

BWR Chemistry/Radiochemistry Data Evaluation and Interpretation

Course Outline

- 1.0 Introduction 1**
 - 1.1 Introduction

- 2.0 Quality Data Generation**
 - 2.1 Sampling Practices
 - 2.2 On-line Instrumentation
 - 2.3 Quality Control
 - 2.3.0 Adequate Procedures
 - 2.3.1 Adequate Instruments
 - 2.3.2 On-Line Instrument QA/QC
 - 2.4 Analytical Parameters and Techniques
 - 2.4.1 Anions (Chloride, Sulfate, Nitrate, Chromate)
 - 2.4.2 Anions (Post UV Analysis)
 - 2.4.3 Cations (Sodium, Potassium, Calcium, Magnesium, etc.)
 - 2.4.4 Conductivity
 - 2.4.5 Cation Conductivity
 - 2.4.6 Dissolved Hydrogen and Oxygen
 - 2.4.7 Corrosion Products and Injected Zinc
 - 2.4.8 Isotopics
 - 2.4.9 Organics
 - 2.4.10 pH at 25° C
 - 2.4.11 Silica
 - 2.4.12 Hydrogen Peroxide
 - 2.4.13 Boron and Lithium
 - 2.4.14 Unexpected Source Terms
 - 2.4.15 Electrochemical Corrosion Potential (ECP)
 - 2.5 Chemistry Parameter Interrelations
 - 2.5.1 Conductivity and pH
 - 2.5.2 Relation of Conductivity and Ionic Concentration
 - 2.5.3 Molar Ratio Predictions

- 3.0 BWR Water Chemistry Control**
 - 3.1 Introduction
 - 3.1.1 Normal Water Chemistry
 - 3.1.2 Hydrogen Water Chemistry
 - 3.1.3 NMCA + HWC
 - 3.2 Action Levels
 - 3.3 Monitoring and Control Parameters
 - 3.3.1 Cold Shutdown
 - 3.3.2 Startup/Hot Standby
 - 3.3.3 Power Operation
 - 3.4 Control of IGSCC

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- 3.4.1 Role of Water Quality
 - 3.4.2 Effects of Ionic Impurities in HWC
 - 3.4.2.1 Sulfate
 - 3.4.2.2 Chloride
 - 3.4.2.3 Sodium and Potassium
 - 3.4.2.4 Nitrate
 - 3.4.2.5 Chromate
 - 3.4.2.6 Silica
 - 3.4.2.7 Zinc
 - 3.4.2.8 Borate
 - 3.4.2.9 Lithium
 - 3.4.2.10 Ferrous Ion
 - 3.4.2.11 Copper Ion
 - 3.4.3 Effects of Ionic Impurities in NWC
 - 3.4.3.1 Sulfate
 - 3.4.3.2 Chloride
 - 3.4.3.3 Sodium and Potassium
 - 3.4.3.4 Nitrate
 - 3.4.3.5 Chromate
 - 3.4.3.6 Silica
 - 3.4.3.7 Zinc
 - 3.4.3.8 Boron
 - 3.4.3.9 Lithium
 - 3.4.3.10 Ferrous Ion
 - 3.4.3.11 Copper Ion
 - 3.4.3.12 Other Impurities
 - 3.5 Fuel Integrity
 - 3.6 Flow Assisted Corrosion
 - 3.6.1 NMCA and FAC Summary
 - 3.7 Dose Control
- 4.0 BWR Operating Experience**
- 4.1 BWR Strategic Water Chemistry Plan
 - 4.2 Review of Plant Experience
 - 4.2.1 BWR Transient Experience
 - 4.2.2 IGSCC Initiation During Water Chemistry Transients
 - 4.2.3 Water Chemistry Response to Transients
 - 4.2.4 Clean-up Studies
 - 4.2.5 Decision Trees for Some Selected Transients