



# ASQ CRE Prep course

Lesson II. A. 4. c.

Poisson Process Models

Non-Homogeneous Poisson Process



A coastal landscape featuring a green, rocky hillside on the left, a calm blue sea in the foreground, and a clear sky. Several large, dark rocks are scattered in the water. In the distance, a small, isolated rock formation is visible on the horizon.

Generally for complex systems

# NON-HOMOGENEOUS POISSON PROCESS

# Generalized NHPP

- **Repairs do not fully restore to as new condition**
- **Operating times between repairs may not be independent or identically distributed**

# Models for Mean Repair Function

- **M(t) is the mean repair function**

$$M(t) = at^b$$

- **Power Model - linear on log-log paper**

$$M(t) = ae^{tb}$$

- **Exponential Model - linear on semi log paper**
- **Often we assume constant failure rate between repairs to use HPP**



# Example

- **Let's say a system follows NHPP with**

$$M(t) = 0.002t^{1.3} \text{ for } t > 0$$

- **Find expected number of failures between 168 hrs and 672 hrs**

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$$M(672) - M(168)$$

$$0.002(672)^{1.3} - 0.002(168)^{1.3}$$

$$3.421 - 0.605 = 2.81$$

Is it appropriate to  
assume constant  
failure rates?



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Mann Reverse Arrangement Test