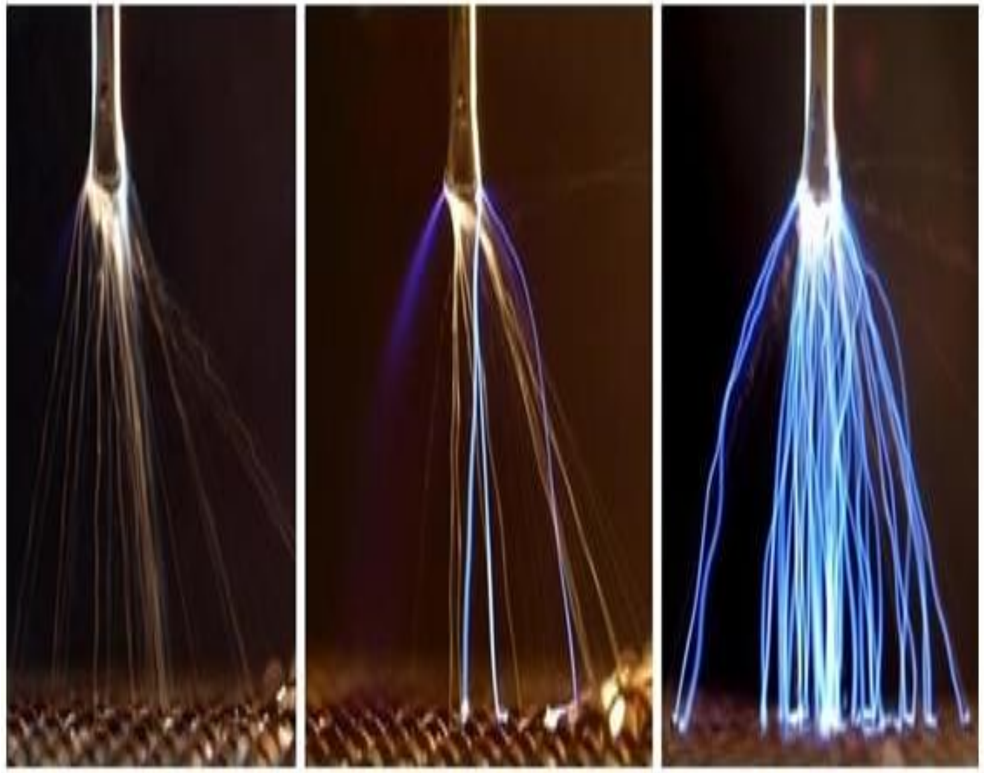
Mastering PD Testing Ensuring Compliance and Prevent Failure



- **Popcorn Analogy**
- **Title:** *What Do Transformers and Popcorn Have in Common?*

Just like **popcorn kernels**, transformers can **“pop” from the inside** when internal stress builds up.

In popcorn, it’s **steam pressure** — in transformers, it’s **electrical stress in insulation**.

Those tiny **“pops”** in a transformer are **Partial Discharges (PD)** — early signs of internal failure.

What Is PD? – A Quick Refresher

partial discharge (**PD**) is a localized dielectric breakdown of a small portion of a solid or fluid electrical insulation (EI) system under high voltage (HV) stress.

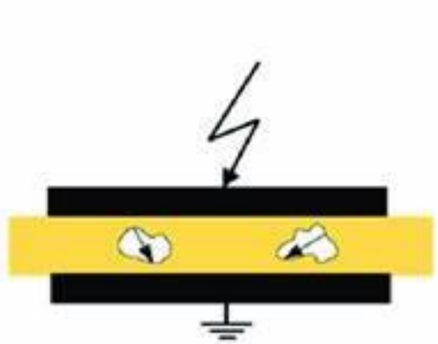
Types: Internal, Surface, Corona

Imagine: Micro-lightning damaging your cables over time

INTRODUCTION

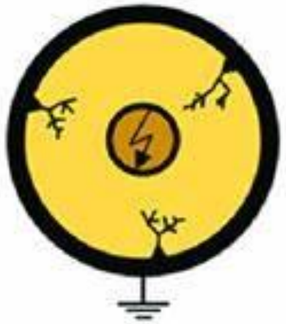
- **Partial Discharge (PD) testing** is a critical tool in assessing the health of **HV electrical insulation**. It helps detect electrical flaws before they lead to catastrophic failures.

PD is a silent threat—deteriorating insulation, reducing efficiency, and increasing failure risks. "Detecting PD early ensures operational safety and minimizes costly outages.

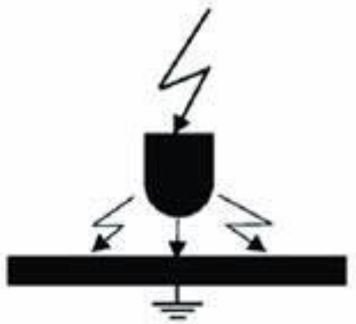


INTERNAL DISCHARGES

SURFACE DISCHARGES



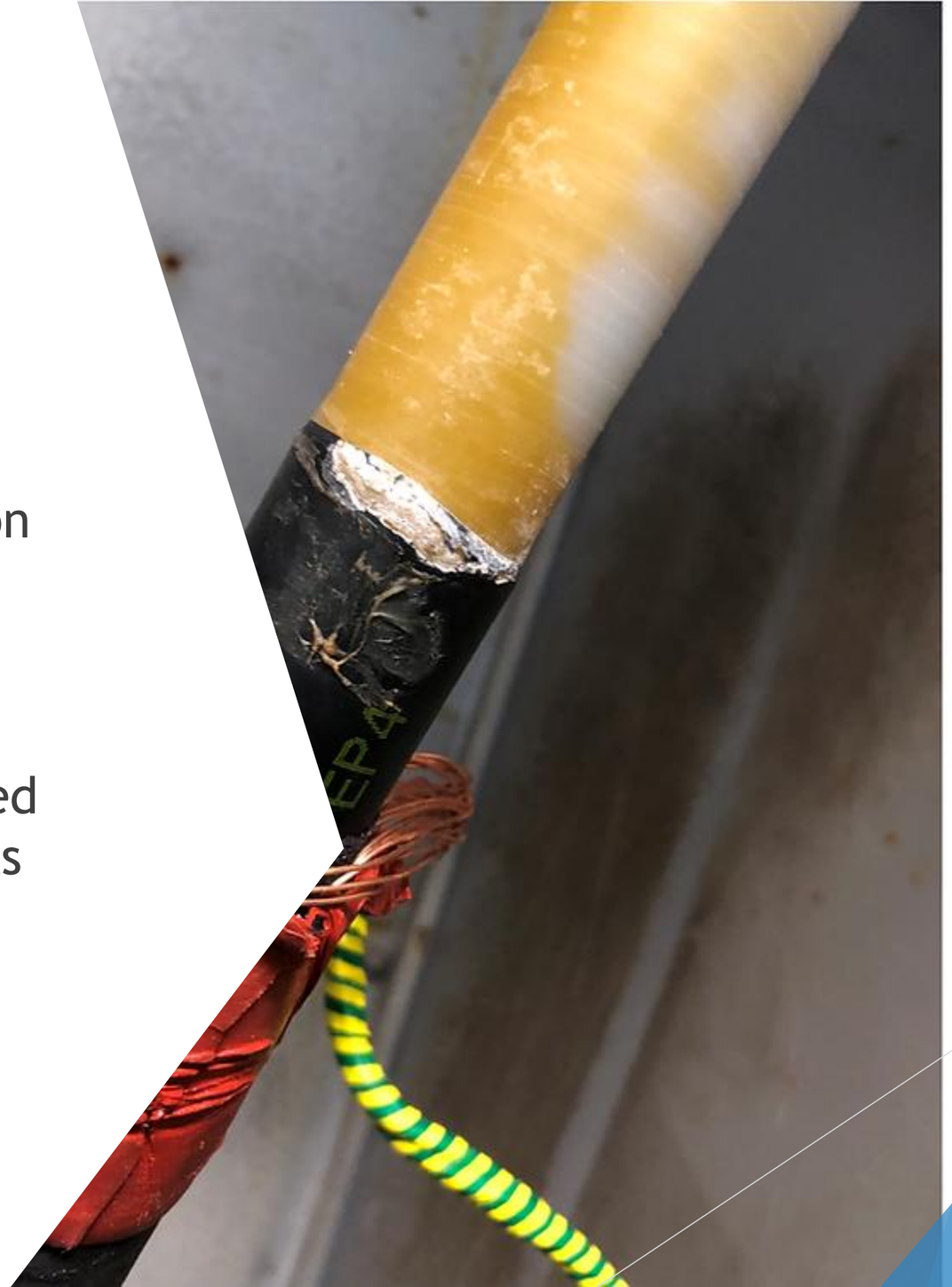
TREEING

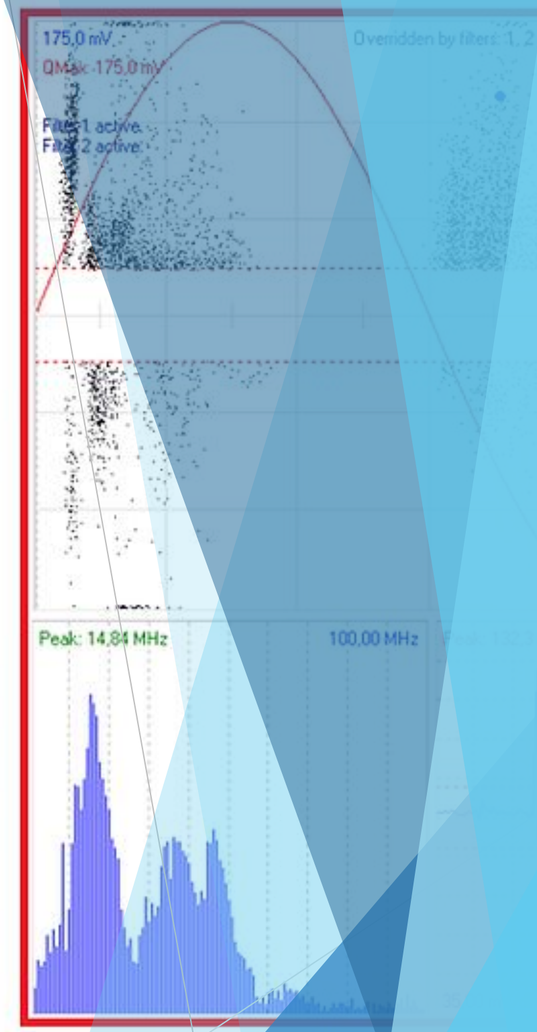


CORONA IN AIR

Why Care About PD?

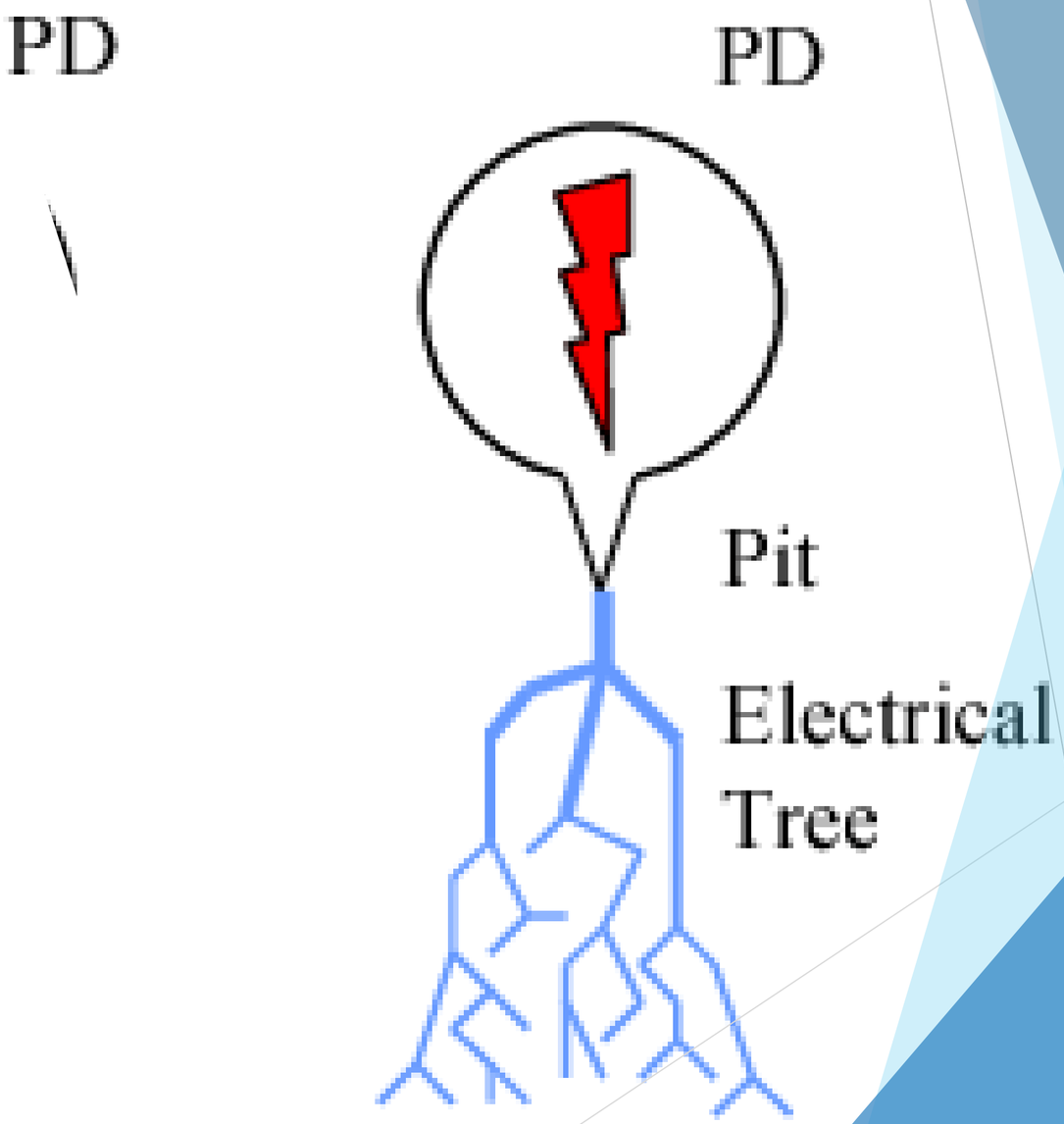
- Partial Discharge (PD) is a silent indicator of insulation failure
- It can occur long before a catastrophic failure
- Unchecked PD = Unexpected Outages + High Repair Costs
- Our mission: Detect early, act smart, stay compliant





Australian Standards

- Adhering to standardized measurement techniques ensures consistency and reliability in PD detection. The IEC 60270 standard provides guidelines for measuring PD in electrical equipment, emphasizing the importance of maintaining specific characteristics of PD measuring systems.



Online PD Testing: Monitors equipment while energized—ideal for early detection. Ideal for routine maintenance checks.

Offline PD Testing: Conducted during maintenance shutdowns—provides detailed diagnostics. Useful for commissioning tests and in-depth diagnostics.

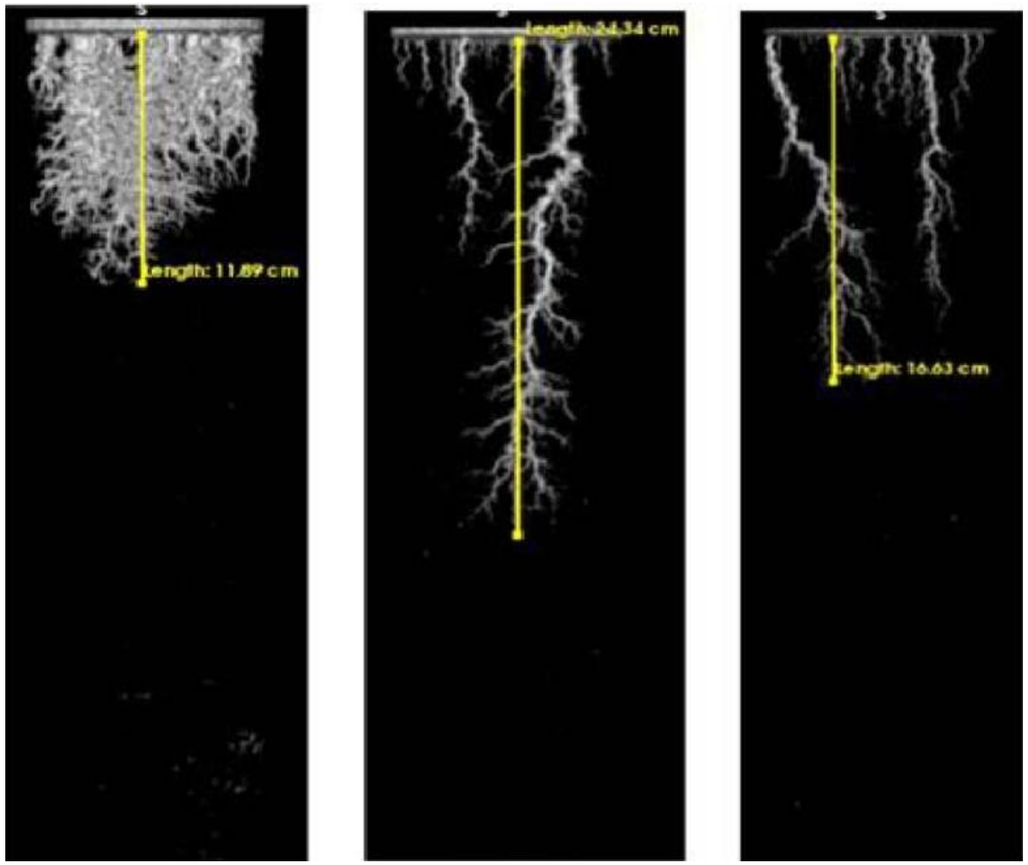
- Both methods help **extend asset lifespan** and **mitigate operational risks**.

Feature	Offline Testing	Online Testing
When	During outage	While energized
Pros	Controlled, accurate	No shutdown, real conditions
Cons	Needs downtime	Noisy environment
Ideal For	Commissioning	Monitoring in service

Real-world Applications – Where PD Strikes

Equipment	Common PD Causes	Typical Failure Risk
Switchgear	Loose connections, poor insulation, dust	Arc faults, total panel failure
Cables & Joints	Voids, moisture, poor terminations	Cable burnout, localized breakdown
Transformers	Insulation aging, internal voids, oil issues	Explosion, fire, major outages
Bushings & CTs/VTs	Surface tracking, cracks, partial flashover	Measurement error, explosion risk
Rotating Machines	Slot discharges, coil movement	Rotor/stator damage, shutdown

You don’t need to replace what you understand and maintain.



Risk Mitigation & Lifecycle Extension

- Early detection = Early intervention = Less damage
- Better planning of maintenance & asset replacement
- PD data helps justify CapEx/Opex to stakeholders

Thanks

References: General online sources, technical articles, and manufacturer publications.