# TDI *TURBOGUARD*™ | SMART START SYSTEM

## ANOTHER TDI *TURBOTWIN*™ RELIABILITY BREAKTHROUGH: *TURBOGUARD*™ AIR STARTERS

TDI engineers are constantly designing new features and functionality to improve the reliability of engine operations and assure successful starting under the most challenging conditions. The problem of hydrolock has been vexing engine manufacturers for many years. After testing the *TURBOGUARD* system on their own laboratory engines and seeing its split second responsiveness, *TURBOGUARD* was tested at a number of engine manufacturer's laboratories around the world. The test results proved 100% positive at every location.

*TURBOGUARD* will be appearing on a number of OEM engines soon and is available immediately as a retrofit safeguard to any engines where the T100-V are installed.





The TurboGuard control box allows you to choose "safe start mode" with TurboGuard protection, or "immediate start mode" for normal starting when you are doing multiple starts or testing.

**TDI**
TECH DEVELOPMENT

*TURBO TWIN*™

**Anything Less Than a *TURBOTWIN* Air Starter is a Compromise**

6800 Poe Ave. • Dayton, OH 45414
Tel: 937-898-9600 • Fax: 937-898-8431
**www.tdi-turbotwin.com**

## A RELIABILITY BREAKTHROUGH PREVENTING ENGINE DAMAGE & DOWNTIME CAUSED BY HYDROLOCK



This 3 min. informative video explains the cause of hydrolock and how TurboGuard prevents it. View the movie at **www.Tdi-TurboTwin.com/Air-Starters/ TurboGuard** or on YouTube by searching TurboGuard.
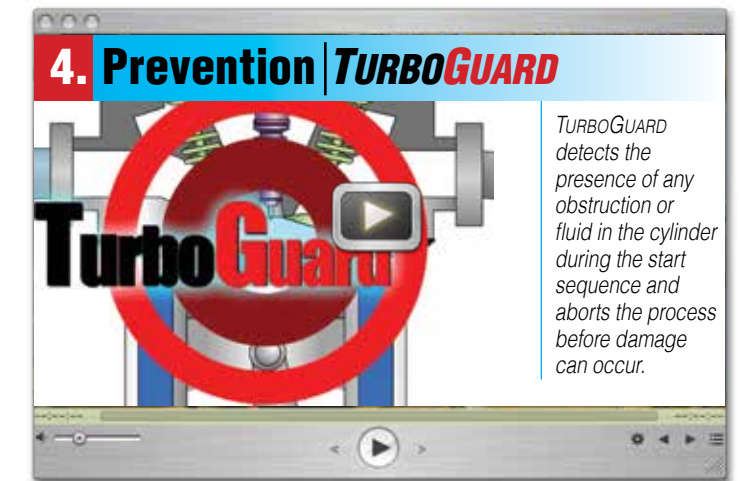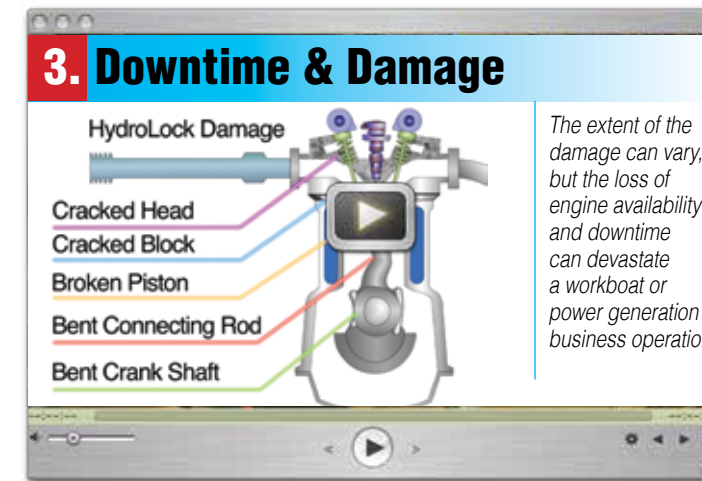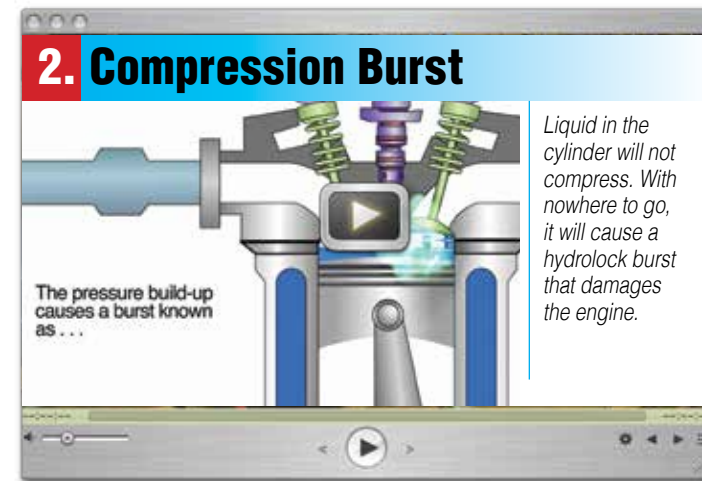
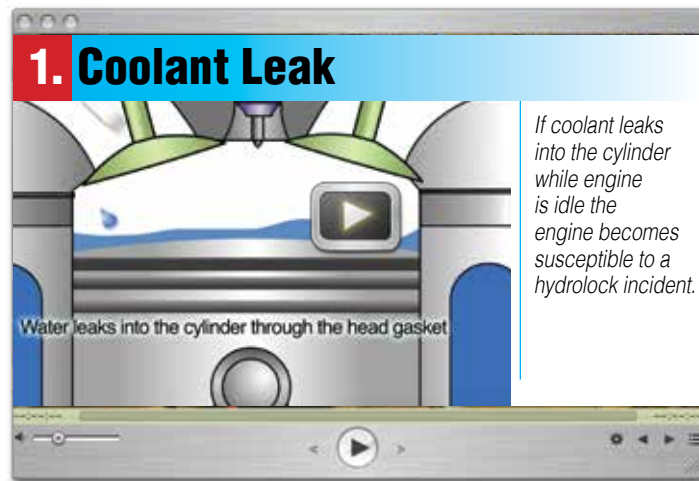## APPLICATIONS

Workboats & Marine

Power Generation/ Remote Starts

Critical Engine Availability Sites

Engines with Long Periods Between Starts

**TDI**
TECH DEVELOPMENT

*TURBO TWIN*™

**Anything Less Than a *TURBOTWIN* Air Starter is a Compromise**

## 1. Coolant Leak



Water leaks into the cylinder through the head gasket

*If coolant leaks into the cylinder while engine is idle the engine becomes susceptible to a hydrolock incident.*

## 2. Compression Burst



The pressure build-up causes a burst known as . . .

*Liquid in the cylinder will not compress. With nowhere to go, it will cause a hydrolock burst that damages the engine.*

## 3. Downtime & Damage



HydroLock Damage

Cracked Head
Cracked Block
Broken Piston
Bent Connecting Rod
Bent Crank Shaft

*The extent of the damage can vary, but the loss of engine availability and downtime can devastate a workboat or power generation business operation.*

## 4. Prevention | *TURBOGUARD*



*TURBOGUARD detects the presence of any obstruction or fluid in the cylinder during the start sequence and aborts the process before damage can occur.*

***TURBOGUARD's Soft Start Reduces Wear on Ring Gear. The reduced impact will extend pinion and ring gear life up to three times.***

---

## What Applications Have the Greatest Need for *TURBOGUARD*?



**Workboats & Marine** *engines are susceptible to leaking coolant or fluids after being in port for periods of time.*

**Engines with Long Periods Between Starts** *are candidates for TURBOGUARD because during those times, the engine is vulnerable to leaking coolant.*

**Power Generation/Remote Starts** *with no operator present to blow down the engine, TURBOGUARD is a safeguard.*

**Remote Automatic Gas Compression Stations** *are often unmanned and have long periods of time between starts — meaning coolant leaks can go unnoticed.*

---

# HOW HYDROLOCK HAPPENS & HOW *TURBOGUARD* PREVENTS IT

### What is Hydrolock?
HydroLock occurs when the engine is started with coolant in a cylinder. The coolant is driven through the cylinder at very high pressures during the compression cycle. Because liquids do not compress, as the pressure builds, there is no place for it to go causing an internal collision known as hydrolock.

### What Damage Does it Cause?
The high pressure mechanical collision can cause bent connecting rods, broken pistons, a cracked block, damaged cylinder head, and broken crankshaft. The damage could require a completely new engine. Perhaps the biggest problem is the cost of downtime to your operation as you wait for parts and repair, or have to move the old engine out and wait for the replacement engine to arrive.

### How Does TDI TurboGuard Prevent Hydrolock?
TDI's *TURBOGUARD* Smart Starter detects the presence of leaking coolant, extraneous fluids, or any other type of obstruction in the cylinders during the start sequence. *TURBOGUARD* automatically shuts the starting process down before damage occurs – preventing a hyrdolock incident.

### Introducing TDI's Proprietary Smart Starter Control
TDI's innovative smart starter technology has the ability to regulate air pressure, speed, and other variables in such a precise way it can determine if there are cylinder obstructions and abort before coolant is pushed through the system to cause damage. This is a significant engineering accomplishment because a typical engine start cycle may go from 0 to engine firing RPM in under 5 seconds.

### How TurboGuard Smart Starting Works
*TURBOGUARD*'s intelligent control system has extended the normal cycle ten seconds longer using relay valves, solenoids, and precise control of speed and air pressure. As the engine is slowly rotated, the starter system monitors for anomalies in the process indicating a hydrolock condition. If an obstruction is identified, the starter sequence is aborted. If no obstruction is detected, the engine will be brought to normal crank speed utilizing a "soft-start pressure ramp" to minimize impact torque between starter pinion and engine ring gear. In cases where the engine has been started recently (durations you can preset), the protective safe start feature can be bypassed and the engine can start immediately.

### TurboGuard Assures a New Level of Engine Reliability
Your engine has many built-in safeguards, but protection against hydrolock is not one of them. With *TURBOGUARD* there is a new level of protection against the threat of leaking head gaskets, oil from valves, or other obstructions that make their way into a cylinder. Being able to abort the start cycle before damage is done delivers a new level of engine reliability.

### TurboGuard is a Safeguard for Your Business
It's estimated that one hydrolock incident can cost between $50,000-$1 million dollars in downtime and replacement costs. *TURBOGUARD* isn't just a new reliability feature for your start system; it's a quality process safeguard that minimizes the possibility of a catastrophic loss of engine availability. For protecting your engines from hydrolock damage and assuring equipment availability in your operations, *TURBOGUARD* is an essential option.

### The TurboGuard Start System Fits All Kinds of Engines
Presently, *TURBOGUARD* is designed to fit on all large reciprocating engines from 70-300 liters. It fits the same engine market as TDI's T100-V models. It's more than just a starter. *TURBOGUARD* systems include a new TDI smart starter, valves, controls, and all the hardware required for a fast, complete installation on your engines.