

# Condition Monitoring Questions 1

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## Introduction

Doble has monitoring systems for different asset types – including breakers, batteries, transformers, GIS, metalclad switchgear, cable terminations and more. We give here some questions to help discussion as regards which monitoring is appropriate for a client. More detailed discussion and analysis is provided in a sister document.

## Ten Scoping Questions - Overview

- 1. Which asset or assets to monitor, and why – general condition monitoring or specific failure modes?**  
It is important to understand the motivation – what problem are we trying to solve – and whether the monitoring is for general awareness or to address a specific failure mode.
- 2. For transformer DGA – is it single value or multi-gas, which valve will we use, is moisture a concern?**  
Single value devices are good detectors, and very economical; multi gas devices give diagnostics but are consequently more costly; moisture may be an option – an additional value
- 3. For PD – main tank, bushings, cables, neutral, which sensors are appropriate?**  
Partial Discharge is a complex subject – but a great warning system for insulation deterioration. Transformer main tank UHF sensors can help isolate the transformer as a source, whereas a neutral HF CT is a good reference but may not distinguish between internal and external PD; bushing PD should be in parallel with main tank or neutral PD.
- 4. Bushing Monitoring?**  
Specific bushings have specific failure modes – an IDD will detect common failure modes through the leakage current. This can be used as part of a targeted monitoring campaign or as part of a comprehensive approach.
- 5. Will Doble supply an enclosure to house monitors?**  
Some users supply their own housing or enclosures and fit it themselves; Doble can prewire and deliver tested systems; where will enclosures be mounted and powered, and what conduit required?
- 6. What operational data is available or required – load, current, temperatures?**  
Though not strictly monitoring data, operational data is useful for context and analysis; temperatures, load, voltages, currents, tap changer status etc are all valuable and can be included in Doble Prime.
- 7. Are analytics needed to aggregate and analyze?**  
Data may be taken from Doble modules and input to SCADA or other systems, or we can integrate all available data into Doble Prime for advanced correlation, trending and other analytics.
- 8. Communications – DNP, Modbus, 61850, fiber, wifi?**  
Data communications, in a secure manner, need to be installed; Doble modules have all standard communications available and will talk to existing monitors on a station.
- 9. Where are data/alarms going?**  
It is important to identify how alarms and notification levels will be set, communicated and acted upon ahead of time; agreed action plans should be in place when monitoring equipment is first operational.
- 10. Who will install, commission, check, verify and maintain the equipment?**  
Doble finds most problems with monitors can be traced back to poor or incorrect installation and commissioning. Doble will warranty equipment if appropriately checked and verified.