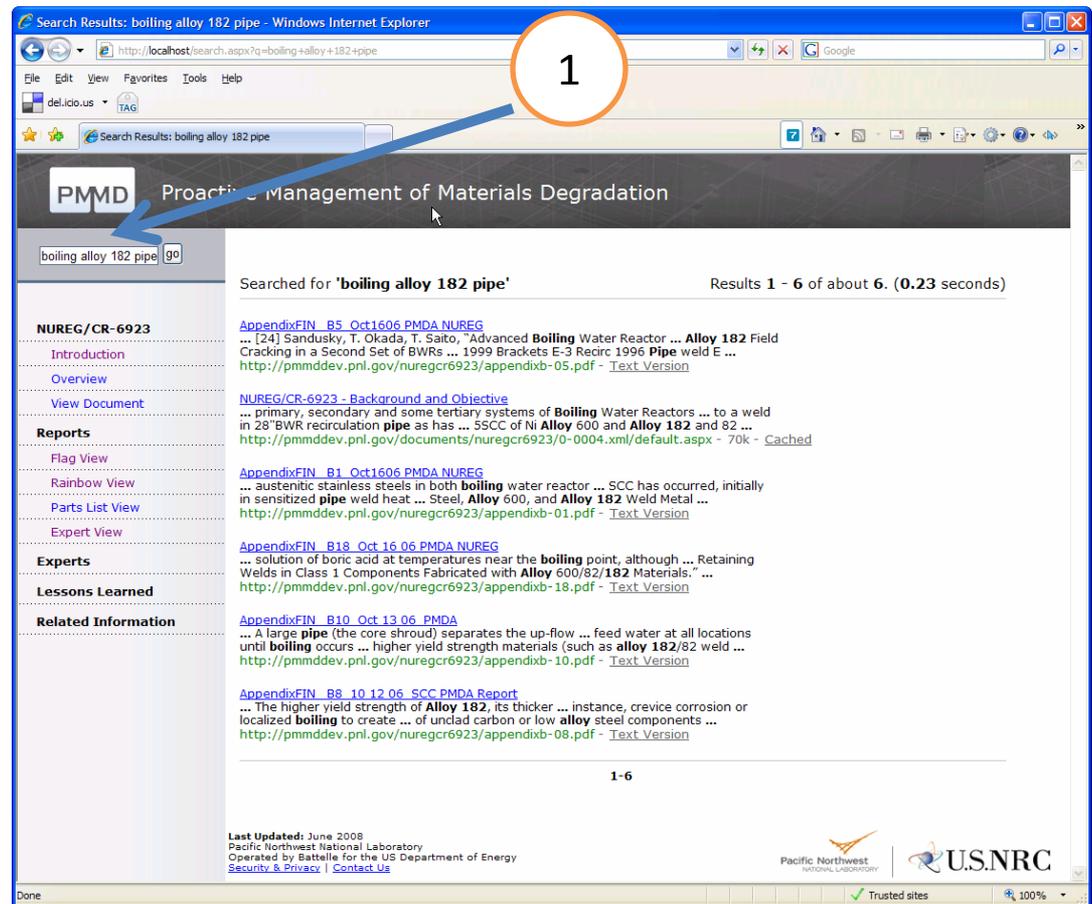


Using PMMD: Search

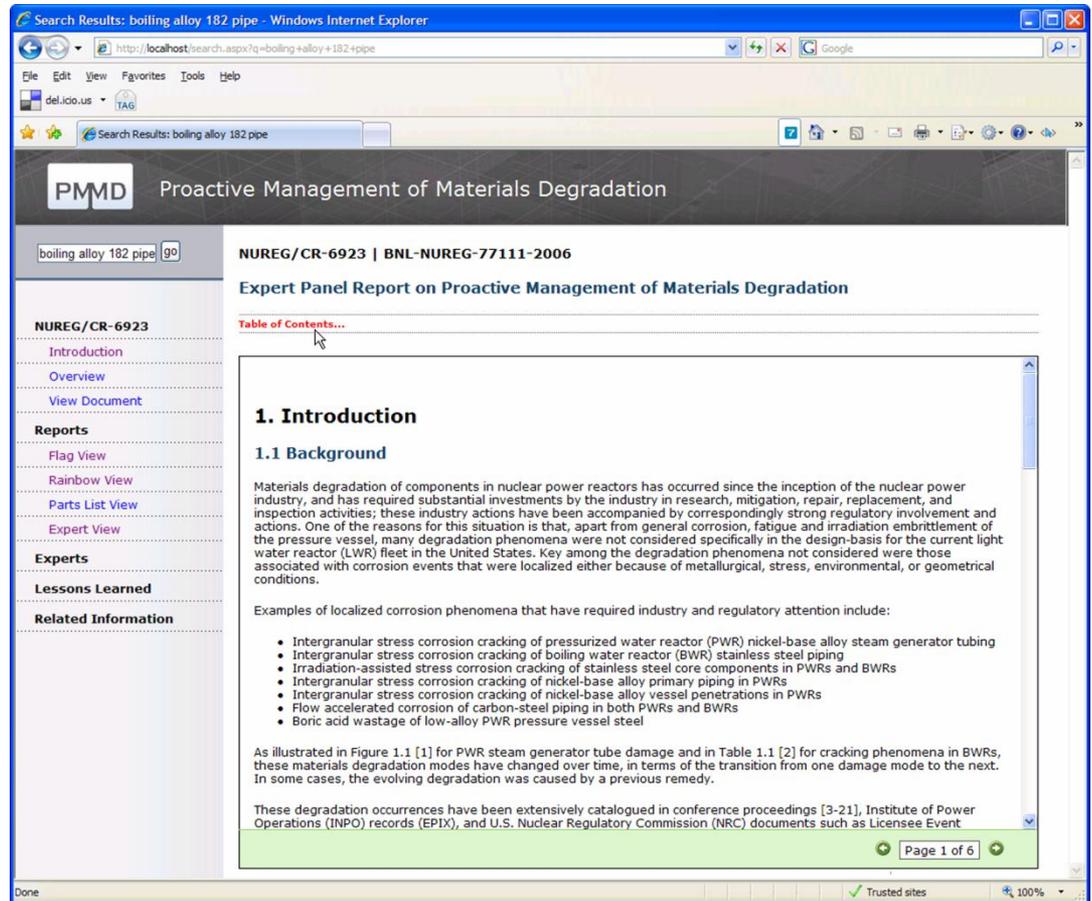
The PMMD web site has a text based search engine to quickly find sections within a large document relevant to the terms provided.

- 1) Each page has a search “form” in the left hand navigation column.
- 2) Type one or more words relating to the information you want to find
- 3) Click the “go” button
- 4) A list of links will appear that are prioritized on their relevance to the search terms



Using PMMD: NUREG/CR-6923

NUREG/CR 6923 is a document that is the framework upon which the PMMD web site is built on. The full text of this document encompasses thousands of pages and most of it is presented here on this web site by breaking it down into manageable chunks to facilitate more accurate text searches. Several of its appendix sections have been converted into “Reports” and a dynamic query engine has been applied to filter the results. This version of NUREG/CR 6923 is not the official document. While every effort has been made to accurately reproduce this document on this web site we can not guarantee it to so. Users of this web site should cite the original document located at <http://www.nrc.gov/reading-rm/doc-collections/nuregs/contract/cr6923/> And not this version.



Search Results: boiling alloy 182 pipe - Windows Internet Explorer

http://localhost/search.aspx?q=boiling+alloy+182+pipe

del.icio.us TAG

Search Results: boiling alloy 182 pipe

PMMD Proactive Management of Materials Degradation

boiling alloy 182 pipe go

NUREG/CR-6923

- Introduction
- Overview
- View Document

Reports

- Flag View
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Experts

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Related Information

NUREG/CR-6923 | BNL-NUREG-77111-2006

Expert Panel Report on Proactive Management of Materials Degradation

[Table of Contents...](#)

1. Introduction

1.1 Background

Materials degradation of components in nuclear power reactors has occurred since the inception of the nuclear power industry, and has required substantial investments by the industry in research, mitigation, repair, replacement, and inspection activities; these industry actions have been accompanied by correspondingly strong regulatory involvement and actions. One of the reasons for this situation is that, apart from general corrosion, fatigue and irradiation embrittlement of the pressure vessel, many degradation phenomena were not considered specifically in the design-basis for the current light water reactor (LWR) fleet in the United States. Key among the degradation phenomena not considered were those associated with corrosion events that were localized either because of metallurgical, stress, environmental, or geometrical conditions.

Examples of localized corrosion phenomena that have required industry and regulatory attention include:

- Intergranular stress corrosion cracking of pressurized water reactor (PWR) nickel-base alloy steam generator tubing
- Intergranular stress corrosion cracking of boiling water reactor (BWR) stainless steel piping
- Irradiation-assisted stress corrosion cracking of stainless steel core components in PWRs and BWRs
- Intergranular stress corrosion cracking of nickel-base alloy primary piping in PWRs
- Intergranular stress corrosion cracking of nickel-base alloy vessel penetrations in PWRs
- Flow accelerated corrosion of carbon-steel piping in both PWRs and BWRs
- Boric acid wastage of low-alloy PWR pressure vessel steel

As illustrated in Figure 1.1 [1] for PWR steam generator tube damage and in Table 1.1 [2] for cracking phenomena in BWRs, these materials degradation modes have changed over time, in terms of the transition from one damage mode to the next. In some cases, the evolving degradation was caused by a previous remedy.

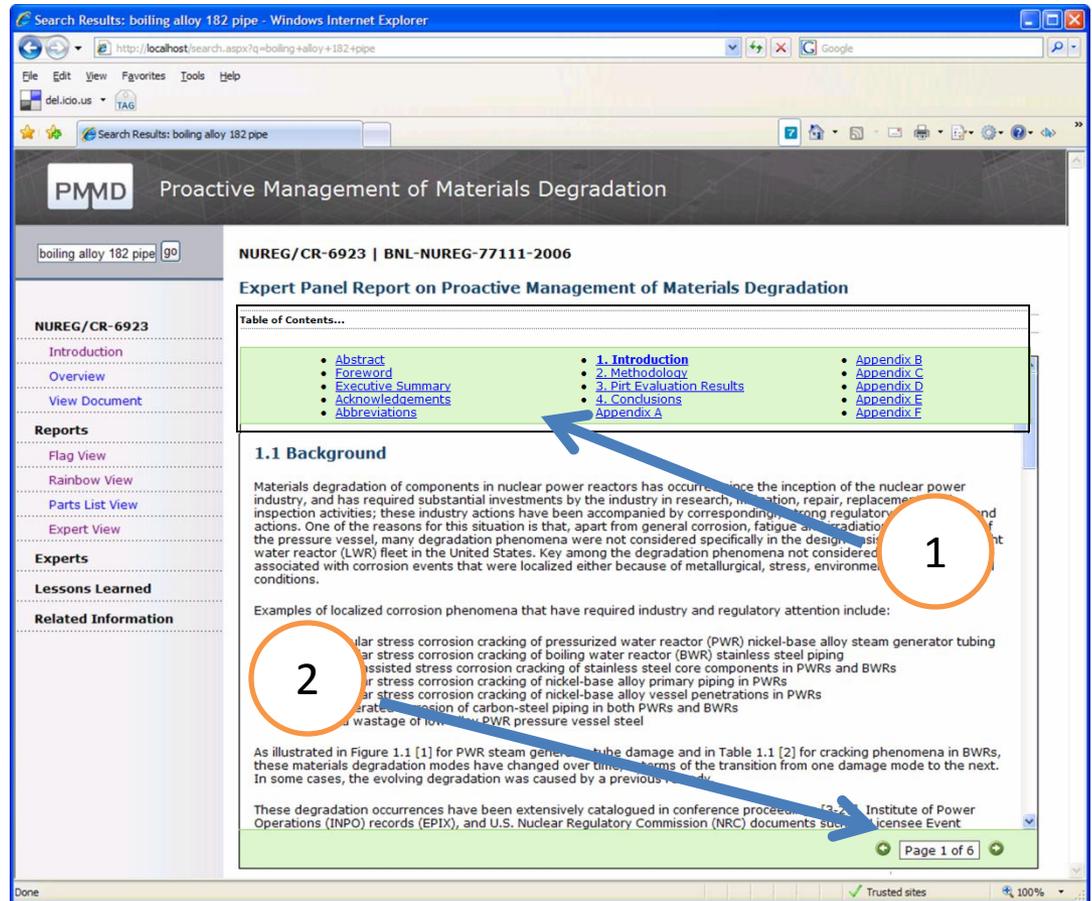
These degradation occurrences have been extensively catalogued in conference proceedings [3-21], Institute of Power Operations (INPO) records (EPIX), and U.S. Nuclear Regulatory Commission (NRC) documents such as Licensee Event

Page 1 of 6

Using PMMD: NUREG/CR-6923 (continued)

Navigation of NUREG/CR 6923 can be accomplished through a couple of methods.

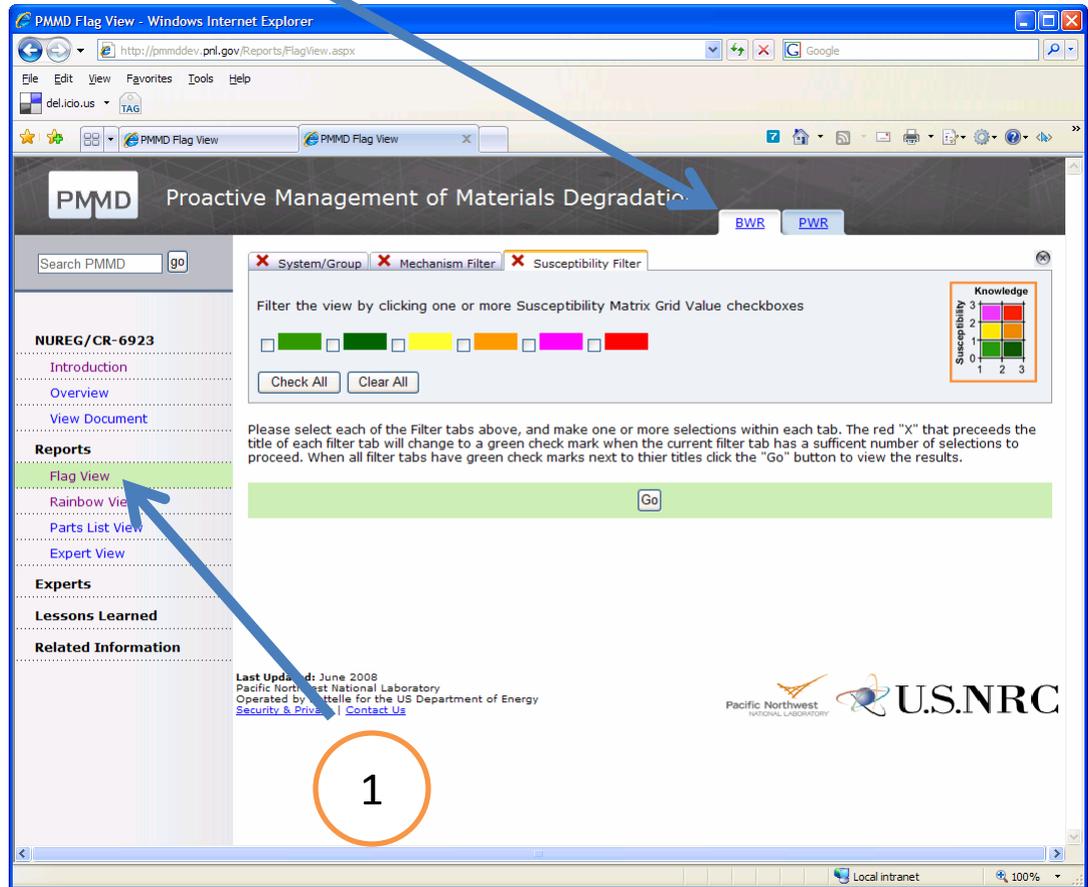
- 1) Click the text “Table of Contents...” and a box pops down with a list of the major sections of the document. Click the desired section to move to it.
- 2) Each major section has multiple parts to it. A control at the bottom of the section is provided to move forward or backwards through the section. A text indicator is also provided to indicate how many “chunks” are in a major section. If the page is displaying the first or last “chunk” and the “back” or “forward” arrows are clicked. The last chunk of the previous section or the first chunk of the next section will be displayed.



Using PMMD Tool: Reports

The Reports group in the left hand navigation column presents information from NUREG/CR-6923 that can be tailored by the user dynamically. Selecting “criteria” to filter within each of the reports is done using “Filters”. Each type of filters functions identically in each of the reports but not all filters are available for each of the reports. Results match content “style” published in the original report but the information is a subset and focused based on filter choices made by the user. To get Started...

- 1) Click a report type. For purposes of illustration we have chosen “Flag View” in this example.
- 2) Select the type of Reactor you are interested in from the tabs at the top of the page. Choices are: Boiling Water Reactor (BWR) and Pressure Water Reactor (PWR). In this example we have chosen BWR



Using PMMD Tool: Using Filters

Report Filters are represented as “Tabs” which are displayed across the top of the main content area of the tool.

The user must select at least one criteria item from each of the filters by clicking on the tab and selecting “criteria” from each filter before they can get results.

A visual clue in the form of a red “X” or a green “check mark” indicates if the filter has enough selected criteria to generate a report.

When each filter tab has a green “check mark” the report can be generated by pressing the “Go” button.

The screenshot shows the PMMD Flag View web application in a Mozilla Firefox browser. The page title is "Proactive Management of Materials Degradation". The main content area features a search bar and three filter tabs: "System/Group" (with a red X), "Mechanism Filter" (with a red X), and "Susceptibility Filter" (with a green check mark). Below the tabs, there is a section titled "Filter the view by clicking one or more Susceptibility Matrix Grid" with a grid of colored squares (green, yellow, orange, pink, red) and checkboxes. A "Go" button is located at the bottom right of the filter section. The left sidebar contains a navigation menu with sections: "NUREG/CR-6923" (Introduction, Overview, View Document), "Reports" (Flag View, Rainbow View, Parts List View, Expert View), "Experts", and "Lessons Learned". The footer includes the text "Last Updated: June 2009", "Pacific Northwest National Laboratory", "Operated by Battelle for the US Department of Energy", and "Security & Privacy | Contact Us". Logos for "Pacific Northwest" and "USNRC" are also present.

Using PMMD Tool: Susceptibility Filter

The Susceptibility filter allows the user to select a subset of the possible data values based on the susceptibility matrix as defined in NUREG/CR 6823

- 1) Select one or more Susceptibility Matrix “grid” values in the Susceptibility Matrix filter by clicking on the check box next to each possible value. A picture of the Susceptibility Matrix is provided. Positioning the Mouse over the “color” bars next to the check boxes will popup a description of where in the matrix the selection is.
- 2) The “Check All” will select all available options when clicked. The “Clear All” button will deselect all criteria that is currently selected. Both buttons only work in the context of this filter (i.e. criteria in other filters will not be affected by clicking these buttons)

1

PMMD Proactive Management of Materials Degradation

Search PMMD

System/Group Mechanism Filter **Susceptibility Filter**

Filter the view by clicking one or more Susceptibility Matrix Grid Value checkboxes

Check All Clear All

Icon Color is: Light Green; Susceptibility is Low and Knowledge is Low

Please select each of the Filter tabs above, and make one or more selections within each tab. The red "X" that precedes the title of each filter tab will change to a green check mark when the current filter tab has a sufficient number of selections to proceed. When all filter tabs have green check marks next to their titles click the "Go" button to view the results.

Knowledge

3	Light Green	Light Green	Light Green
2	Light Green	Light Green	Light Green
1	Light Green	Light Green	Light Green
0	Light Green	Light Green	Light Green

1 2 3

NUREG/CR-6923

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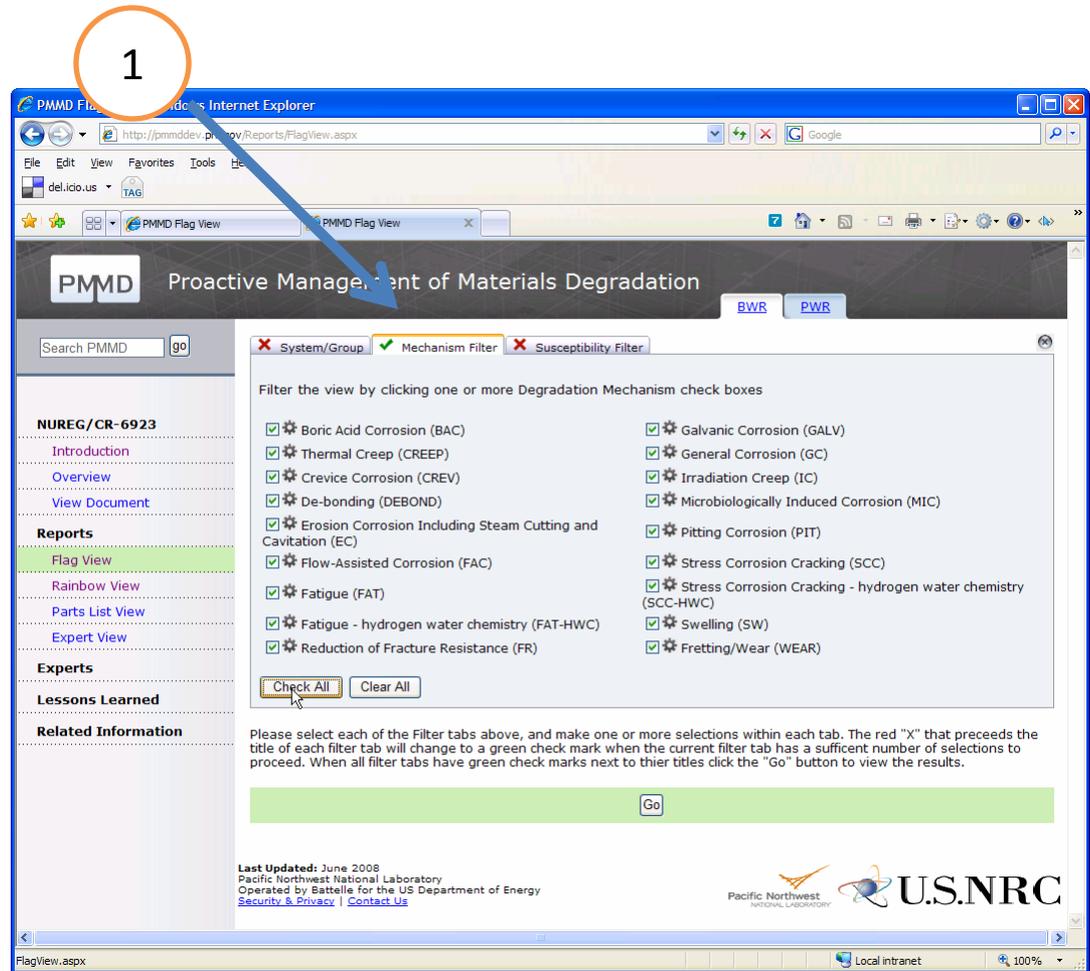
Trusted sites 100%

Using PMMD Tool: Mechanism Filter

The Mechanism Filter is a simple list filter and represents the types of Degradation identified in NUREG/CR-6923

1) Clicking on the “Mechanism Filter” tab the user can select one or more Mechanisms by clicking the check box next to the desired mechanism description(s).

The “Check All” button will select all available options when clicked. The “Clear All” button will deselect all criteria that is currently selected. Both buttons only work in the context of this filter (i.e. criteria in other filters will not be affected by clicking these buttons)



Using PMMD Tool: System/Group Filter

The System/Group Filter is a “tree” control which means the choices are hierarchical in nature. The top level choice (System) can be further filtered to specific “children” (Groups).

1) To view the Groups within a system click on the folder icon next to the System name or the text describing the system name to display its groups.

The “Check All” button will select all available options when clicked. The “Clear All” button will deselect all criteria that is currently selected. Both buttons only work in the context of this filter (i.e. criteria in other filters will not be affected by clicking these buttons)

1

PMMD Proactive Management of Materials Degradation

Search PMMD

System/Group Mechanism Filter Susceptibility Filter

Filter the view by clicking one or more System and/or Group check boxes

- Auxiliary System (AS)
 - Spent Fuel Pool and Fuel Racks
 - Control Rod Drive
 - Reactor Core Isolation Cooling
- Emergency Core Cooling System (ECCS)
 - High Pressure Core Spray - SP Water
 - HPCS - CST Water (OTHER PLANT)
 - Low Pressure Core Spray
- Engineered Safety Feature System (ESF)
- Steam and Power Conversion System (PCS)
- Reactor Coolant System (RCS)
- Support System (SS)

Please select each of the Filter tabs above, and make one or more selections within each tab. The red "X" that precedes the title of each filter tab will change to a green check mark when the current filter tab has a sufficient number of selections to proceed. When all filter tabs have green check marks next to their titles click the "Go" button to view the results.

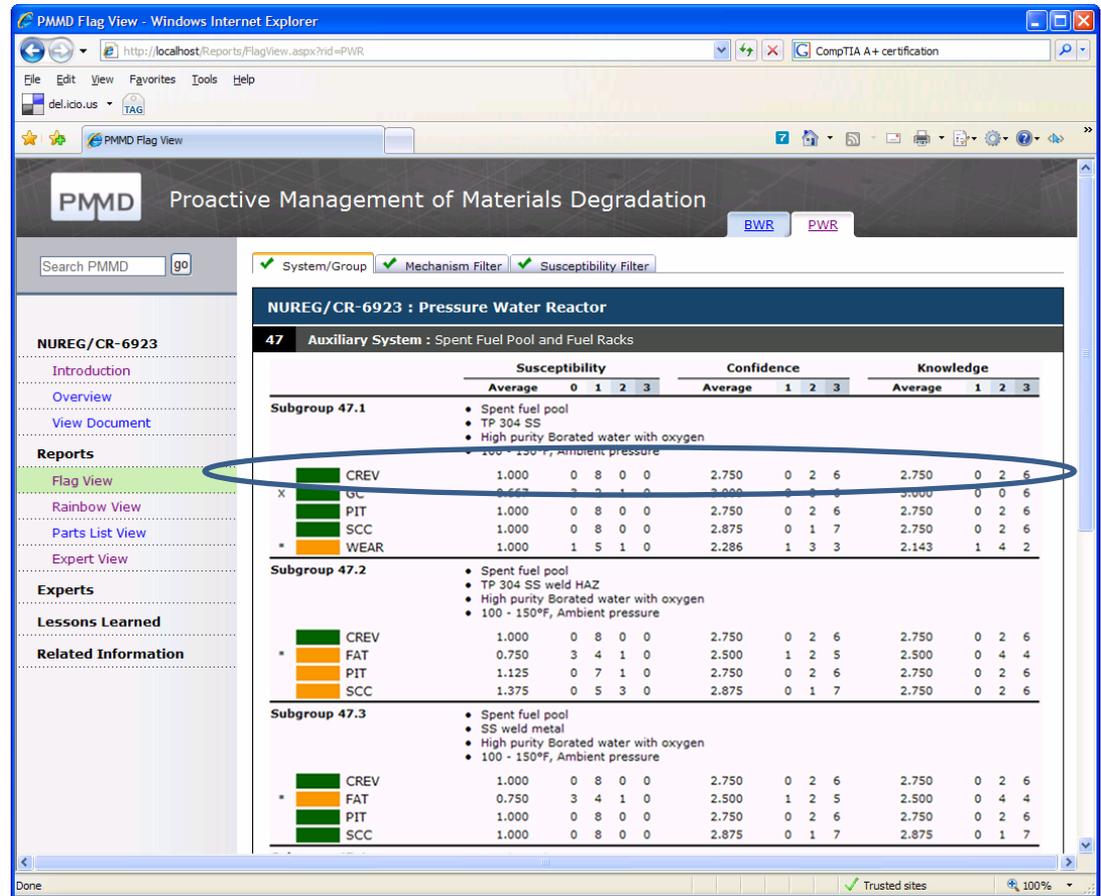
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Local intranet 100%

Using PMMD: The Flag View Report

The Flag View Report replicates information found in Appendix D sections 1 and 3 of NUREG/CR-6923. It summarizes susceptibility matrix ratings for degradation mechanisms and organizes them by System then Group and finally by Subgroup. It reports the aggregated values awarded by each of the experts for Susceptibility, Knowledge, and Confidence for each subgroup based on applicable degradation mechanisms for the “Components” in the subgroup. Those values are averaged and the Susceptibility Matrix coordinate is assigned to the Subgroup. Example: In Subgroup 47.1 of the Spent Fuel Pool and Fuel Racks group (a member of the Auxiliary System) the degradation mechanism “Crevice Corrosion (CREV)” received a Susceptibility rating of “Low” (1) from 8 experts. 6 experts rated their confidence in the possibility of CREV effecting the component as “High” (3) and 6 experts indicated the knowledge about CREV affecting this components is “High” (3).



Using PMMD: The Rainbow View Report

The Rainbow View Report replicates information found in Appendix D sections 2 and 4 of NUREG/CR-6923. It lists specific subgroups within their “Group” and all of the degradation mechanisms with the susceptibility matrix coordinates that effect them. Example: Subgroup 47.1 (SEP Type 304 SS Components) within the Group “Spent Fuel Pool And Fuel Racks” has been evaluated to have the following degradation mechanisms Crevice Corrosion(CREV), General Corrosion (GC), Pitting Corrosion(PIT), Stress Corrosion Cracking (SCC) and Fretting/Wear (WEAR). CREV,GC,PIT, and SCC have Low Susceptibility with High Knowledge (Dark Green) and WEAR has Medium Susceptibility with High Knowledge (Dark Orange).

PMMD Rainbow View - Windows Internet Explorer
 http://localhost/Reports/RainbowView.aspx
 CompTIA A+ certification

PMMD Proactive Management of Materials Degradation
 BWR PWR

Search PMMD go

System/Group Mechanism Filter Susceptibility Filter

NUREG/CR-6923 : Pressure Water Reactor

Subgroup Description	Degradation Mechanism														
	BAC	CREEP	CREV	DEBOND	EC	FAC	FAT	FR	GALV	GC	MIC	PIT	SCC	SW	WEAR
Spent Fuel Pool And Fuel Racks															
47.1 SFP Type 304 SS Components			Dark Green							Dark Green		Dark Green	Dark Green	Dark Orange	Dark Orange
47.2 SFP Type 304 SS HAZ			Dark Green				Dark Orange			Dark Green		Dark Green	Dark Green	Dark Orange	Dark Orange
47.3 SFPSS Welds			Dark Green				Dark Orange			Dark Green		Dark Green	Dark Green	Dark Orange	Dark Orange
47.4 Aluminum Boral Panels			Dark Orange							Dark Green		Dark Green	Dark Green	Dark Orange	Dark Orange
47.5 Zr- Alloy Fuel Assembly			Dark Green							Dark Green		Dark Green	Dark Green	Dark Orange	Dark Orange
47.6 SFP Floor SS Liner - Int. Surface			Dark Green				Dark Green			Dark Green		Dark Green	Dark Green	Dark Orange	Dark Orange
47.7 SFP Floor SS Liner - Ext. Surface			Dark Orange							Dark Green		Dark Green	Dark Green	Dark Orange	Dark Orange
RWST Header Piping															
14.1 SS External Surface												Dark Green	Dark Green	Dark Orange	Dark Orange
14.2 Wrought 304/316 SS Piping							Dark Green			Dark Green		Dark Green	Dark Green	Dark Orange	Dark Orange
14.3 Type 304/316 SS HAZ							Dark Green			Dark Green		Dark Green	Dark Green	Dark Orange	Dark Orange
14.4 Type 308 SS Weld							Dark Green			Dark Green		Dark Green	Dark Green	Dark Orange	Dark Orange
14.5 Forged 304/316 SS Nozzles							Dark Green			Dark Green		Dark Green	Dark Green	Dark Orange	Dark Orange
14.6 Type 304 Socket Welds							Dark Orange			Dark Green		Dark Green	Dark Green	Dark Orange	Dark Orange
CVCS Pump Suction Piping															
15.1 SS External Surface												Dark Orange	Dark Orange	Dark Orange	Dark Orange
15.2 Wrought 304/316 SS Piping							Dark Orange			Dark Green		Dark Green	Dark Green	Dark Orange	Dark Orange
15.3 Type 304/316 SS HAZ							Dark Orange			Dark Green		Dark Green	Dark Green	Dark Orange	Dark Orange
15.4 Type 308 SS Weld							Dark Orange			Dark Green		Dark Green	Dark Green	Dark Orange	Dark Orange
15.5 Forged 304/316 SS Nozzles							Dark Green			Dark Green		Dark Green	Dark Green	Dark Orange	Dark Orange

Using PMMD: The Expert View Report

The Expert View Report replicates information found in Appendix E sections 4 and Appendix F section 4 of NUREG/CR-6923. It presents the actual values each expert gave to each subgroup along with “Rational” and “Factors Controlling Occurrence” assessments from each expert. Example: In the Subgroup 47.1 Expert No. 1 ratted the Susceptibility as “Low”, had “High” confidence in his/her Susceptibility rating and has “High” knowledge regarding the degradation mechanism “Crevice Corrosion (CREV)” effects on the subgroup. A comment about the Rational in that experts ratings is also presented.

PMMD Proactive Management of Materials Degradation

Search PMMD [go]

System/Group Mechanism Filter Susceptibility Filter

NUREG/CR-6923 : Pressure Water Reactor

Subgroup47.1

- Spent fuel pool
- TP 304 SS
- High purity Borated water with oxygen
- 100 - 150°F, Ambient pressure

Expert	Susceptibility	Confidence	Knowledge	Rationale	Factors Controlling Occurrence
1	Low	High	High	Assuming water quality remains good	
2	Low	High	High	Assume that correct water Chem is maintained	
3	Low	High	High	Well known phenomenon, will occur under stagnant conditions	contaminants not limited to Cl, not only low temperature phenomenon
4	Low	Medium	Medium	Susceptibility low in absence of contamination	Avoid off-chemistry situations
5	Low	High	High	No known problems for stainless steels even in concentrated aerated boric acid unless contaminated by chloride	Chloride contamination
6	Low	High	High	Geometrical discontinuity of structure may form crevice	Geometry and Cl contamination
7	Low	Medium	Medium	Complex geometries, variable flows locally, oxygen, impurities can produce accelerated corrosion in crevices.	crevice geometries, oxygen
8	Low	High	High	unlikely unless pool contaminated with chloride; occurs in crevices or under deposits	chloride contamination >10ppm; crevices between supports and SS

GENERAL CORROSION