Forward Technology Industries Inc

LOW FLASH POINT SOLVENT VAPOR DRYER

FOR PRECISION DRYING

AD-SERIES™

PRECISION CLEANING EQUIPMENT

Forward Technology AD-Series Vapor Dryers are specifically designed for use with isopropyl alcohol and other low flash point solvents for precision removal of water and particulates.

SYSTEM ADVANTAGES

- **Superheated Vapor Drying**
  Parts dry faster while reducing solvent consumption.
- **Zero Recovery Time**
  Vapor zone does not collapse, allowing shorter cycle times and greater throughput.
- **Temperature Controlled Collection Tray**
  Minimizes reflashing of water/IPA back into vapor.
- **Low Solvent Usage**
  Minimizes dragout.
- **Working Mode Dual, Horizontal Sliding Covers**
  Reduces vapor loss by minimizing disturbance of the air-vapor interface.

True Superheat™

Unique to Forward Technology's design is the use of True Superheat™ during the final drying process. A vapor zone heated 20-50 F above the solvent's boiling point evaporates remaining liquid on the parts. Parts leaving the system contain no liquid solvent, minimizing dragout and vapor emissions.

DESIGN FEATURES

Stand-Alone or Wet Bench Installation
The AD-Series can be operated as a stand-alone vapor dryer, or can be integrated into a cleaning line as a final drying station.

Remote Control Cabinet
A remote-mounted control cabinet containing PLC, hot water heating and CO_2 fire suppression systems is designed to be located outside the Class 1, Division 1 area.

Indirect Heating
Water-glycol heating ensures that the system cannot reach the solvent auto ignition temperature, even under fault conditions.

Automated Lift System
A cantilever-style vertical lift with a 50 lb. load capacity is standard on the system. This ensures process standardization and minimizes dragout of solvent.

Extensive Safety Systems
Forward Technology vapor dryers meet all applicable National Fire Protection Association (NFPA) safety standards and have an integral CO_2 fire suppression system.

100% Freeboard Ratio
This design feature minimizes vapor loss from the containment tank.

Secondary Containment Tray
Capable of holding more than 100% of tank liquid volume including plumbing.

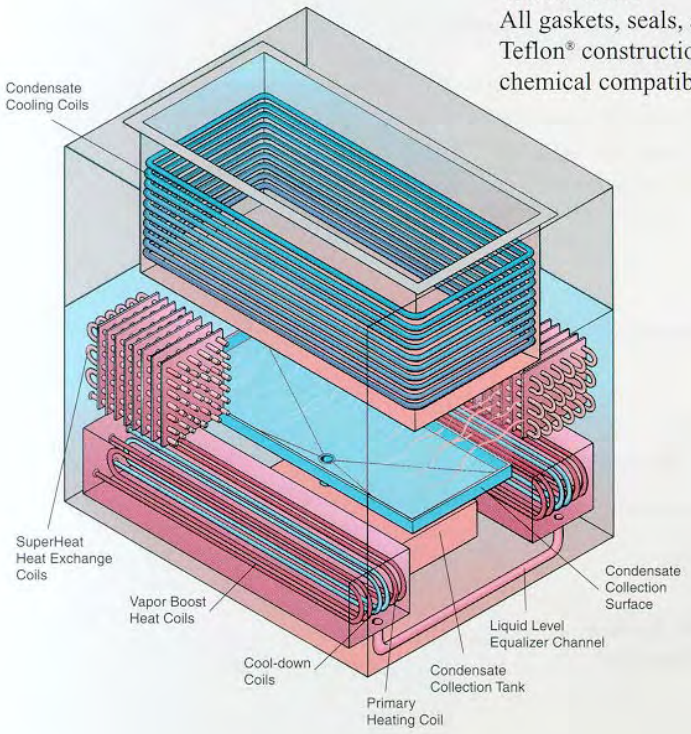
Integral Fill & Drain System
The system is provided with individual, dedicated pumps for filling and draining the system. These pumps provide a safe method of solvent transfer, while eliminating the possibility of solvent contamination.

Removable Access Panels
Removable lift-off panels on all sides allow easy accessibility to all electrical and mechanical components and facilitate maintenance.

Cleanroom Assembly
Final assembly of the AD-Series is conducted in a cleanroom environment to minimize introduction of contaminants into the system.

Stainless Steel Construction
All components which contact solvent, including tanks, solvent plumbing, and heating and cooling coils are made of electropolished 316 or 316L stainless steel. All structural components, including framing, covers and countertops in the vapor dryer are constructed of 300-series stainless steel.

Teflon® Seals
All gaskets, seals, and elastomers feature Teflon® construction, ensuring optimal chemical compatibility.



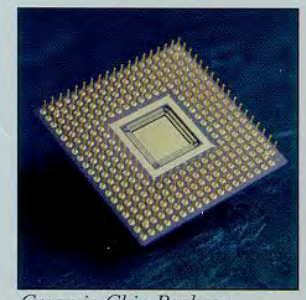
APPLICATIONS

Forward Technology's vapor dryers are specifically designed for use with flammable solvents such as isopropyl alcohol (IPA). Typical applications include the removal of water from:

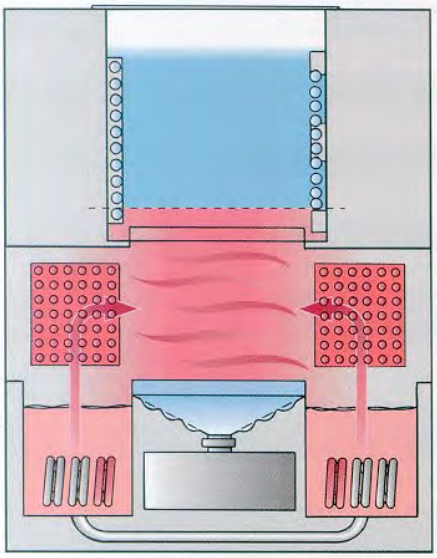
- Disk drive media
- Flat panel displays
- Semiconductor wafers
- Photomask substrates


Magnetic Disk


Flat Panel Display

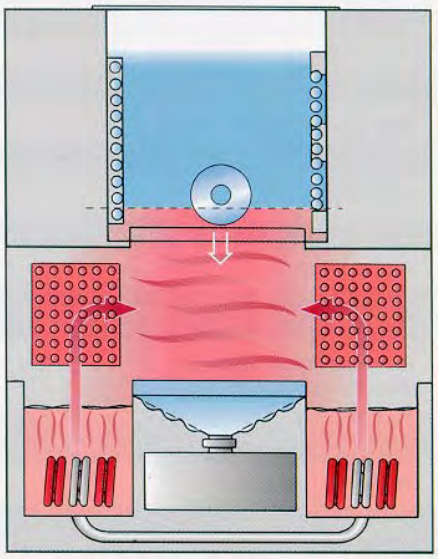

Ceramic Chip Package

SUMMARY OF OPERATION



Machine in equilibrium

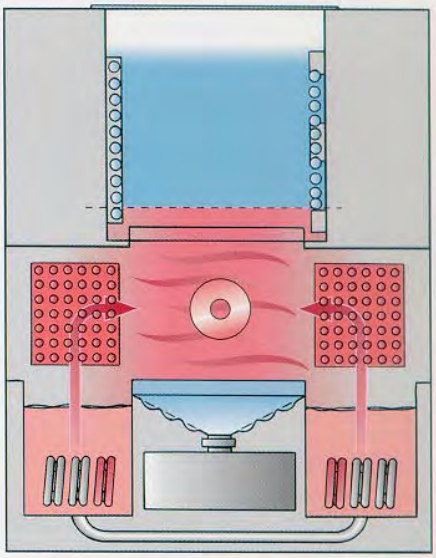
When not processing a load, the system operates with only the two primary heating coils active, vigorously boiling IPA in dual off-set boil sumps. IPA vapors are super-heated to 105°C as they pass through superheat heat exchangers positioned above each boil tank.



As load (heat sink) is inserted, PLC activates vapor boost sequence

As the incoming process load (effectively acting as a heat sink) is inserted into machine, a secondary pair of "vapor boost" heating coils is activated by the PLC. This vapor boost action offsets the effects of "work shock" as the incoming load absorbs heat and condenses vapors. The vapor boost effect prevents vapor zone collapse, and allows sustained and vigorous IPA condensation rinsing of the inserted load. As incoming load descends through the condensation cooling coils, horizontally-sliding process tank lids close above the load, to minimize vapor emissions and vapor zone disturbances.

As condensed IPA streams off the parts, falling condensate strikes a sloped collection surface, which is backed by a temperature-controlled water jacket. By keeping the condensate collection surface cooled below the boiling point of the azeotropic IPA/water mixture, the system minimizes reflashing of water-rich azeotrope back into vapor, thus preserving process integrity.



As load is heated to equilibrium temperature with vapor, hot water flow is withdrawn from vapor boost coils

Once the inserted parts load has reached equilibrium temperature with the surrounding vapor, condensation ceases. The vapor boost heating coils are deactivated, and heat balance within the system is returned to equilibrium. The parts load and fixtures may be superheated by the surrounding vapors, as selected by customer, to speed drying and minimize solvent drag-out. The load is then raised above vapor zone using a movement profile designed to minimize the "chimney" effect, and halted briefly in the cooling coil region, to allow entrained solvent vapors to dissipate. Horizontally-activated tank lids are then opened, and the load is automatically raised to the upper "home" position for unloading.