Thematic Week: Water Services for Supply and Sanitation

Thematic Axis: Best Practices on Water Services in Metropolis

Title of the Presentation: *Best Practices on Water Services in Shanghai Pudong*

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Summary
Shanghai is the fastest growing economic region in China and one of the swiftest developing areas in the world. Pudong New Area, a district of Shanghai and Special Economic Zone is a fast growing new city with demand for clean and safe water permanently increasing.
Veolia Water started in 2002 a 50 years partnership with Chengtou Group, the infrastructure arm of Shanghai Municipality to face the challenges of the accelerated water demand growth and to raise the drinking water service quality to international standards.
The Joint Venture in Pudong has marked water management history in modern China. This is the first time a foreign water operator has been given the opportunity to share the management of full drinking water services.
The results have so far been promising. Through a 50%-50% joint venture and a system of collegial leadership and joint decision making, the management team integrated with managers from both shareholders has significantly improved the water service for more than 2.6 million residents of Pudong Area. The list of achievements and improvements in water quality, service quality, management and employees development is impressive and consistent with the targets fixed by Veolia Water and Shanghai Municipality.

Key-words: 50-year long-term Public-private partnership, Veolia Water's first full concession contract in China, Modern drinking water network management, One of the most compact and sophisticated water laboratories in China, Water solution to a fast growing city

"Public authority and operator. A tandem serving the population".

Shanghai-Pudong: The first Public-Private-Partnership for complete drinking water services in China

Project Background

Shanghai is the fastest growing economic region in China and one of the swiftest developing areas in the world. With approximately 17.5 million residents, it is the business capital of China and has risen as a major international city attracting increasing foreign investment in the last decade.

Figure-01

Pudong New Area, a district of Shanghai declared Special Economic Zone in 1990, is a symbol of China's reform, modernization and liberalization. The rapid development of Pudong since the 1990s represented a strategic move to open Shanghai and catalyze the economy of the entire Yangtze River Delta. Pudong's GDP has increased at an average annual growth rate of 18.4% since 1990 to 236.5 billion RMB (23 billion euros) in 2006. Today, Pudong is an area of 570 km2, with a population of 2.85 million people, where 4 trade zones, an international airport, the Shanghai Stock Exchange and the venue of the World Expo 2010.

As a fast growing and rapidly-modernizing city, Pudong's demand for clean and safe water is increasing rapidly at an annual average rate of 6%.

First global Public-Private Partnership for drinking water in China

The Pudong Water Corporation was created in 1999 when the Shanghai Water Authority separated the city's water supply system into four distinct and newly created state owned companies.

To face the challenges of the accelerated demand growth and to raise the drinking water service quality to international standards, Shanghai Municipal Government decided in 2001 to launch an international bidding process for the selection of a professional partner for the water company.

Veolia Water was designated in May 2002 as the successful bidder for the purchase of a 50 percent stake in Pudong Water Corporation, the state-owned water company for Pudong at that time.
This joint venture is a landmark in public-private partnerships in China – it is the first time a private foreign water operator has shared the entire management of a Chinese water company.

Shanghai Pudong Veolia Water Corporation Limited (SPVWC) became China's first public-private partnership for the management of the global drinking water service. The license for the 50-years water supply operations in the Pudong area started in September 2002. Veolia Water's partner in this project is Shanghai Chengtou, an infrastructure development, operations and investment group owned by the municipal government.

The Partners

Veolia Water: The world's leading operator of water service, has been present in the water market in China since the 1980's. Across the world, Veolia Water's services include the design, construction and operation of water and waste water plants and networks for industrial and municipal clients. Today Veolia Water operates in 20 out of 34 provinces, municipalities, autonomous regions and special administrative regions in China.

Shanghai Chengtou Group: The Shanghai Municipal Government is present in the joint venture via Shanghai Chengtou Group, an infrastructure development, operations and investment group owned by the municipal government. Established in 1992, has invested over RMB 200 billion (20 billion euros) on 60 major infrastructure projects in Shanghai transport, housing, water and wastewater sectors. Chengtou Group employs 13.000 staff.

The new Joint Venture has been established with the two partners in equal proportion (50% shares for each). The partners bring a depth local and international expertise to develop Pudong's water service. The company operates therefore under a "system of collective leadership and joint decision-making" with 50%-50% representation in Executive Management Committee and Board of Directors. A well balanced management team was established with rotation of main positions (General Manager and Chairman) every four years and distribution of key management positions between both shareholders.

The same conditions to other water companies in Shanghai are applied to the Joint Venture: water quality, service levels, water tariff, laws and regulations. No special subsidy was accorded.

Key Facts

- Service area of 480 km2
- Serving population of 2.85 million
- 970,000 water meters
- 1,210 employees
- 6 water treatment plants and 8 pumping stations
- Network of 3,300 km (pipe diameter 5 mm – 1,800 mm)
- 4 customer services centers (agencies)
- Average daily production: 1.2 million m3 per day

Objectives of the JV

The mission of the JV as expressed in Articles of Association: "*The purposes of the Joint Venture Company are: to introduce advanced water supply technology and management experience, improve water quality, reduce cost, and provide high quality water supply services to the customers and the developments of Pudong Area*"

With the strong cooperation of both management teams, the mission established for the joint venture was reflected in a group of strategies and action plans focused on the following main points:

1) Improvement of the water quality to be in total compliance with the higher standards requested by China and Shanghai.
2) Improvement of the service:
   - ✓ Simplify all the applications and procedures for our customers.
   - ✓ Be always available to receive customer's requests reacting as fast and effective as possible and trying to go beyond their expectations.
   - ✓ When executing pipeline works, make the procedure simple, the works on schedule and the quality of the works excellent.
3) Commitment with the development of Pudong Area and with the city of Shanghai.
   - ✓ Ensure at all times the safety of the water supply
   - ✓ Support the development projects (housing, infrastructure, commercial, industry), providing adequate water supply solutions.
   - ✓ Respect the surrounding environment and minimizing the environmental impact of our activities
4) Make the company profitable for the shareholders:
   - ✓ Expand the activity and the service coverage.
   - ✓ Optimize investments and operational costs.
   - ✓ Optimize cash management.
5) Make the Company a good place to work for the employees, providing professional satisfaction, development opportunities and fair compensation:
   - ✓ Recognize and compensate good performers.
   - ✓ Support professional and personal evolution of employees.

Best Practices introduced from years 2002-2008

During the period 2002-2008, a strong expansion and coverage of the service has been experienced in Pudong Area, supporting its urban development

	2002	2007	Increase
Service Area (km2)	**319**	**480**	**+50%**
Network Length (km)	**1975**	**3300**	**+67%**

No. of Water Meters	**573 000**	**970 000**	**+69%**
Population served (Million inhab.)	**1.8**	**2.85**	**+58%**

Figure-02

Trough the joint work of both partners, numerous improvements have been achieved since 2002, introducing the best professional practices in China's water sector.

Best Practices to guarantee water quality

Shanghai Pudong Veolia Water Corporation has started introducing advanced technology, management methods and overall water quality improvement to achieve the new national standard for water quality adopted by China in 2007. The new national drinking water standard extended the number of parameters controlled from 36 to 106. Replacing the 1985 enactment, the new regulation brings water quality control in China closer to European and US regulations.

Since 2002, the water distributed by Shanghai Pudong Veolia Water Corporation has been in perfect compliance with the 1985 water quality regulation. To meet the new 2007 regulation, the Joint Venture has identified main areas for improvement, including that of treatment technologies in water plants. Construction of ozone and activated carbon filtration units has started in the main water plant and is planned for all water plants in the medium and long-term.

The establishment of a new ***Water Quality Center*** has continually reinforced water quality management and control. As one of Veolia Water China's largest laboratories, the new laboratory is now capable of testing more than 110 drinking water parameters. Shanghai Pudong Veolia Water Corporation has made substantial investments into equipment and employees to upgrade the water treatment process.

Figure-03

- Latest equipment and software, being able to analyze more than 110 parameters for drinking water.
- A testing program with a minimum of 35 network points checked weekly; raw and treated water sampled and tested on daily basis. 5,000 samples & 80,000 analyses performed per year
- Average turbidity reduced from 0.20 to 0.14 NTU in the water plants outlet. From 0.41 to 0.32 NTU in the network.

- Manganese compliance improved from 61% to 91%.

- Sharp reduction of water quality complains to less than 0.5% of the total.

Best Practices in water production

New developments at the Linjiang Water Treatment Plant represent the best of the Joint Venture's forward-looking approach to water technology and treatment.

In July 2006, the Linjiang Water Treatment Plant extended its water supply capacity of 400,000 m3 per day to 600,000 m3 with a plant extension equipped to meet the tightened regulations and growing demand in the Pudong New Area while achieving a significant reduction of land use, an important condition in the high-developing urban area of Shanghai. The use of new advanced treatment methods has produced major space saving benefits:

- ACTIFLO micro-sand accelerated sedimentation tanks – first time used in China

- High Speed Filters licensed by Veolia Water and used internationally

- Highly space-efficient units: They use only one-third of the space required compared to conventional treatment techniques. Only 3,000 m2 of land space, compared to 15,000 m2 required using conventional facilities to supply 200,000 m3 of water per day.

The second phase for the Linjiang water treatment plant extension project is now under construction. When completed, it aims to achieve water quality in compliance with the new national regulation, through advanced treatment:

- Sludge treatment involving sludge water collection, concentration and dewatering

- Deep treatment including ozonation, active carbon and UV technology

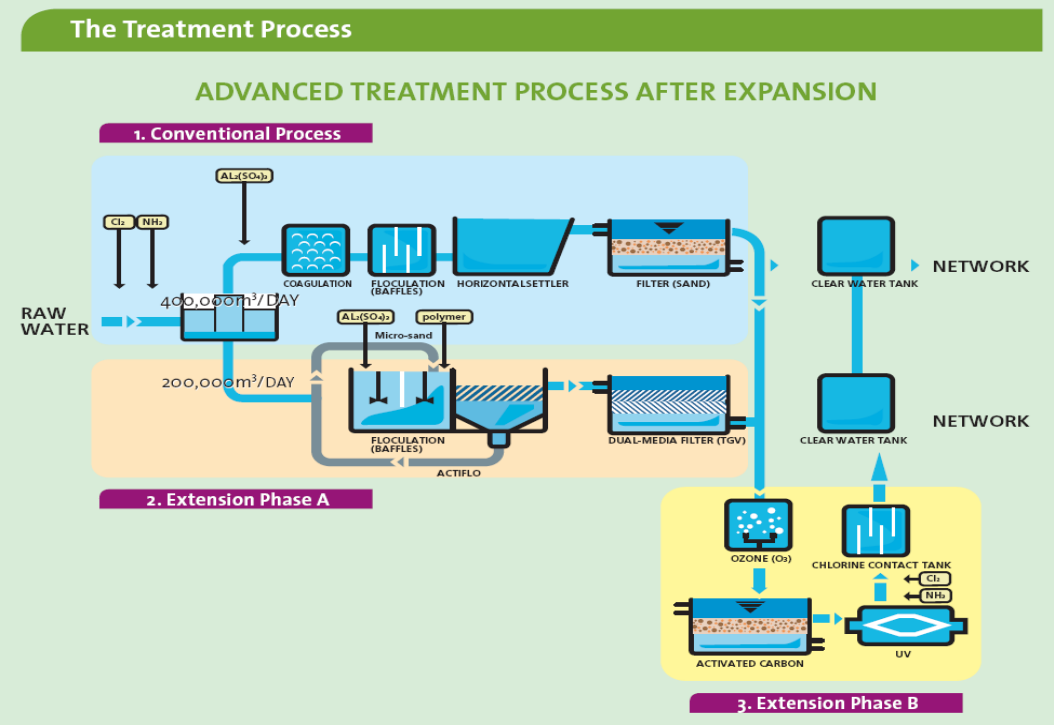

Figure-04

As economic growth continues at a phenomenal pace in Shanghai, water demand is expected to grow six percent per year over the next 5-10 years. In order to ensure stable and reliable water supply to an increasing population, apart from the extension of Linjiang Water Treatment Plant, a new water treatment plant, Jinhai, in the center of Pudong District, scheduled to commence construction in 2007, will provide an additional 400,000 m3 of water daily to the district before 2010.

Best Practices for Network Management

Development of the Pudong's pipeline network has been rapid over the last few years from 1750 km in 2002 to 3300 km in 2008. Most of the urban areas in Pudong district are now served by Shanghai Pudong Veolia Water Corporation. A further 500,000 people will be connected as the company is expected to expand to cover all of Pudong District by 2010, following the urban planning directives from Shanghai Municipality.

Non-revenue water, which is water produced and pumped into network but not invoiced to customers, is caused mainly by leakage, inaccurate metering or unauthorized usage. Severe water leakage due to aged and improperly installed pipes have caused problems and high costs to the water industry in many Chinese cities. Although the network is relatively young in the Pudong district, leakage still contributes to non-revenue water, in addition to metering inaccuracies. To optimize the network, Shanghai Pudong Veolia Water Corporation has introduced new metering technology as well as state-of-the-art technologies and management tools to maintain and repair the network. NRW level has been reduce to 27% in 2007 from more than 35% in 2002. The Joint Venture aims to reduce the level continuing a downward trend of at least two percent per year, to reach an efficiency target of 19 percent by 2011. GIS, Hydraulic model and SCADA are among the

tools used by the Control Center which help coordinate operations at the various water treatment plants and pumping stations to optimize the distribution system.

	2002	2003	2004	2005	2006	2007
Network Efficiency (%)	**65**	**66.5**	**67.1**	**68.2**	**70.2**	**72.5**
Loss index (m3/km/day)	**-**	**159.2**	**148.1**	**135.5**	**121.8**	**101.2**

Figure-05

GIS model improves water pipe management From more than 5,000 paper maps showing partial sections of the pipelines, Shanghai Pudong Veolia Water Corporation completely digitalized the whole network maps, containing today 3,300 km of pipelines and thousands of valves, fire hydrants and other special equipments. All this work has been completed in less than 18 months, providing a powerful management tool. Today, a modern Geographic Information System (GIS) is in use and kept updated by a team consisting of six draftsmen and two engineers. Pipelines and valve information, data on sensitive customers and relevant information are stored on the system and available for operational staff. Water cut operations can be efficiently managed using this system, reducing intervention time. The company aims to improve response capability and be on the ground within two hours of identifying pipe breaks. The location of each valve and meter is identified precisely on the map helping to ensure efficiency of the repairing works as well minimizing water services damage or suspension in the case of emergency situations. To further improve assets management, a major step in progress is to categorize pipes into families, whereby types of pipes with higher risk of bursts can be monitored and handled effectively.

Figure-06

First large-scale network sectorization in China The zoning of the Pudong district, which marks the first sectorization on such a large scale in China, is scheduled to be completed in 2008. The Joint Venture has already started using the sectorization to analyze water loses in completed zones. With the district divided into 34 zones, non-revenue water can be better tackled. Accurate assessment of the water balance of each zone is now possible as information on flow-in, flow-out is measured on a monthly basis and compared with consumption. Already, 360 electromagnetic flow meters have been installed to enable the efficiency improvement of the water supply. A total of 400 flow meters will be in place by the end of 2008.

Optimizing network design with Hydraulic Model Shanghai Pudong Veolia Water Corporation completed a sophisticated hydraulic model of the pipeline network for its service area within 18 months from the start of the joint venture. The hydraulic model optimizes the design of the network by simulating network conditions, providing operation parameters of the pipe network system (pressure, flow, quality) after emergency incidents through analog operations. This enables operators to verify the effectiveness of emergency handling operations by carrying out model schemes beforehand. Based on information from the hydraulic model, pumping stations can now optimize energy use, and operators can carry out immediate and accurate reaction to emergencies and problems in the distribution system. Additionally the hydraulic model facilitates network zoning, validation of projects and helps identify influence areas.

Best Practices in Customer Services

Customer satisfaction surveys have been carried every year since 2004 for industrial, commercial and residential accounts. Following analysis of the four-year findings, an action plans have been defined to improve areas of services in line with customer expectations.

Since January 2005 the company provides efficient communication services to its customers through the Customer Call Center working 24 hours a day, 365 days a year. The Call Center links customers to the company through a sophisticated communication and service platform.

- After-sales service management whereby information from the hotline is integrated into a complete profile for each customer;
- Average waiting time: six seconds; less than 1% of lost calls.
- Instant access to the billing system and database.
- Automatically distributes and coordinates work orders to the company's other departments, work teams and customer service agencies, enabling efficient operational flow and reaction capacity to all kinds of customer needs.
- Provides an interface with a supportive information system in order to facilitate quick access of relevant information by the telephone operator. Seamlessly connected to both the Water Quality Center and Control Center, the Customer Call Center ensures network and water quality operators are immediately informed of customer concerns and reports.
- ATM and other network technologies are used to transmit user repair report information to the relevant departments. Averaging 800 phones calls per day in 2007, the company aims to encourage more customers to make use of the services provided at the Customer Call Center.

- Receives customers calls 24 hours, 7 days a week.
- 16 work stations, 30 staff rotating according to calltraffic and customer demand.
- Communicates through emails, SMS, fax and post.
- Call back procedure to ensure needs of customers are met an audit costumer satisfaction.

Key accounts management: As the number of large industrial and commercial customers has grown significantly over the years, The company established an agency dedicated solely to serving the 6,000 big customers who although comprise less than one percent of total customers, represent almost 60 percent of the distribution volume. These key accounts enjoy specific services for professional needs such as consumption analysis, remote reading and alarms.

Improved emergency response: Connected to the Control Center, the Customer Call Center can access important pipe network information and respond to emergencies in time. When the Customer Call Center receives notification of a break or leakage, or several calls concerning deterioration in water quality in a certain zone, a 'special situation' procedure is triggered. The Control Center, integrated with the databases of the Customer Call Center, receives instant notification and coordinates relevant parties to deliver rapid emergency reaction

Best Practices in Human Resources Management

The human resources strategy has been developed specially in three axes: health & safety, training and salary reform.

After 5 years, 2/3 of the production capacity, all the pumping stations, network, customer service and pipeline works sections have been certified OHSAS 18.001 as the culmination of a process of continuous improvement in health and safety conditions for the employees.

Training has been a priority in the development process of the staff. Through the Competency Based Training approach, which is based on identifying training needs through competencies required for each position and identifying gaps between actual and required capability, and intense training program has been gradually implemented. An average of 46 hours of training/employee each year, covering more than 90% of the employees has been achieved in 2006 and 2007 and it is the minimum target for next years.

With the aim of encouraging individual, team and company performance the salary system has been reformed. During this process, jointly developed with the Labor Union and the management, the structure of basic salaries, allowances, variable salaries, performance evaluation and procedures was completely updated to modern practices.

In spite of the increasing activity and service area, the number of employees remained stable, with productivity rising based on training, technology and better organization. Without lying off any employee, the staff profile has been gradually improving, including today a good number of young university graduates and technicians.

Productivity Indicators	2002	2006
Pipe length (km/ employees)	1.61	2.26
Water meters/ employees	488	763

Figure-07

Best Practices in Transparency and Financial Management

Since the beginning of the joint venture, the transparency of the management and the optimization of the financial management have been key objectives. Several improvements have been achieved, deepening the mutual trust between partners.

- Integrated Accounting System
- Bank Account Centralization
- Standardized Chart of Accounts and Financial Statements
- Budget System
- Purchasing Centralization
- Sarbanes-Oxley compliance

Community Participation

The Joint Venture has been actively involved with the local community. Specially focused on environmental education, numerous activities are organized around subjects like water resources and environmental protection. School visits to the facilities, cooperation with local universities and exchange with the communities about water allows the company to be in contact and contribute to de general environmental awareness.

Innovation

Innovation is promoted at all levels of the company through "Golden Ideas" awards, and several research cooperation agreements with local universities. Subjects like water treatment optimization, health & safety equipments and energy savings have been the focus of research projects.

Moving forward

The Joint Venture in Pudong has marked water management history in modern China. This is the first time a private foreign water operator has been given the opportunity to share management of full water services with a Chinese water company. The results have so far been promising. The list

of achievements and improvements in water quality, service quality, management and employees development is impressive and in line with the targets fixed by Veolia Water and Shanghai Government. Shanghai will come under the spotlight of the world as the 2010 World Expo approaches, stimulating higher expectations and demand of water supply and quality. The Joint Venture's partners are stepping up management processes and technologies to meet and even exceed the new water standards and customers expectations.