vertical)**

- Vents air and prevents dry run
- Use with single seal or dual seal
- Prevents clogging
- Cools seal
- Promotes flow
- Reduces seal-generated heat
- Use caution with low vapor pressure liquids

---

**PLAN 21**

**Cooled Discharge Recirculation**

- Use with a single seal
- Cools hot, volatile fluids
- Cools seal
- Increases seal chamber pressure
- An orifice can be used to control flow and reduce pressure
- Use with close tolerance throat/restriction bushing
**PLAN 23**

**Cooled Seal Recirculation**
- Use with a single seal and pump mechanism
- Minimizes heat exchanger size and coolant water usage
- Cools seal while pumping hot and/or volatile fluids
- Use with close tolerance throat/restriction bushing
- Venting is important

**PLAN 31**

**Discharge Recirculation with Cyclone Separator**
- Use with a single seal where fluid contains some abrasives
- Cools seal
- Increases seal chamber pressure
- Density of solids must be significantly greater than fluid
- Use caution with high viscosity fluids
- Requires pressure differential
- Will not remove micron-size particles
PLAN 32

Clean Flush
- Use with a single seal
- Provides clean fluid to seal
- Prevents clogging
- Acceptable flush fluids
  - Clean, compatible fluid
  - Water, if compatible
  - Clean product
  - Downstream additive
  - Carrier solvent

PLAN 33H

SpiralTrac™ Version D Type I
- Use with a single seal
- Removes solids
- Seal runs in clean fluid
- Prevents clogging
- Removes vapor from seal chamber
- Prevents dry running
- No flush required

SpiralTrac is a trademark of EnviroSeal Engineering Products Limited.
Environmental Control Plans

PLAN 33S

SpiralTrac™ Version F Type S
- Use with a single seal
- Removes solids
- Seal runs in clean fluid
- Prevents clogging
- Prevents dry running

PLAN 41

Cooled Discharge Recirculation with Cyclone Separator
- Use with a single seal where fluid contains some abrasives
- Cools seal
- Increases seal chamber pressure
- Supplies cleaner fluid
- Reduces clogging potential
- Density of solids must be significantly greater than fluid
- Use caution with high viscosity fluids
- Requires pressure differential
- Will not remove micron-size particles
PLAN 52

Circulation with External Buffer Fluid Tank

- Use with a dual seal
- Low pressure buffer fluid, 0.7 bar g (10 psig) minimum
- Buffer fluid should be clean, compatible and lubricating
- Buffer fluid pressure lower than seal chamber pressure
- Seal venting is important
- Use long sweeps in tubing bends

PLAN 53A

Circulation with Pressurized External Barrier Fluid Tank

- Use with a dual seal
- Pressurize barrier fluid 1 - 2 bar g (15 - 30 psig) over maximum seal chamber pressure
- Barrier fluid should be clean, compatible and lubricating
- Provides clean fluid to the inboard seal faces
- Use long sweeps in tubing bends
**PLAN 53B**

Closed Loop with Heat Exchanger and Accumulator

- Use with dual seals
- Optional thermocouple
- No foaming
- Heat is removed by an air-cooled or water-cooled heat exchanger
- Accumulator sizing crucial
- Maintains constant pressure on the circulation system

**PLAN 53C**

Heat Exchanger and Piston Accumulator

- Optional thermocouple
- No foaming
- Heat is removed by an air-cooled or water-cooled heat exchanger
- Tracks product pressure in seal chamber
- Maintains constant pressure on the circulation system
**PLAN 53P**

Circulation with Pressurized External Barrier Fluid Tank

- Maintains constant pressure and liquid supply to the dual seal
- External water pressure is set at 2 bar g (30 psig) over maximum seal chamber pressure
- Initial tank level is set through the external water pressure line
- Pressurize tank to 1.7 bar g (25 psig) over maximum seal chamber pressure with a regulated gas pad, then isolate gas pressure
- Tank is then charged with regulated external water pressure
- System operates with a constant external water pressure

**PLAN 54DM**

Circulation with Pressurized External Barrier Fluid Source and Flow Guardian™ DP50

- Use with a dual seal
- Pressurize barrier fluid 15 - 30 psig (1 - 2 bar g) over maximum seal chamber pressure
- DP50 provides inboard seal leak detection, pressure regulation and flow control
- Barrier fluid should be clean, compatible and lubricating
- Provides clean fluid to inboard seal faces
**PLAN 62**

**Quench**
- Use with a single seal
- Prevents coking, crystallization
- Use low pressure only
- Cleans atmospheric side of seal faces
- Common quench fluids:
  - steam
  - water
  - nitrogen

**PLAN 74**

**Externally Supplied Barrier Gas**
- Use with a non-volatile gas
- Provide gas at 1.7 bar g (25 psig) above seal chamber pressure
- Venting of the seal chamber may be required prior to start-up
- Use nitrogen, carbon dioxide or compressed air
- Zero emissions and leakage to atmosphere