

# Industrial Tank

## Common Failure Modes and Preventive Actions



Industrial tanks can fail for various reasons, posing significant safety and environmental risks. Preventing tank failures is crucial to avoid disasters. Here are some common causes of tank failures and preventive measures:



### 1. Corrosion:

- **Cause:** Corrosion occurs when the tank's material deteriorates due to chemical reactions with the stored contents or environmental factors.
- **Prevention:** Regular inspections, protective coatings, cathodic protection systems, and proper material selection can prevent corrosion.

### 2. Overpressure:

- **Cause:** Excessive pressure within the tank, often due to overfilling, equipment malfunctions, or thermal expansion.
- **Prevention:** Use pressure relief valves, monitoring systems, and follow safe operating procedures to prevent overpressure incidents.

### 3. Underpressure:

- **Cause:** Tanks can collapse or implode if subjected to extreme vacuum conditions, which may occur during rapid product withdrawal.
- **Prevention:** Ensure proper venting, maintain adequate product levels, and follow established procedures for product withdrawal.

### 4. Leaks and Spills:

- **Cause:** Mechanical damage, defective seals, or inadequate maintenance can lead to leaks and spills.
- **Prevention:** Conduct regular inspections, perform maintenance, and implement secondary containment systems to contain spills.

### 5. Material Fatigue:

- **Cause:** Repeated stress and strain cycles can weaken tank materials over time, leading to cracks and failures.
- **Prevention:** Use materials with high fatigue resistance, conduct non-destructive testing, and replace tanks when necessary.

### 6. External Forces:

- **Cause:** Events such as earthquakes, floods, or accidents like vehicle collisions can damage tanks.
- **Prevention:** Design tanks to withstand environmental forces, implement protective measures, and have emergency response plans in place.

### 7. Foundation Settlement:

- **Cause:** Uneven settling of tank foundations can lead to stress on the tank structure.
- **Prevention:** Ensure proper foundation design and regular inspections to detect settlement issues early.

### 8. Inadequate Maintenance:

- **Cause:** Neglecting routine inspections, repairs, and maintenance can lead to deteriorating tank conditions.
- **Prevention:** Implement a robust maintenance program, including inspections, corrosion monitoring, and prompt repairs.

### 9. Material Incompatibility:

- **Cause:** Some substances stored in tanks can react with the tank material, causing degradation.
- **Prevention:** Select materials compatible with the stored contents and employ proper lining or coatings if necessary.

### 10. Human Error:

- **Cause:** Mistakes during tank operation, such as incorrect filling or venting procedures, can result in failures.
- **Prevention:** Provide comprehensive training, standard operating procedures, and thorough safety protocols for personnel.

### 11. Age and Wear:

- **Cause:** Tanks deteriorate over time due to aging and wear, leading to potential failure.
- **Prevention:** Regularly assess the condition of aging tanks, perform necessary repairs or replacements, and consider retirement when appropriate.

**12. Design Flaws:**

- **Cause:** Inadequate tank design or manufacturing defects can compromise structural integrity.
- **Prevention:** Employ sound engineering practices, conduct thorough quality control during fabrication, and ensure designs meet industry standards.

Preventing industrial tank failures involves a combination of proper design, material selection, regular inspection, maintenance, and adherence to safety protocols. Implementing these measures can significantly reduce the risk of tank failures and the associated hazards.