

# Technical Bulletin 58

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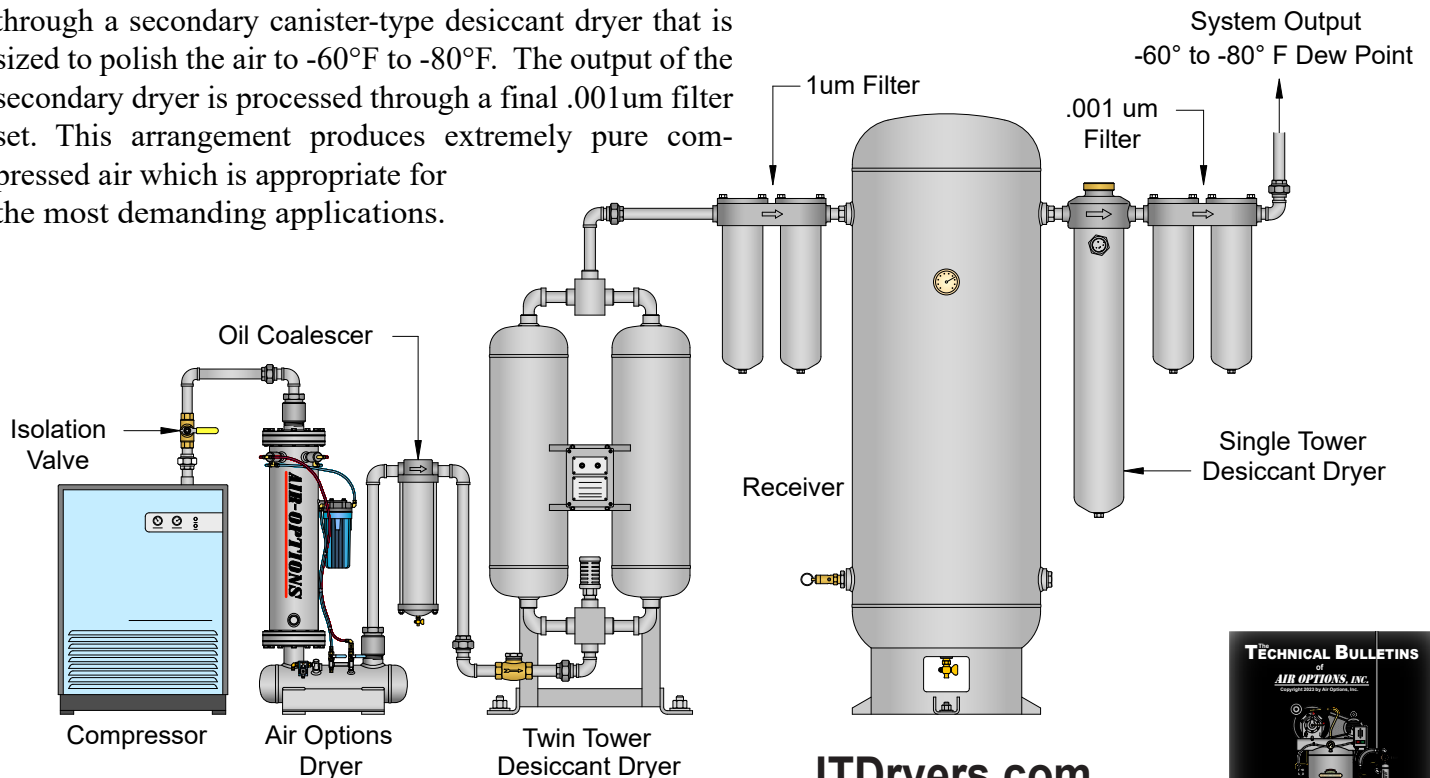
## High-Purity Compressed Air System

by Brian S. Elliott

High-purity compression systems are specified for applications that require extremely clean air, most notably, semiconductor manufacturing. The quality of air that is plumbed into these fabrication laboratories must be very dry and exhibit exceptionally low particulate and hydrocarbon contamination. The dew point requirement specified by most facilities is  $-60^{\circ}\text{F}$  to  $-80^{\circ}\text{F}$ , the particulate specification is  $.001\mu\text{m}$  and the hydrocarbon specification is less than one part per million. Achieving these specifications requires a carefully designed system with a rigorous maintenance and monitoring program.

Compressed air in these facilities is used to control all manner of devices, from operating cylinders to providing flow for air bearings. Additionally, it is commonly used for ultra-clean dust-off operations. This air quality is required because of the microscopic scale of the semiconductors being manufactured. When these components are examined under a microscope, a  $10\mu\text{m}$  particle looks like a 20' boulder lying in the middle of a street. A  $1\mu\text{m}$  drop of oil is a greasy flood, which will completely destroy a circuit.

The illustration below shows a high-purity compression system that might be found in a medium-sized semiconductor facility. The output of the compressors is channeled through a refrigerated dryer and an oil coalescer. The output of the oil coalescer is fed directly into a twin tower desiccant dryer. The output of the desiccant dryer feeds a  $1\mu\text{m}$  twin tower particulate filter. At this point, the air introduced into the receiver should be in the  $-40^{\circ}\text{F}$  dew point range. The output of the receiver is processed through a secondary canister-type desiccant dryer that is sized to polish the air to  $-60^{\circ}\text{F}$  to  $-80^{\circ}\text{F}$ . The output of the secondary dryer is processed through a final  $.001\mu\text{m}$  filter set. This arrangement produces extremely pure compressed air which is appropriate for the most demanding applications.



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