Experiences from the Re-location and Re-location Planning of Various Laboratories

Presented by: Peter Slinn,
Natural Resources Canada

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Context and Considerations

- A lab re-location requires analysis and costing of:
  - Facility
  - Equipment
  - Processes
  - People
- Developing clear, well-defined operational requirements is critical
- Maintaining these requirements throughout the life-cycle of the organization is advised

Key Questions

- Lab design process and deliverables
- Research and OHS&E requirements
- Acts, regulations, codes, standards, and best practices
- Project's impacts

Variety of Lab Types

- Wet/ dry labs
- Analytical labs
- Small scale physical simulation labs
- Industrial pilot scale simulation labs
- Field certification labs
- High density computational facilities

Variety of Hazardous Materials

- Standard lab chemicals in small quantities
- Acid digestion processes
- Radioactive materials in small to moderate quantities
- Compressed gases in moderate quantities
- Cryogenic liquids
- Small and large quantities of hazardous process by-products

Process Risk Analysis

- Potential process failure modes
  - Facility containment failure
    - Structure
    - HVAC supply and exhaust fans
    - Ducting rupture
  - Tank, piping, valves, fitting, etc. failure
  - Electrical failure
  - Safe guarding failure
  - Operator error
  - Etc…

Process Risk Analysis cont'd

- Non-scenario-based hazard evaluation procedures
  - Pre-Start Health and Safety Reviews
  - Relative Ranking
  - Checklist Analysis
- Scenario-based hazard evaluation procedures
  - What-If Analysis
  - What-If/ Checklist Analysis
  - Hazard and Operability (HAZOP) Studies
  - Failure Modes and Effect Analysis
  - Fault Tree Analysis
  - Event Tree Analysis
  - Cause-Consequence Analysis

Lab Commissioning Experiences

- Key Considerations:
  - Unique requirements
  - Operational diversity
  - Breadth of expertise required
  - Lab processes not well understood
  - Familiarity with applicable OHS&E codes and standards

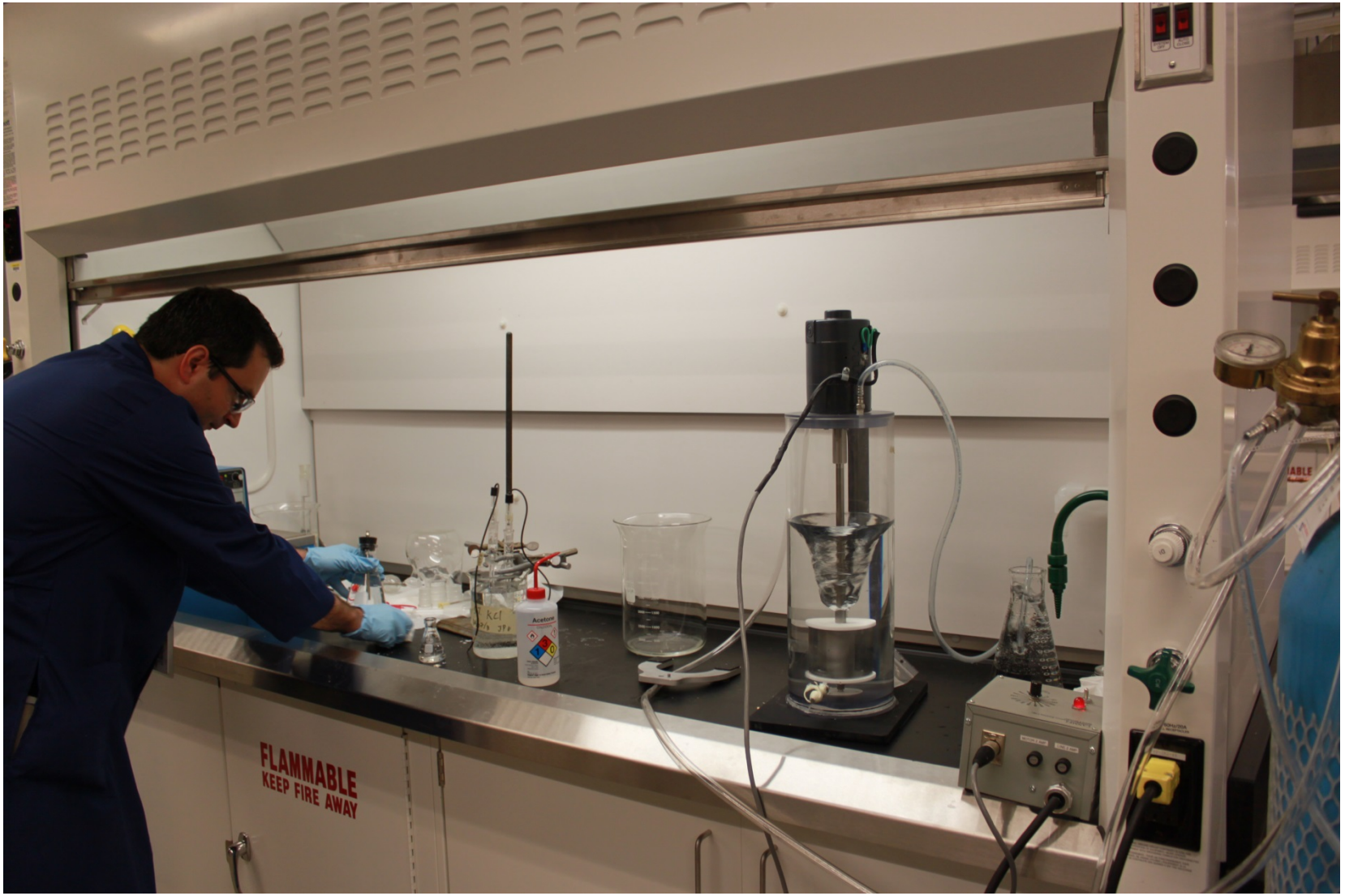
Let's look at some examples…


MACRODYNE
DANGER
DO NOT ENTER
AUTHORIZED
PERSONNEL ONLY


DANGER


TECNAI OSIRIS


SCOTT
CanmetMATERIALS
Corrosion Laboratories


FLAMMABLE
KEEP FIRE AWAY
Acetone

Lessons Learned

- **What is the lab design process and what deliverables are required?**

- **Research and OHS&E Requirements**
- Room Data Sheets
- Functional Program Report
- Schematic Designs
- Detailed Design
- Construction
- Hand-over to client

Operational Requirements are documented in the following manner…

- Lab methods
- Equipment, materials, processes, and by-products
- **Room data sheets**
- Structure the data so that building and environmental engineers can conduct their work

Room Data Sheet Structure

- Lab classification
- Activity description
- **Lab methods analysis**
- Facility/ equipment interface
  - Architectural
  - Structural
  - Mechanical
  - Electrical
  - Safety
  - Lab Layout

Lab Methods Analysis

- Theoretical chemical reaction determination
- Risk assessments
- Environmental impact assessments
- Environmental impact re-certifications
- Safety

Equipment Requirements

- Environmental disturbances
- Radiation safety requirements
- Structural requirements
- HVAC requirements
- Process cooling water requirements
- Electrical requirements
- Fire protection requirements
- Plumbing requirements
- Compressed gas and cryogenic liquids requirements
- Telecommunication requirements

Functional Program Outline

- Executive summary
- Introduction
- Existing state
- Lessons learned
- Future state
- Technical and performance requirements
- Concept diagrams

Implementation

- **Codes and Standards**
  - 15 pages of references
  - Many and ever growing reference texts
  - In-house developed documents

- **Research and OHS&E Requirements**
  - Reference / checklist document is 100 pages, feeding:
    - Equipment procurement specifications
    - Equipment installation specifications
    - Building layout and fit-up requirements
    - Project Commissioning Test Plan

Scope and Processes

- Breadth of consideration
  - Facility
  - Equipment
  - Processes
  - People
- Lab methods analysis
- Process hazard analysis
- Documentation
- Certifications
- Training
- Continuous change management process

Conclusion:

- Keys to success:
  - Holistic view - Facility, Equipment, Processes and People
  - Right team to answer ALL the questions
  - Clear client requirements
    - Detailed Room Data Sheets
    - Aligned Functional Program
  - Ability to address organizational change management implications

Questions?

Peter Slinn

Email: peter.slinn@nrcan-rncan.gc.ca

Cell: 905-906-8979