Process Monitoring

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Chapter 1
Introduction To Process Monitoring

Chapter Description

- Aims
  - Define the conceptual background of process monitoring.
- Expected Outcomes
  - Critically discuss the essentials and benefits of applying process monitoring system for ensuring smooth as well as safe industrial operability.
- Other related Information

Subtopics

1.3 Statistical Fundamentals

1.4 Monitoring Phases

1.3 Statistical Fundamentals

- Statistics: characterizing/summarizing, analysis and interpretation on some specific phenomena of interest to us.
- Population: a set of collection of all possible observations of some specific characteristics.
- Two generic categories of statistical analysis:
  - Finite -> to conduct analyses at a particular time/existing situation.
  - Conceptual -> to examine the behaviors of some measurable phenomenon as time elapses.

1.3 Statistical Fundamentals

- Finite statistical analysis
  - Two approaches -> study on elements.

    -> subsets (samples).
  - Samples -> drawing conclusions from a set of samples about the population.
  - The goal -> characterize the existing population as exactly as possible based on the given amount of information obtained.

1.3 Statistical Fundamentals

- Conceptual statistical analysis …continue
  - Objectives:
    1. Understanding of the past behavior (taken sequentially over time).
    2. To predict how the process is likely to perform in the future based on knowledge derived from the past data.
  - Advantages:
    1. Reveal the underlying cause.
    2. Experiment new approaches as to assess and improve the process.

1.3 Statistical Fundamentals

- Conceptual statistical analysis
  - Focusing on studying the behavior of a process over time

    -> Time-series study.

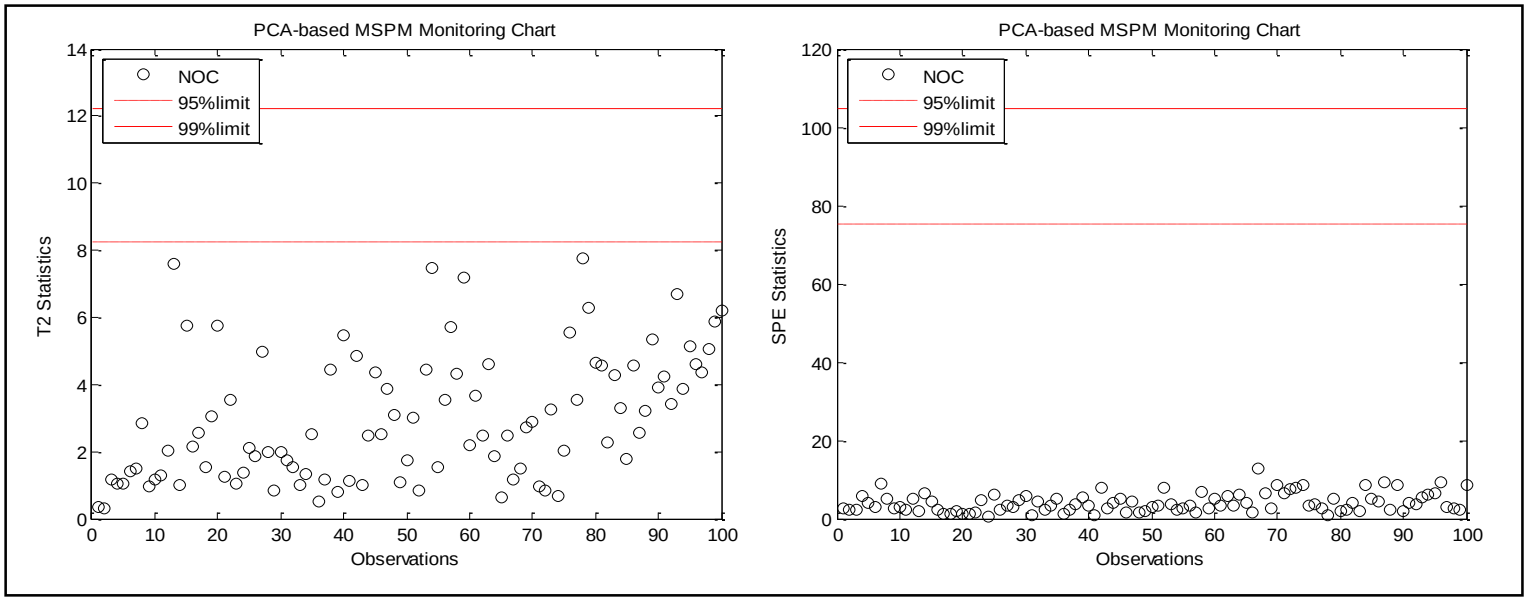
    -> Analytical study.
  - Considering on-going process (past + future).
  - Associated processes as a conceptual subject rather than established.
  - Involve observations that might occur from performing a particular operation in a particular way.

1.4 Monitoring Phases

- Two phases of building a monitoring application
  - Phase I: model development.
    - To gain an understanding of the process and to establish a statistical benchmark for the likely future process outcomes -> normal operating condition (NOC) data.
  - Phase II: fault detection operation.
    - Observing the process in real time by comparing the new process data with the pre-specified model that established during the first phase -> normal (nothing changes) /abnormal (there are fundamental changes which require intervention)!

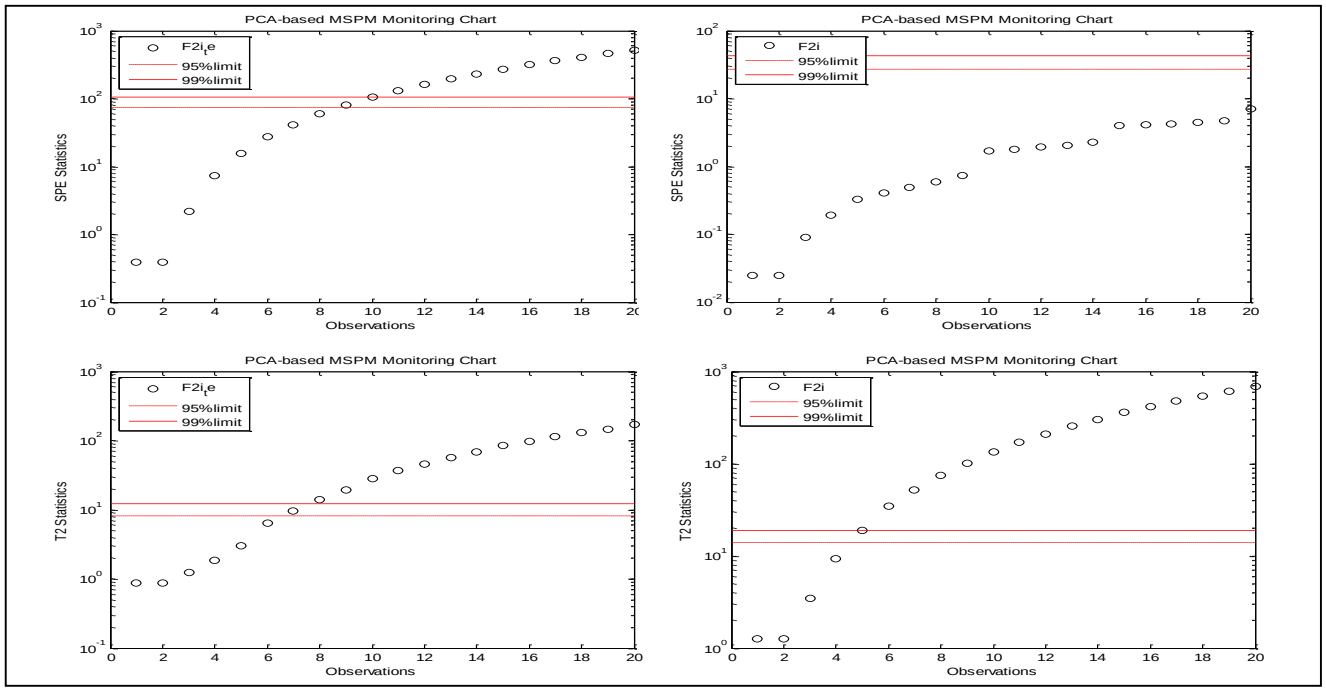
1.4 Monitoring Phases

- **Phase I:** T^2 and SPE progressions.



1.4 Monitoring Phases

- **Phase II:** T^2 and SPE progressions.



References

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- **MacGregor, J. F., and Kourti, T. (1995). Statistical Process Control of Multivariate Processes. Control Engineering Practice, 3, 403 – 414.**

Authors Information

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