Condition based maintenance in complex systems subject to degradation

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Maintenance research has arisen increased attention in recent times as systems are more complex. There are three important aspects that can affect the maintenance and increase the variability of the maintenance model:

- 1. Heterogeneous components. Some components fail without warning, in contrast with perceptible deterioration that are precursors of failure in others. Different components may require different maintenance actions.
- 2. Opportunistic maintenance. It plays an important role in reducing costs and avoiding unnecessary shut-downs.
- 3. Lead time. There is usually a delay time between failure and maintenance, due to several factors.

Since industrial systems are becoming increasingly complex, they are likely to suffer from multiple degradation processes. Hence, other important aspect is to analyse systems with more than one degradation path. These degradation processes can present substantial variations between them causing different degradation patterns. Different models have been proposed to integrate the heterogeneities under the common idea that some parameters are process-specific and different across processes.