



**Soil and Groundwater Remediation Equipment**

## ShallowTray® Low Profile Air Stripper

As the inventor of the original ShallowTray® low profile air stripping and owner of numerous patents, **BISCO Environmental/NEEP Systems** has more than 2,500 systems installed throughout the world. The ShallowTray™ has become the technology of choice for air stripping of VOCs from aqueous streams in commercial groundwater, industrial process and wastewater applications. As the authority on low profile air strippers, our reputation is reinforced as the manufacturer with the technical know-how to maintain quality product stewardship before, during, and after the sale.

This field-proven expertise qualifies **BISCO Environmental/NEEP Systems** to offer the ShallowTray technology as the preferred choice over other tray air stripping or packed tower technologies.

The ShallowTray's primary advantages over other strippers based on using trays, particularly removable trays, includes these features and benefits:

- **In place cleaning:** Easily accessible cleaning ports with supplied washer wand. Easy to use — “Shallow Tray” systems are designed for ease of cleaning and longevity in the field without disassembling the unit.
- **No trays to pull out:** No concerns of air leakage on the sides which could adversely affect stripping performance due to air bypass.
- **Tray and cover seals not used:** Seals used in removable tray units accumulate residues making them difficult to clean, wear out, and provide a leak path for the stripping air, plus they need replacement. The ShallowTray does not use tray or cover seals.
- **No need to purchase spare trays:** Since cleaning the trays that are removed can delay the restart of the stripper, the suppliers recommend the purchase of expensive replacement trays.
- **No messy waste disposal:** When trays are pulled out and the fouling material is dumped on the ground, it can create a mess that must be handled. Shallow Tray operation is much cleaner; the waste material is simply flushed out of the system.
- **Smaller footprint:** Modular design and more efficient surface/volume ratio.
- **Accurate modeling software:** Available based on empirical data from hundreds of operating units. No one else has this data base of performance. This provides “certainty of outcome” for applications.

The ShallowTray's primary advantages over packed tower strippers arise from three design features:

- **Turndown:** ShallowTray™ air strippers can be operated effectively from 100% of hydraulic capacity down to 2%, which is 98% turndown. Packed towers are limited to about a 40% turndown due to channeling and short circuiting. In fact, as the flow rate to a ShallowTray™ is reduced, the efficiency of removal of volatiles increases.
- **Maintainability:** ShallowTray™ air strippers are designed to allow ready access to the interior of the trays through cleanout ports for inspection and tray cleaning. A washer wand may be utilized with a pressure washer to remove and flush away any solids buildup. Packed towers are limited to less than effective acid washing for partial removal of scale. Towers regularly require total replacement of packing media, which is very costly with significant downtime.

## ShallowTray® Low Profile Air Stripper

- **Low Profile:** ShallowTray™ air strippers are less than ten feet tall, resulting in minimal visual impact. More importantly, this allows for installation inside existing buildings to take advantage of weather protection of the equipment, operations and maintenance activities and safety and security. Packed towers located out-of-doors are subject to environmental risk from wind and windborne objects, freeze damage, and attendant operation and maintenance complications.

### Performance

The stripping mechanism of the proprietary ShallowTray™ low-profile perforated-plate air stripper is dependent on the plug flow of an influent liquid through a long, narrow channel on a discrete number of trays while subject to a countercurrent flow of ambient air at a fixed flow rate. As such, its performance does not follow the predictive model widely employed today for estimating removal efficiencies of VOCs in packed tower strippers.

In lieu of this, the **BISCO Environmental/NEEP Systems** ShallowTray Modeler™ software has been developed to provide system performance estimates to make appropriate ShallowTray air stripper selections for specific sets of site requirements. The stripping performance provided by the software is based on more than 10,000 gas chromatography analyses of influent and effluent samples taken from operating, full scale ShallowTray systems stripping a variety of VOCs including Benzene, Toluene, Ethylbenzene, and Xylene (BTEX), as well as assorted Polycyclic Aromatic Hydrocarbons (PAHs), chlorinated organics, and ketones.

The method of correlation between this database, the site specific variables of flow rate, temperature, concentration, and the predicted ShallowTray performance are trade secrets and remain the property of **BISCO Environmental/NEEP Systems**. The design criteria can be described as based on the following:

- Input operating conditions of water flow rate, water and air temperature, specific contaminant concentration and desired effluent concentration
- Using the performance curves developed in our full scale testing program, look up the expected per-tray removal efficiency for each compound
- Calculate the minimum number of trays required to achieve the desired overall removal efficiency

The ShallowTray Modeler™ program automates the design process. The design process could be reduced to theoretical equations if all the compounds to be modeled follow a well-defined distribution equation such as Henry's law. BTEX compounds follow Henry's law quite nicely. However compounds such as MTBE and naphthalene do not. In order to produce a Modeling program of maximum accuracy **BISCO Environmental/NEEP Systems** chose to use curve fitting techniques using actual empirical data rather than attempting to develop correction factors for compounds that deviate from agreement with Henry's law. The known high accuracy of this method based on actual data provides certainty of achieving the performance goals.

The field performance of ShallowTray air strippers has proven the stripping mechanism to meet or exceed the System Performance Estimate model in every case.