Metro Vancouver’s Technical Training Program

Capturing & Transferring Institutional Knowledge

www.metrovancouver.org
Metro Vancouver

- Metro Vancouver is a federation of 22 municipalities, one electoral area, and one treaty First Nation
- Provide regional services such as water, wastewater, solid waste, air quality, parks, etc.
- 1,300 employees
- 2.1 million people
- Located in the lower mainland of British Columbia, Canada
Surface water supply from three protected watersheds (Capilano, Seymour and Coquitlam)

550 Km of large diameter transmission mains

22 reservoirs

15 pump stations

2 Primary Water Treatment Plants

7 Secondary Disinfection Facilities
Wastewater Collection and Treatment

33 pumping stations

440 Km of trunks and interceptor sewers

3 secondary treatment plants

2 primary treatment plants
Change is the New Normal

- New and more complex facilities and equipment (infrastructure growth, regulatory change)
- Increasing need to optimize service quality, energy and other costs, extend infrastructure life

Reactive Thinking

Proactive Thinking

Simulation and Modeling (WSS, WSG)

Forecasting (WCF, WSA, WQA, MCS)

Performance planning (USOP)

Monitoring (USOP, OM)

Operating (SCADA, PVS)

Forecasting (WCF, WSA, WQA, MCS, MCS)

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Change is the New Normal

O&M is the largest staff group at Metro Vancouver

“Success depends on our people”

O&M workforce is changing
Adapting to Change

• Providing tools and opportunities so staff can work more efficiently and effectively
  – Hiring and training multi-skilled workers
  – Onboarding
  – Redesigning jobs
  – **Providing easy access to relevant technical knowledge and information**
Relevant Technical Knowledge

Knowledge Categories

- Business
- Safety
- Technical

- MV Specific
- Industry Specific (AWWA, WEF, EOCP)
- University/College
- High School
Utility Specific Knowledge

Most common approach...

- Technical knowledge primarily documented in design reports and drawings
- Operations staff carry knowledge ‘in their heads’
- Training conducted verbally by experienced staff while supervising the work
  - Learn as you go
  - Learn as it breaks
  - “Ask Fred”
SCFP Case Study
Procedures

• Critical Task Analysis (& Prioritization)
• Hazard Identification and Risk Assessments
• Lockout
• Confined Space
• Operations
• Maintenance
E-Learning Modules

• Process and facility basics ‘the facts’
• Accessible from any computer with intranet
• Not dependent on trainer or staff scheduling
• Provides reference material after training complete
Field Skills Demonstration

- Confirms understanding of previous training and procedures
- Simulates actual performance under typical working conditions
- Promotes consistent field training
Scenario Exercises

• Team learning and development
• Encourages creative thinking & problem solving
• Simulates non-standard situations
Troubleshooting Guides

- Developed in workshop environment
- Populated into a “live” troubleshooting database
- Searchable by category, key words or by equipment
Assessments

• Formal knowledge and skill based reviews for web based training and field training

• Informal assessment for classroom training

• Records kept on line
Blended Training Approach

Procedures (Operations, Maintenance, Lockout, CSE)

Resources: equipment lists, drawings, process narratives, SMEs, etc.

Ongoing Support & Maintenance

- Troubleshooting Guides
- Scenario Training
- Field Training
- Web based Training
- Competency Matrix

Performance Assessment
Skills Assessment
Knowledge Assessment
Schedule & Resources

- **Schedule**
  - July 2006 to December 2009

- **Resources**
  - 1 person full time for project management and technical reviews
  - Equivalent of 2+ subject matter experts (operators, engineers, consultants, etc.) throughout contract duration for content development and review
“Depending on the size of the project and your staff previous experience, complete operator training and documentation may cost

~ 0.25% to 0.75 % of the total project cost
- do not use low bid for this part of your project
- you get what you pay for ”

- Gerry Stevens, AECOM

- SCFP capital= $300M, therefore $750,000 to $2.25M for training & documentation

- SCFP procedures and training program development project contract ~$1M = 0.33%
O&M Training & Procedures Initiative

In two years...

...we have an effective knowledge management and workforce technical training and development program in place across the O&M Department...

...that is being actively used by both new and existing staff...

...and helps us to develop and maintain an engaged and resilient workforce.
O&M Training Program Goals

- We have the tools and information needed to work safely
- MV utility information is easily accessible without having to always consult a “Subject Matter Expert”
- We are resilient to staff movement and retain “institutional” knowledge when employees leave
- We have the information and knowledge needed to efficiently and effectively operate and maintain the utilities (and minimize errors)
- We can confidently assign work to staff knowing that they are competent to do that work
- Staff have the information and knowledge needed to optimize operations and develop innovative solutions
How we are doing it

- What skills and knowledge do our staff need to do their jobs?
- How are they learning what they need to know?
- How do we know they know?
- How do we manage changes in what they need to know?
Resources

- Program focus is to capture and transfer MV-specific technical knowledge and information
- Success relies on subject matter expert (SME) participation
- Strong project coordination needed to ensure efficient and effective SME scheduling and deliverable reviews
- As with other management systems, resources are required to support and manage changes to the program components and work processes.
“...this is an art. You cannot just do this. You cannot be assigned to do it out of the blue. It is no different from painting. If you never learned to paint, the outcome probably won’t look good.”

Union Sanitary District operator (quoted at West Coast Water Utilities Workshop on Workforce Development, Jan 2010)
References

- ADDIE Model for Instructional Design
  - step-by-step process that helps training specialists plan and create training programs
    - Analysis
    - Design
    - Development
    - Implementation
    - Evaluation

- AWWA Statement Policy on Public Water Supply Matters:
  - “Employee Training and Career Development”

- AWWA Water Sector Competency Model

- AWWA Research Foundation
  - “Strategies to help drinking water utilities ensure effective retention of knowledge”.
  Linda Blankenship, Terry Brueck, Melanie Rettie and Denise O’Berry EMA Inc. and Jim Lee APQC
Questions?
Lessons Learned

• Plan...plan...plan!
  – Include all stakeholders in scoping
  – Do the gap analysis
  – Budget and resources (Multi-year? Phased approach?)
  – Technical limitations (Platform? Bandwidth?)
  – Reference materials availability

• Know your audience - “Learners”
  – Base skills/knowledge
  – Target skills/knowledge
  – Consider different learning styles & needs
  – IT skills? Access?
  – Blended approach
Lessons Learned

- Develop templates

- Evaluate
  - Assess Return on Investment
    - Pre-Tests
    - Value of avoiding the cost of things going wrong
  - Feedback on learning tools and learning content
    - Course evaluation
Testimonials

• “...a great tool to compliment my knowledge about the operation gained previously from the PFSs...”
  - Tahir Maloku, Water Treatment Plant Operator

• “As a new operator here at the SCFP, I found the web-based training to be highly effective at putting the diverse systems into perspective. It allowed me to gain a detailed understanding of the theory and operation of the various systems prior to field work. It would have taken a far greater amount of time to walk the various systems and discover all the feeds and flows. I particularly enjoyed the graphical representations of flows and chemistry...”
  - Rob Chilton, Water Treatment Plant Operator

• “These courses are very user friendly and I can surf in different parts of them easily. The graphics are very clear and neat, and related notes are in perfect and brief shapes...”
  - Reza Fereidouni, Water Treatment Plant Operator

• “The complete package provided a great foundation for staff to operate equipment during early commissioning in support of the Seymour Tie – in, and media washing. The classroom training provides a great forum for team building and trouble shooting..”
  - Alistair Wardlaw, Plant Supervisor
What does a PMC do?

- Participate in Project Management Team meetings
- Coordinates efficient and effective SME scheduling and deliverable reviews
- Gathering information for consultants
- Ensuring Stakeholders and SMEs are fully engaged, including communication with SMEs and commitment from supervisors.
- Reviewing invoices and project updates from consultants
- Responsible for ensuring Divisional needs and priorities (related to training and procedures) are identified
- Receiving and distributing information to and from consultants
What does an SME do?

- Collate appropriate materials to provide to consultant
- Transfer knowledge when not available through documentation (via one-on-one interviews, workshops, etc.)
- Participate in training & procedures development workshops
- Review draft materials for technical accuracy
- Assist with design and development of programs (delivery method, sequencing, etc.)
Who is an SME?

• The most fitting participants in these workshops are subject matter experts who:
  
  – have the expertise:
    • know the design of the process
    • know the intended and actual mode of operations of the plant or process;
  
  – have the experience: have the task knowledge gained through hands-on work;
  
  – have the interest in the positive outcome of the workshop;
  
  – have the influence: can make decisions that stick;

  – are available.
What skills and knowledge do our staff need to do their jobs?

Create a Competency Inventory for Each Job

- What knowledge does the job need?
- What skills are required?
- What experience is needed?
How are they learning what they need to know?

Develop training curricula and prepare inventory of technical reference materials and expertise

- Drawings, equipment lists, design information
- Training materials
- Procedures
- Troubleshooting tools
- Access-to-information tools
- Expertise listings
How do we know they know?

Track Progress Using a Learning Management System
- Assign training using curricula
- Use training delivery platform(s)
- Include competency assurance tools
How do we manage changes in what they need to know?

Ongoing Support Program
- Develop new materials
- Update existing materials
- Support learning management system