THE ONLY CONSTANT IS CHANGE

Job Redesign and Technical Knowledge Transfer at Metro Vancouver

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Overview

• Agency Overview

• Prioritization of Workforce Development

• What Metro Vancouver is Doing

• Costs & Resources

• Lessons Learned
Metro Vancouver

- A federation of 22 municipalities, one electoral area, and one treaty First Nation
- Located in the lower mainland of British Columbia, Canada
- Provides regional services such as water, wastewater, solid waste, air quality, parks, affordable housing, 911 service etc.
- 1,600 employees
- 2.3 million customers
Water Supply and Treatment

Surface water supply from three protected watersheds

550 km (340 miles) of large diameter transmission mains

22 reservoirs

15 pump stations

2 primary treatment plants

8 secondary disinfection facilities
Wastewater Collection and Treatment

- 33 pumping stations
- 440 km (275 miles) of trunk 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
• Demographics (retirements, Gen Y, workforce pool)

Using Technology to Change Our Thinking

- Simulation and Modeling
  - WSS, WSO
- Performance planning
  - USOP
- Monitoring
  - USOP, OM
- Forecasting
  - WCF
  - WSA
  - WQA
  - MCS

Reactive Thinking

Proactive Thinking

Operating

- SCADA, PVS
Success Depends On Our People
Adapting to Change

- Improve understanding of the value of institutional knowledge
- Diversify subject matter expertise
- Shorten learning timeframes
- Improve access to information
- Revise job descriptions and position requirements
- Increase flexibility
- Foster dialogue and enable communication
- Learn from successes and failures
Knowledge & Training – Operations and Maintenance Focus

- Business
- Safety
- Technical

MV
Specific
“Institutional”
Industry Specific
(AWWA, WEF, EOCP)
University/College
High School
What We Are Doing
Collaborating and Communicating with Others

- Working with consultants on job redesign, work process improvement and technical training
- Other Utilities (NWWBI, BAYWORK)
- Internal partnerships
“...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)
Enhancing Communication across the Whole Organization

• Metro Vancouver Employee Conference
  – Online Registration
  – Keynote speakers
  – Technical Transfer Sessions
  – “Exhibition Hall”
  – Tours
  – Wrap up event
Redesigning Jobs and Work Processes

- Water Treatment Operations
- Water Operations Optimization
- Water Treatment and Systems Control integration
Water Treatment Operations

• Started with small group with multiple job descriptions developed over time
• Opportunity due to building new plant with highly automated design philosophy
• Standardized job duties; flattened parallel structure
• Operator-friendly shift schedule
• Flexibility, variety and opportunities
Operations Optimization Vision

- Centralize water supply operations decision making; daily System Planning and Scheduling
- Train and empower knowledgeable operators
- Use advanced technologies to meet multiple operational performance criteria
- Deploy sophisticated automation strategies linking optimization tools directly to the control system
System Planning & Scheduling

Water supply and treatment engineers

Water quality scientists

Field operations supervisors

Control system operators

Watershed managers
Operator Training and Development

SCADA replacement training

Optimization Model training

Division-wide procedures and training system

Certification training

TRAINING AND DEVELOPMENT PLAN
FOR
LCOC CONTROL ROOM OPERATOR INCUMBENTS
TO MEET THE REQUIREMENTS OF THE
UTILITY SYSTEM CONTROLLER POSITION
October, 2007

PURPOSE:
This training and development plan has been created to provide the seven full-time regular Control Room Operator 1, 2 and 3 incumbents with the opportunity to supplement their existing education and experience in order to demonstrate competency equivalent to the requirements of the new Utility Systems Controller (USC) position.

TRAINING
As part of this plan, training will be offered in four areas:
• operator training for the new DeltaV SCADA system,
• user training for the new operations optimization computer models,
• training on operating procedures for specific facilities and equipment, and
• supplementary courses to address gaps in educational background and/or certification level achieved.
Water Treatment and Systems Control Integration

- Developing transition plans for existing staff
- Consulting with employees union
- Managing cross training and transition process
- Division-wide procedures and training system
- Certification challenges
- Operations Supervisor-in-Training position
Developing Better Information Tools

- Corporate Historian
- Operations Optimization technologies
- Process control systems upgrade and integration
- Utility Gateway for plant/field staff
- OperatorSuite for learning management
Technical Training Program
Seymour Capilano Filtration Plant
Training Program Goals

- All trainees will have a strong working knowledge of plant systems, components, controls, standard operating procedures and familiarity with Metro Vancouver water distribution system and processes.
  
  - Shortened commissioning duration
  - Improved operational effectiveness
  - Staff turnover resiliency.
  - A safer workplace
Seymour Capilano Filtration Plant
Blended Training Model

Procedures
(Operations, Maintenance, Lockout, CSE)

Resource materials (equipment list, drawings, process narratives, positions, SMEs, etc.)

Ongoing Support & Maintenance

Troubleshooting Guides
Performance Assessment
Scenario Training
Skills Assessment
Field Training
Knowledge Assessment
Web based Training

Blended Training Model
Web Based Training

- 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 Training

- Walkthrough Guides
  - Based on operations procedures
  - Provides a structural framework for performance-based training in the field
  - Simulates actual performance under typical working conditions
  - Evaluated by Foremen
Scenario Training

- Themes
- Topics
- Learning objectives
  - Apply knowledge and thinking creatively
  - Team learning
  - Team development
  - Very small class size (from 3 and up)

- Train-the-Trainer Seminars

Dynamic structure to allow flexibility to re-initiate course but with new scenarios as the plant continues to operate
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
Utility Systems & Departmental Competency-Based Technical Training Program
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?
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
Formal Competency Inventory

• For Utility Systems (water transmission and wastewater collection; two operating Divisions)
• What is the scope of the work?
• How will we organize the material?
  – Simple (foundations) to more complex
  – Follow ‘process’ of systems
  – Link manual and automated tasks (currently performed by different groups)
• 21 roles - operations, management and engineering
Costs & Resources
Job and Work Process Redesign

- **Water Treatment Operations**
  - Management and HR staff time
  - Union Review
  - Relatively inexpensive (0.5 FTE over 2 years)

- **Operations Optimization**
  - Part of larger consulting project along with technology design ($1.5 million and 2 FTE over 4 years)
  - Created 2 new positions (approx. $200,000 per year)
  - New Utility Systems Controller position ($2 to $6 more per hour over 8 staff)
  - Draws on specific daily/weekly contributions from existing staff in other Divisions
“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 (BCWWA Conference, 2007)
Technical Training Program
Analysis & Design

- Utility Systems
  - $75,000 consulting contract
  - Project Management (PM): Equivalent of 180 days over 6 months
  - Subject Matter Experts (SME): Equivalent of 90 days over 6 months
Technical Training Program
Development & Implementation

• Seymour Capilano Filtration Plant
  – July 2006 to December 2009
  – capital = $300M, therefore should be $750,000 to $2.25M for training & documentation
  – Procedures and training program development project contract ~$1M = 0.33%
  – 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
Technical Training Program
Evaluation & Ongoing Support & Maintenance

- Learning Management
- Content Management
- LMS Program Technical Support
Employee Conference

• <$15,000 (keynote speakers, catering, marketing materials)

• ~1.5 resources over 6 month period to plan

• ~5 volunteers/day over the course of the 4-day conference
  – Greeters, speakers, moderators
Lessons Learned
Lessons Learned – Job and Work Process Redesign

- Don’t over design your structure or your process to address problems that may not emerge.
- Don’t control the process too much - be clear on the outcomes you want, be willing to let go of some of the details.
- Be trustworthy – do what you say you will do.
- Trust your employees – provide the carrots without hidden sticks.
Lessons Learned – Job and Work Process Redesign

- Actively manage transition to prevent negative consequences
- Focus on the people first and the technology second
- Never underestimate the resistance to change
- Communicate, communicate, communicate
Lessons Learned
Technical Knowledge Transfer

- Know your audience - “Learners”
  - Base skills & knowledge
  - Target skills & knowledge
  - Consider different learning/teaching styles & needs
  - IT skills? Access?
- Develop templates and standard formats
- Evaluation
  - Pre-Tests
  - Inverse ROI
  - Feedback
- Ongoing management
Lessons Learned
Technical Knowledge Transfer

- Plan...plan...plan!
  - Include stakeholders in scoping and development
  - Do the gap analysis
  - Technical limitations (Platform? Bandwidth?)
  - Reference materials availability
  - Budget and resources (Multi-year? Phased approach?)
  - Seek out partners and plan your team

“Trying to phase this project with annual funding would be like trying to build a high rise by hiring a new architect and contractor each year.”
Questions?

“If you do what you’ve always done… you’ll get what you’ve always got.”

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Extra Information
Tools Available

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

- 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
Inventory Methodology

• Pre-work
  – Preliminary workshops to create lists of tasks/procedures
  – Tasks grouped and assessed for criticality and priority
  – With identification of tasks comes discussion of knowledge needed to perform them
  – Review of job descriptions and keywords

• ‘Day in the life’ approach

• ‘Train your replacement’ approach
Inventory Methodology

- Competency Matrix development workshops
- Participants grouped by related positions
- Included both technical and management tasks
- Consider the verbs carefully
  - Which position is doing?
  - Which position is organizing, supervising, checking?
- Consistency?
- Opportunities for job redesign?
- Parking lot issues