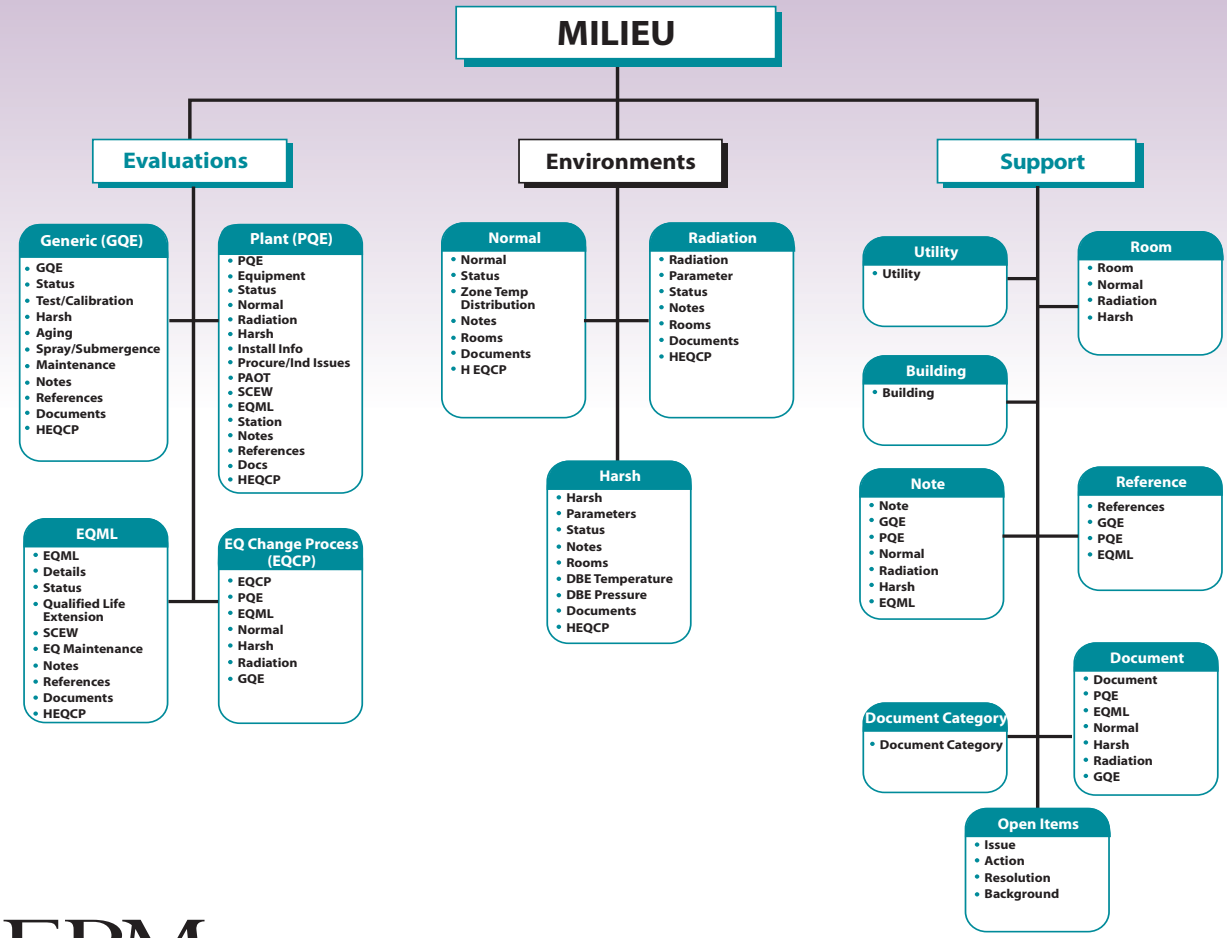
MILIEU

MILIEU – The Complete Environmental Qualification (EQ) Solution

The Milieu module of Genesis is a complete 10 CFR 50.49 Environmental Qualification (EQ) solution. Milieu was specifically designed as a configuration management/control engineering tool to support 10 CFR 50.49. Milieu's design supports:

- **Plant Life Extension**
- **Power Uprate**
- **Long-term configuration management/licensing.**

The following is an overview of the content of Milieu.



EPM
Engineering Planning and Management, Inc.

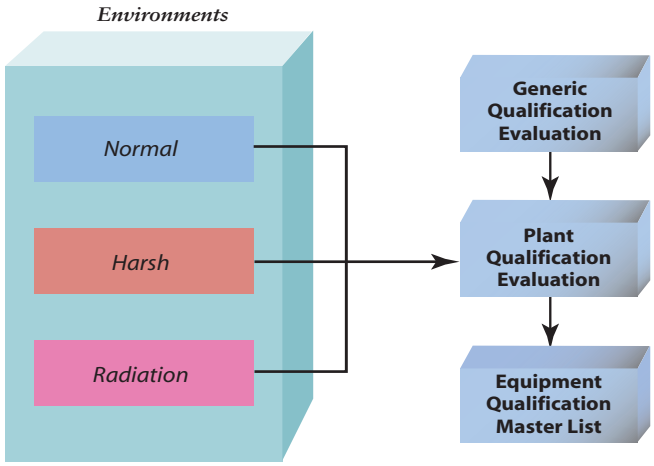
MILIEU Navigation

Overview

The primary components that comprise Milieu are:

- **EQCP – Environment Qualification Change Process**
- **PQE – Plant Qualification Evaluation**
- **GQE – Generic (Manufacturer) Qualification Evaluation**
- **EQML – Equipment Master List**
- **Environments (Normal, Harsh, Radiation)**

Environmental Qualification Change Process



Environmental Qualification Change Process (EQCP)

The EQ Change Process (EQCP) provides a controlled process for modifying/updating environmental qualification information of the following entity types:

- **Environments**
  - **Normal**
  - **Harsh**
  - **Radiation**
- **Generic Qualification Evaluations (GQE)**
- **Plant Qualification Evaluations (PQE)**
- **Equipment Master List (EQML)**

The EQCP provides automated status updates, as well electronic signatures for Preparer, Reviewer and Approver. Through the EQ Change Process, electronic history files are automatically created and viewable from within the system.

Formulas and Calculations

Milieu automatically performs the following calculations:

- **Qualified Life for EQML as well as its replacement parts.**
- **Post Accident Operating Time**
- **Total Equivalent Gamma Radiation**

The Arrhenius Methodology is used to calculate the Qualified Life of plant equipment.

The Arrhenius method is used in the following formula:

$$QL(=t2) = \left(t1 * exp \left(\left(\frac{-Ea}{kB} \right) * \left(\frac{1}{T1k} - \frac{1}{T2k} \right) \right) \right)$$

Where:

Ea = Activation Energy (eV)

t1 = Accelerated aging time at temperature T1 (Hrs)

T1k = Calculated accelerated service temperature (K)

T2k = Calculated normal service temperature (K)

kB = Boltzmann's constant = 8.617 E-5 (eV/K)

t2 = QL = Normal service time at T2 (Yrs)

The Arrhenius method also back-calculates the 40- and 60- year qualified lives to determine the plant desired operating temperatures.

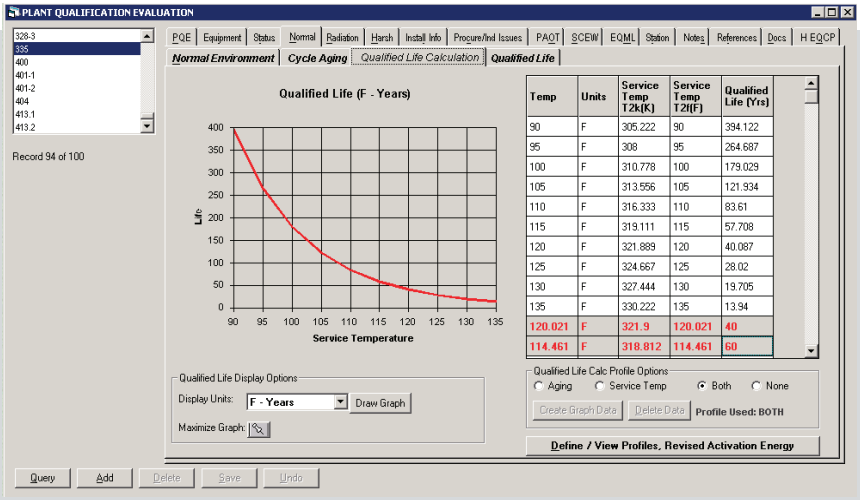
Note: For 40/60- year back calculations, the system will use the 365.25 days in a year conversions.

Qualified Life can be calculated using the weighted ambient temperature, service level temperature and/or the aging temperature.

Table 1: PQE Qualified Life Calculation - Input Matrix

Inputs	Aging Profile	Service Temp Profile	Both Profiles (Aging & Service)	Weighted Ambient
Aging Time	AP	PQE	AP	PQE
Aging Temp	AP	PQE	AP	PQE
Service Temp	PQE	SP	SP	PQE
Activation Energy	PQE or AE	PQE or AE	PQE or AE	PQE or AE
Note: Service Temp = Ambient Temp + Heat Rise				

The user is provided with the flexibility to revise the activation energy from the PQE form if a basis is defined. If the activation energy is revised, the system will use the revised value for both the Qualified Life and PAOT Calculations.

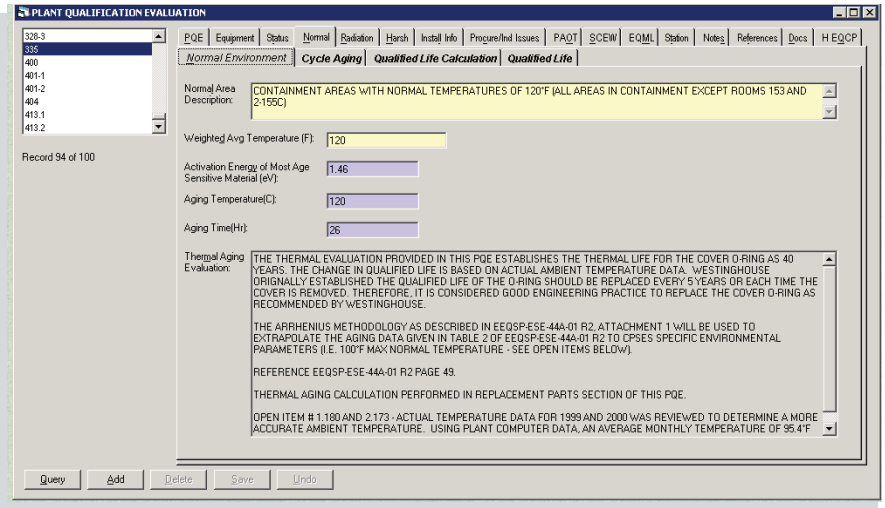


Plant Qualification Evaluation

Plant Qualification Evaluation (PQE)

The PQE electronically documents the specific EQ parameters a component will experience, based on it's location in the plant. The PQE inherits inputs from the GQE and specific plant environments. Inputs inherited are highlighted in the PQE, and distinguished between GQE *(in lavender)* and Environments *(in yellow)*.

The screen at right is a sample of PQE Normal Environment with the inherited information highlights.



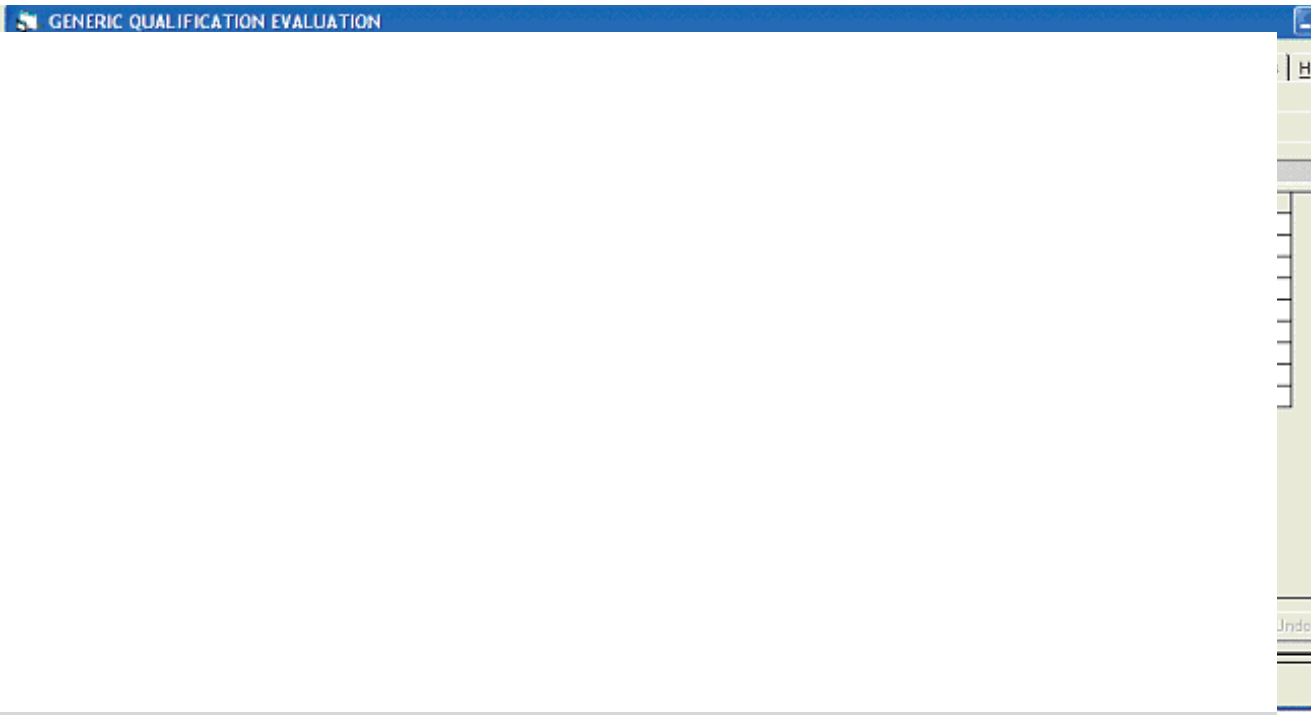
Plant Qualification Evaluation

Generic Qualification Evaluation (GQE)

The GQE provides the ability to capture the pertinent data from a manufacturer's test report and other supplemental testing sources. The GQE can have up to six temperature profiles to accommodate various testing scenarios.

The information in the GQE required for the PQE is automatically displayed in the PQE.

The following form is a sample of the GQE profile for a Harsh Environment.



Generic Qualification Evaulation

Equipment Master List (EQML)

For each component evaluated, a PQE is associated.

Milieu automatically inherits the appropriate GQE (Qualification) and PQE (Specification) parameters and provides a comparison summary on the System Component Evaluation Worksheet (SCEW).

From the EQML form, the system also provides a means to document when a component on the Equipment Master List (EQML) has been granted a temporary qualified life extension.

Generic (manufacturer) Qualification Evaluations

- DBE Pressure Profile
- DBE Multiple Temperature Profiles
- Submergence Qualification
- Spray Qualification
- Maintenance Requirements
- Testing Configuration and Results
- Installation and Replacement Requirements
- Activation Energy (eV) Calculator
- Qualified Life Calculation for Components
- Cycle Aging
- Qualified Life Calculation for Sub-components
- GQE Advanced Query
- GQE Sharing

Plant Qualification Evaluations

- Temperature Profiles
  - Aging Temperature
  - Service Temperature
  - Ambient Temperatures
- Revised Activation Energy
- Post Accident Operating Time/Margin
- Procurement Requirements
- Performance Requirements
- Frequency Margin Evaluation
- Qualified Life Calculation for Replacement Components
- Installation and Replacement Requirements
- Qualified Life Calculation for Components
- Cycle Aging
- Industry Issues

Environment Qualification Change Process (EQCP)

- Electronic Signature
- Electronic Routing of Packages
- Automated Status
  - In Progress
  - Reviewed
  - Approved

Equipment Master List (EQML)

- System Component Evaluation Worksheet (SCEW)
- Component Qualified Life
- Component Replacement Data Determination
- Component Qualified Life Extension
- Maintenance Activities

For more information, contact Vincent Renzi at vrr@epm-inc.com or 508-532-7167

MILIEU Version 1.3.0

MILIEU DEPLOYMENT REQUIREMENTS:

Server:

Database Management System - Oracle® Version 9.x (or greater)
Operating System - Microsoft® Windows Server 2003, 2008 or Unix/Solaris
Disk Space - 5 GB
Memory - 1 GB (minimum)

Client:

Operating System - Microsoft® Windows 7, Vista, XP, 2000
Disk Space - 250 MB
Memory - 1 GB (minimum)
Oracle® Objects 2.3.x (or greater)
Microsoft® ADO 2.6

EPM
Engineering Planning and Management, Inc.

959 Concord Street, Framingham, MA 01701
508-875-2121, www.epm-inc.com