The Operational Excellence (OpX) program: an innovative model of partnership

NACWA
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Contents

- DEP and OpX
  - The approach
  - Results
NYC Department of Environmental Protection

- Supply 1 billion gallons of water per day to 9 million New Yorkers
  - 19 storage reservoirs and 3 controlled lakes
  - 550,000 water quality tests per year
  - 295 miles of aqueduct and tunnels
  - 7,000 miles of water mains
  - 56 shaft sites; 500 pressure regulators; 3 pump stations
  - 109,000 fire hydrants

- Treat 1.3 billion gallons of wastewater per day
  - 14 In-city treatment plants; 8 upstate
  - 7,400 miles of sewer: 3,337 miles of combined, 2,271 separated
  - 157,000 street segments of sewer
  - 490 regulators (104 telemetered), 96 pump stations
  - 144,000 catch basins

- $14 billion in active construction & design projects
- Air Quality, Hazmat, Emergency Response, & Noise
Water Supply & Wastewater

New York City's Water Supply System

<table>
<thead>
<tr>
<th>Plant Location</th>
<th>Capacity (MGD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>North River</td>
<td>170</td>
</tr>
<tr>
<td>Wards Island</td>
<td>275</td>
</tr>
<tr>
<td>Hunts Point</td>
<td>200</td>
</tr>
<tr>
<td>Newtown Creek</td>
<td>310</td>
</tr>
<tr>
<td>Red Hook</td>
<td>60</td>
</tr>
<tr>
<td>26th Ward</td>
<td>85</td>
</tr>
<tr>
<td>Owls Head</td>
<td>120</td>
</tr>
<tr>
<td>Concy Island</td>
<td>110</td>
</tr>
<tr>
<td>Bowery Bay</td>
<td>150</td>
</tr>
<tr>
<td>Tallmans Island</td>
<td>80</td>
</tr>
<tr>
<td>Jamaica</td>
<td>100</td>
</tr>
<tr>
<td>Rockaway</td>
<td>45</td>
</tr>
<tr>
<td>Port Richmond</td>
<td>60</td>
</tr>
<tr>
<td>Oakwood Beach</td>
<td>40</td>
</tr>
</tbody>
</table>

Wastewater Treatment Plants

NYC Environmental Protection

www.nyc.gov/dep

Community Board Boundaries

Catskill / Delaware Watershed Area
Croton Watershed Area
Rivers and Reservoirs
Catskill Aqueduct and Tunnels
Croton Aqueduct
Delaware Aqueduct and Tunnels
County Borders
State Borders
Well engaged Strategic Initiatives at NYC’s and DEP’s levels

- NYC has ushered in a business approach to governing that is a world-wide model
- Goal is to deliver high value to current and future New Yorkers, consisting of superior performance at an affordable price
- MMR, 311, PlaNYC, Strategy 2011-14, and H2O Stat, all explain and demand accountability for delivering services of a world-class city
- Budgets, rate, and investments in assets demonstrate fiscal stewardship
- OpX is part of the effort “to ensure the efficient and cost-effective operation of the water system” and to “innovate and implement best practices … around the country and the world” (Strategy, Initiatives 1 & 2)
Realizing that DEP is part of a worldwide network of water utilities where best practices can be shared

**Naugatuck**
- Reliability Centered Maintenance
- GIS based Job management systems

**Milwaukee**
- H&S performance program
- Balanced Score Cards
- CO2 and water impact evaluation

**NYC - DEP**
- WWTPs operated to ensure high level of compliance
- Unique Watershed management system
- Comprehensive Filtration Avoidance Determination Program
- Green infrastructure and blue belts
- World’s largest state-of-the-art UV Plant
- Large scale AMR program

**Copenhagen**
- Storm water and CSO management

**Berlin**
- Comprehensive Job Management System
- Automation of operations and flow optimization
- Co-fermentation in WWTP – energy optimization
- Trenchless sewer rehabilitation techniques

**Budapest, Prague**
- Energy efficient wastewater treatment plants

**Brussels**
- Bioplastic recovery from wastewater

**Paris, Berlin, Shanghai**
- Training centers

**Paris**
- Integrated Control Center
- Condition based maintenance

**Lyon**
- Vacuum excavation

**Douai**
- Green infrastructure and Eco-district

**Shanghai**
- Integrated Control Center
- Underground Asset Management

**Across Australia**
- Asset Management (Capital management planning)

**Singapore**
- Water reuse
- Control systems
- Innovation through new technology
- Marketing and public engagement
## Ambition: Engaging into a structural transformation

<table>
<thead>
<tr>
<th>Goal</th>
<th>Strategies</th>
<th>Specific initiatives</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Make our workforce as productive as possible</td>
<td>Improve productivity by almost 10% by providing more appropriate and innovative tools and equipment, better planning, and adjusting crew size to fit job needs. <em>Example: reduce sewer cleaning crews from 3 to 2 people.</em></td>
</tr>
<tr>
<td></td>
<td>Use our resources efficiently and sustainably</td>
<td>Reduce energy demand by over 15% through improved energy production and energy efficiency. <em>Example: improve dissolved oxygen process control at wastewater treatment plants.</em></td>
</tr>
<tr>
<td></td>
<td>Develop greater fiscal responsibility</td>
<td>Strengthen financial accountability at lower levels of the organization. <em>Example: make wastewater treatment facility managers accountable for all aspects of their budget from personnel costs to chemical costs.</em></td>
</tr>
<tr>
<td></td>
<td>Attract, develop, and strengthen DEP's human resources</td>
<td>Develop a more strategic role for Human Resources, recruit stronger employees throughout the agency, and better match titles to job requirements. <em>Example: conduct organizational health index and track HR metrics.</em></td>
</tr>
<tr>
<td></td>
<td>Improve inventory and procurement management</td>
<td>Strengthen our procurement capability and processes to pay 9-13% less, develop a cohesive parts and inventory strategy, and shorten the time it takes to procure resources. <em>Example: eliminate unnecessary specifications.</em></td>
</tr>
</tbody>
</table>

**Become the safest, most reliable, cost-efficient utility in the nation**
Contents

- DEP and OpX
- The approach
- Results
A new form of partnership (1/2)

- Peer Performance Solutions model – Win-win
  - Quick/consulting-type impact
  - Mid to long-term support to ensure impact
  - No outsourcing of assets/management/employees
  - Largely performance based contracts – benefits are split between contractor and city in win-win setup

- Traditional O&M, outsourced operations, asset management contract
  - Long-time contract (5-20 years)
  - Outsourcing (assets and/or employees under private management)

- Partnership model

- Consulting model
  - Support limited in time
  - Utility keeps full ownership of assets and management responsibility
  - Little accountability for result

Accountability of service provision

Ease to implement

1 Concession, outsourced operations, DBO...
▪ **Concept:** getting access through the private sector to global best practices thanks to a performance-based consulting contract

▪ **DEP keeps full control** of its operation and decides which initiatives to undertake or not

▪ Compensation structure of shared savings ensures **alignment of the interests of DEP** and the private consultant.

▪ Structured into 2 **phases**:
  
  – Phase 1: initial identification of potential and implementation of some first quick wins
  
  – Phase 2: 4 years of implementation of initiatives
Consultant

Malcolm-Pirnie Arcadis
- Deep engineering experience
- Knowledge of the DEP and New York

Veolia Water
- Water services provided to 150 million people worldwide
- 100,000 professionals
- Combination of ops, engineering, technology and R&D
- Your peer from the private sector

McKinsey & Company
- 6,200 operational improvement projects worldwide
- Track record in New York, including completed benchmarking
- Transformation experience with leading industrials and water
Integrated team

DEP and Consultants working hand in hand and sharing a common goal from day one
Communication

- Top management sharing their change story and vision in person
- Branded program
- Frequent updates via internal magazine, posters, intranet sites, etc.
- On site displays
Structured approach: addressing all elements of excellence

- Streamlined processes, flows of information and materials
- Optimized tools and systems
- Standard operating procedures

- Clear vision, direction and compelling purpose
- Strong leadership alignment and role modeling
  - Improved individual capabilities and continuous improvement mindset

- Comprehensive performance management
- Stringent project management and governance
- Optimal organization design and clear roles and responsibilities
Structured approach: top-down analysis benchmarking & transparency

- Chemical cost is close to best practice
- Site operating costs
  - Energy use is above average
  - Maintenance cost is better than average
  - Maintenance cost varies between plants by a factor of two
  
  Normalized maintenance cost, USD/PE

- Preliminary benchmarking
- Qualitative expert assessments to align on improvement areas
Structured approach: bottom-up validation

Top down findings

Verified findings

Onsite diagnostic

Manager and frontline operator engagement

Fact-based analysis
Structured approach: prioritization

**Ideas vetted by core team**

1. Reduce fluoride dose rate to 0.8 mg/l
2. Eliminate fluoride treatment
3. Eliminate sampling requirements in Croton while system is offline
4. Discontinue micro-filtration at city-owned WWTPs
5. Optimize O&M for non-city WWTP
6. Consolidate 7-8 existing EOH reporting into 1 or 2 locations
7. Use CMMS system
8. Shift from 5 8-hour days to 4 10-hour days a week
9. Scale back residential lead testing program
10. In-source storm water BMP management at Kensico
11. Re-allocate personnel within Kensico region to achieve insourced waterfowl management
12. Optimize chlorine dosing through automation
13. Reduce in-person inspections of septic tanks and storm water

**Size of opportunity**

- Small: <$100k in annual efficiencies
- Medium: $100-500k in annual efficiencies
- Large: >$500k in annual efficiencies

**Ease of implementation**

- Easy
- Moderate
- Difficult

**High priority**

- 1. Reduce fluoride dose rate to 0.8 mg/l
- 3. Eliminate sampling requirements in Croton while system is offline

**Medium priority**

- 2. Eliminate fluoride treatment
- 4. Discontinue micro-filtration at city-owned WWTPs
- 5. Optimize O&M for non-city WWTP
- 6. Consolidate 7-8 existing EOH reporting into 1 or 2 locations
- 7. Use CMMS system
- 8. Shift from 5 8-hour days to 4 10-hour days a week
- 9. Scale back residential lead testing program
- 10. In-source storm water BMP management at Kensico
- 11. Re-allocate personnel within Kensico region to achieve insourced waterfowl management
- 12. Optimize chlorine dosing through automation
- 13. Reduce in-person inspections of septic tanks and storm water

**Low priority**

- 6. Consolidate 7-8 existing EOH reporting into 1 or 2 locations
- 7. Use CMMS system
- 8. Shift from 5 8-hour days to 4 10-hour days a week
- 9. Scale back residential lead testing program
- 10. In-source storm water BMP management at Kensico
- 11. Re-allocate personnel within Kensico region to achieve insourced waterfowl management
- 12. Optimize chlorine dosing through automation
- 13. Reduce in-person inspections of septic tanks and storm water
Structured approach: build momentum and achieve scale

- PILOT: 1 site
- REFINE: 2 sites
- ROLLOUT (wave 1): 4 sites
- ROLLOUT (wave 2): 4+ sites

NUMBER OF ASSETS COVERED
Contents

- DEP and OpX
- The approach
- Results
Phase 1: actions and findings

- The six-month diagnostic Phase 1 included full analysis of improvement opportunities available to DEP; $5M in annual savings already implemented

### What we did in Phase 1

- Performed site assessment of treatment plants, pump stations, reservoirs, repair yards, etc.
- Observed ~800 person-hours of work
- Reviewed more than 35 contracts
- Conducted negotiation training for DEP and DCAS staff
- Ran analysis of ~15,300 meters
- Conducted interviews and workshops with leadership, supervisors, and field staff

### Already implemented initiatives

- Chemical usage reduction
- Manual control of aeration
- Chemical cost renegotiation with incumbent vendors

### Main initiatives to be addressed in Phase 2

- Use resources and materials efficiently and sustainably (e.g., lower energy consumption, increase energy generation and reduce the volume of sludge transported for disposal)
- Improve procurement process to ensure DEP pays the best price for goods and services
- Help DEP’s workforce become more effective (e.g., through improved scheduling and equipment availability)
- Improve revenue for services rendered (e.g., expand large meter replacement program)
- Strengthen performance management and metrics across the organization
- Invest in attracting, developing and retaining talent
**Procurement example:** Clean-sheet cost estimate for the residuals removal contract is 9-14% lower than current price paid

### Assumptions

- **Transport to and disposal at landfill**
  - Transport from the transfer facility in Queens and disposal at landfill is equivalent to transport and disposal from DEP’s own transfer facility at Wards Island
  - Wards Island transport and disposal cost is $69.50/ton (on a separate contract; also with Tully)

- **Additional trucking from DEP plants to transfer facility includes:**
  - Capital, depreciation and licensing cost of trucks in NYC
  - Truck fuel and maintenance costs
  - Labor costs based on union rates

- **Additional handling at transfer facility includes:**
  - Frontloader and operator costs
  - Container costs based on external quote
  - Real estate costs based on current Queens warehouse rents

- **Overhead and profit on additional trucking and handling**
  - Overhead is 20% of all additional trucking and handling costs
  - Profit is 10% of all additional trucking and handling costs

### 9-14% difference between current price and clean sheet costing estimate driven by:

- Service level requirements (e.g., 8 hr response time)
- Lack of volume guarantee
- No differentiation between base load and peak volume
- Additional services layered on contract to be provided on an as needed basis

### Potential savings of $0.7-1.1 million
Procurement example: Renegotiation of chemicals contracts has already delivered $750k; additional $1.7 million quick-win expected

Baseline spend\(^1\) $ millions, FY11

<table>
<thead>
<tr>
<th>Category</th>
<th>Baseline Spend</th>
<th>Savings Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemicals</td>
<td>45.5</td>
<td>14-21%</td>
</tr>
<tr>
<td>Contractor services</td>
<td>30.4</td>
<td>12-17%</td>
</tr>
<tr>
<td>Mtce &amp; repair</td>
<td>26.4</td>
<td></td>
</tr>
<tr>
<td>Selected vendors (&gt;1M)</td>
<td>23.0</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>81.9</td>
<td></td>
</tr>
<tr>
<td>Total in scope spend</td>
<td>101.3</td>
<td>207.3</td>
</tr>
</tbody>
</table>

Total in scope spend $106.0

Example: Chemicals

<table>
<thead>
<tr>
<th>Chemical</th>
<th>Savings Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypo</td>
<td>2.1-3.0</td>
</tr>
<tr>
<td>Caustic</td>
<td>1.6-1.8</td>
</tr>
<tr>
<td>Fluoride</td>
<td>0.7-1.2(^3)</td>
</tr>
<tr>
<td>Ortho</td>
<td>0.8-1.2</td>
</tr>
<tr>
<td>Polymers</td>
<td>0.4-0.7</td>
</tr>
<tr>
<td>Chlorine</td>
<td>0.2-0.3</td>
</tr>
<tr>
<td>Other</td>
<td>0.3-0.5</td>
</tr>
<tr>
<td>Total</td>
<td>6.2-8.6</td>
</tr>
</tbody>
</table>

Quick-win savings in Chemicals:

- Annual savings of $614k and $140k have already been achieved through rapid renegotiations of the Pencco fluoride and JCI Jones chlorine contracts, respectively.
- Approximately $1.7 million in annual savings could be implemented shortly by switching BWSO’s demand for caustic to a new BWT contract (awaiting registration).

1 Chemicals spend from DEP Finance, other spend from invoice database
2 Deep dives from thorough contract analyses to identify compression opportunity
3 Savings estimate takes into account reduction in fluoride dosing
**Fleet example:** PM cycle for all LD and MD vehicles (excl. police) has been extended from 120 to 180 days; expected impact $0.4M

While proposed preventive maintenance cycle change affects only small part of baseline ...

<table>
<thead>
<tr>
<th>Fleet cost, $ millions, FY’11</th>
<th>Maintenance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depreciation</td>
<td>6.8</td>
</tr>
<tr>
<td>Interest</td>
<td>1.3</td>
</tr>
<tr>
<td>Maintenance</td>
<td>7.9</td>
</tr>
<tr>
<td>Fuel</td>
<td>2.9</td>
</tr>
<tr>
<td>Annualized fleet cost</td>
<td>18.9</td>
</tr>
<tr>
<td>Light-/medium variable PM cost</td>
<td>7.9</td>
</tr>
<tr>
<td>Light-/medium repair &amp; fixed cost</td>
<td>2.6</td>
</tr>
<tr>
<td>Heavy duty &amp; Equipment</td>
<td>4.9</td>
</tr>
</tbody>
</table>

... the PM change from 120 to 180 days will quickly reduce associated costs by 33%

**Number of light- and medium-duty PM jobs**

- **Direct impact:** $128k (33%) from reduction in PM parts and labor
- **Additional indirect impact:** $240k from reduction in travel time to repair shop

1 Avg length of PM = 2.5 hrs at $41/hr (based on representative sample of work orders). Note: Most PMs done by Automotive Service Workers.
2 Assumed time lost from dropping of and picking up vehicle = 5 hrs; avg. hourly cost for DEP employees = $62.5/hr

Source: DEP Fleet, OpX team, MTA Bridges and Tunnels
**WWTP example: optimization of aeration basins operation**

- In Phase 2, we will follow a pilot, refine, and roll-out approach for all front-line initiatives to prove concepts prior to a full roll-out.

*Volume of blown air (MCF/day); Jamaica Bay example*

Able to achieve change savings by carefully monitoring the dissolved oxygen levels in the tanks.
Revenue initiative

- Through statistical analysis, identified strong large meter candidates for replacement that could generate more than $40 million in revenues.

Normalized distribution analysis shows a difference of 12 gpd/capita or 19% between displacement & single-jet meters.

Example: 2” displacement meters, apartments buildings with elevators.

Cumulated frequency

Source: Data extract from OIT; OpX team analysis
Embrace OpX as a transformation in order to achieve scale and sustainability

- Organizational Survey of all employees will help determine the health of DEP as an organization and provide a base for improvement
**Purpose:** In 2011, DEP partnered with Veolia Water, McKinsey and Company and Arcadis to identify opportunities to improve DEP’s drinking water, sewer, and wastewater treatment operations and **make DEP the safest, most reliable, cost-efficient utility in the nation**

<table>
<thead>
<tr>
<th>Phase 1</th>
<th>November 2011 to May 2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>OpX team assessed DEP’s major facilities; interviewed more than 60 individuals, observed more than 800 hours of work, identified opportunities for transformation and savings, and prepared business cases</td>
<td></td>
</tr>
<tr>
<td>OpX team has identified approximately <strong>$108m-$130m in potential savings and revenue enhancement</strong>, after considering certain implementation costs</td>
<td></td>
</tr>
<tr>
<td>Of these, <strong>$4.9m of annual savings have already been implemented</strong>, with additional quick wins worth <strong>$12.0-14.5m in early FY13</strong></td>
<td></td>
</tr>
<tr>
<td>City to determine whether to proceed with Phase 2</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Phase 2</th>
<th>June 2012 to June 2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Follow Phase 2 Implementation Plan to achieve long term transformation and savings over 4 years</td>
<td></td>
</tr>
</tbody>
</table>
Potential financial impact

- The potential financial benefits of the OpX initiatives will ramp-up over time

Percent of total opportunity implemented
Benefit achieved as a % of total benefit, full fiscal year effect

- FY 2013: 10-15%
- FY 2014: 35-50%
- FY 2015: 60-75%
- FY 2016: 80-100%
An exciting and rewarding journey

Operational Excellence
The best always do better