AVANTech

Water Treatment Services

Boric Acid Recovery System (BARS™)

60-gpm Boric Acid Recovery System - Front View

Side View

Reverse Osmosis (RO) is an effective material separation technology that is ideally suited to many tasks at nuclear power plants. AVANTech uses this valuable process to solve a problem common to PWRs with the development of BARS™.

BARS™ Capacity

BARS™ come in many sizes and configurations. A typical multi-stage BARS™ processes up to 60 gpm and is used to remove silica from reactor water storage tanks and spent fuel pools. BARS™ units processing at rates down to 4 gpm are used in batch operation for tasks such as removing silica from Boric Acid (BA) evaporator concentrates.

PROBLEM: Silica

Silica leaching from borosilicate fuel racks and containments can exceed concentration limits set by suppliers and jeopardize fuel warranties.

While BA evaporators concentrate BA, they also concentrate silica in your plant's primary system. Eventually, the silica concentration is so high that BA concentrate must be processed for disposal instead of recycled. This means costs for makeup water, replacement BA, and liquid radwaste (LRW) processing related to the discharge of borated water.

SOLUTION: BARS™

BARS™ uses RO to remove silica from borated reactor water and the concentrate produced by evaporators, while recovering the BA.

BARS™ membranes hold back (reject) most of the silica, while allowing most of the BA to pass through (permeate). This lets you recover up to 89% of the BA while diverting silica-enriched reject to the LRW system for processing and disposal.

Boric Acid Recovery System (BARS™)

Flexible Use

The skid-mounted BARS™ can be divided into sub-units for easy installation. Small units can be easily stored or moved around the plant for a variety of applications.

BARS™ Operation

In the RO vessels at a pH around 4.5, spiral membranes let the bulk of the water and boron pass while rejecting most of the silica. A low pH is preferred, since more boron is rejected (as borate) as the pH value rises.

The BARS™ processes BA solution in a single-pass mode. The reject (concentrate containing silica and boron) is sent to the radwaste system for reprocessing/discharge. Permeate (clean water containing boron) goes back to the spent fuel pool or reactor water storage tank.

Final waste volume corresponds to initial silica concentration, as final silica concentration is limited to approximately 120 ppm silica.

Greater silica concentrations are possible, but precipitation of silicates will result if immediate dilution with other radwaste water does not occur.

System Control

The operator starts the BARS™, adjusts it, and shuts it down from the Main Control Panel. Manual valves and local flow and pressure gauges give the feedback needed for efficient, safe operation without continuous monitoring.

Automatic shutdown at high and low feed pressures prevents damage to the high-pressure pump. Shutdown at conductivity alarm guards against out-of-spec water.

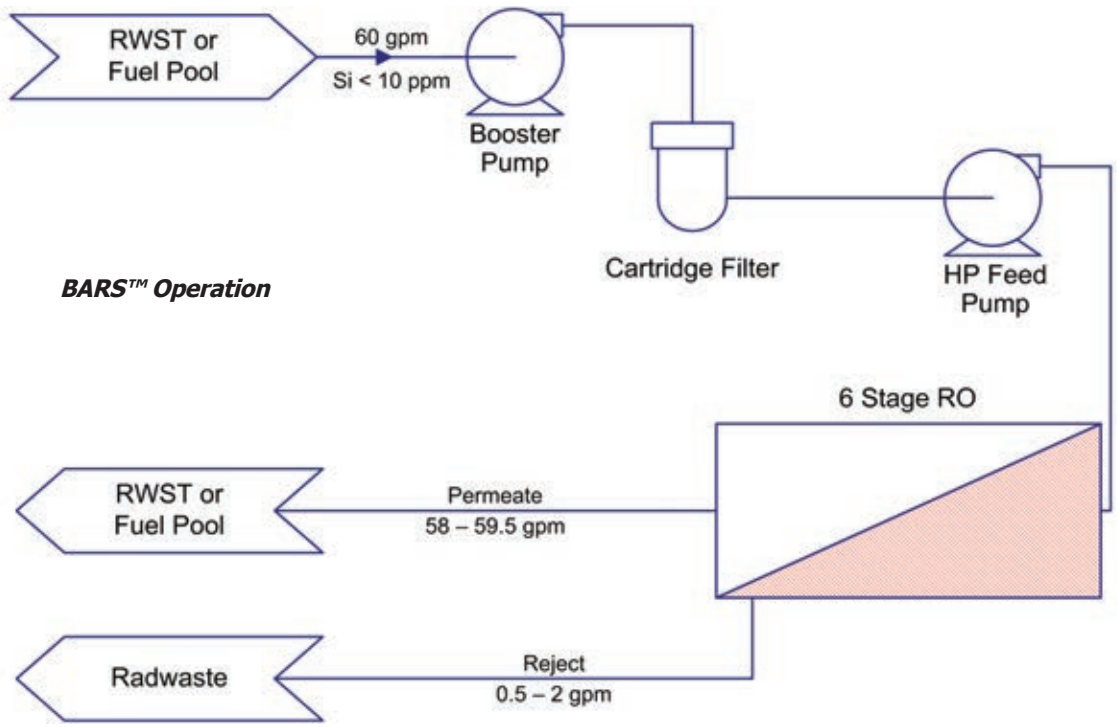
Proven Performance

The BARS™ accepts a feed stream at temperatures up to 113°F. A typical feed might consist of BA concentrates with:

- ✓ Silica concentration up to 30 ppm
- ✓ Maximum free chlorine of <1 ppm
- ✓ pH between 4 and 6

Typical BARS™ results include:

- ✓ 98% water recovery
- ✓ 90-94% reactive silica membrane rejection
- ✓ 60-75% reactive silica rejection per pass
- ✓ 100% colloidal silica rejection per pass
- ✓ 89% BA recovery when silica <10 ppm



BARS™ Operation

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