CIWEM Chartered Institution of Water and Environmental Management

Urban Drainage Group

#CIWEMUDGAnnualConf22

6 – 8 December 2022

The Eastside Rooms Birmingham

Real time optimisation of wastewater and stormwater collection to reduce overflows

The examples of Mulhouse and Paris

Roseline Klein, SUEZ

REAL-TIME OPTIMISATION OF WASTEWATER AND STORMWATER COLLECTION TO REDUCE OVERFLOWS

The examples of Mulhouse and Paris

07/12/2023
CIWEM Urban Drainage 2023 Conference

suez

GLOBALLY, SUEZ OPERATES PLANTS AND COLLECTION NETWORKS ACROSS TWO DIVISIONS

DIFFERENTIATION IS KEY TO PREPARE THE FUTURE

There are 3 differentiation units: Engineering & Construction, Digital Solutions and Innovation. Each of these entities serve water and waste operators, internally and externally.

ENGINEERING & CONSTRUCTION

DIGITAL SOLUTIONS

INNOVATION

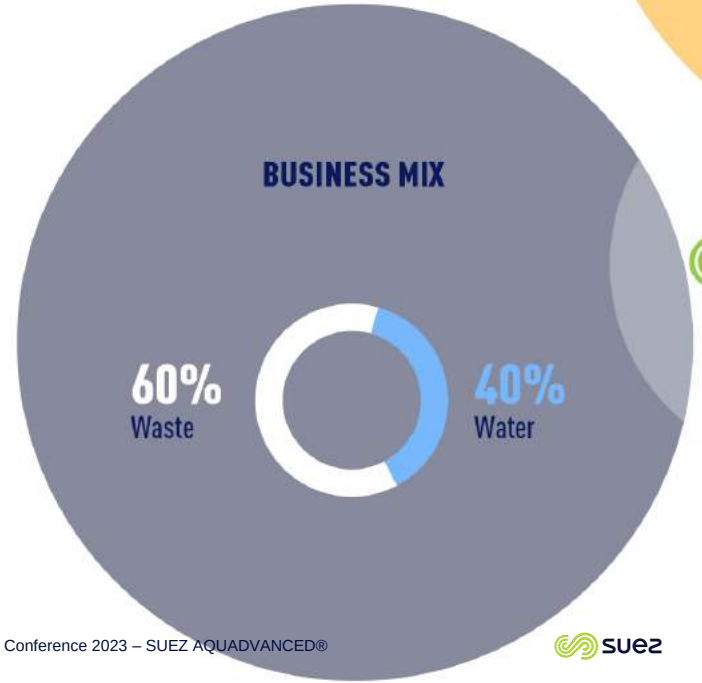
SUEZ AT A GLANCE

€9bn revenues

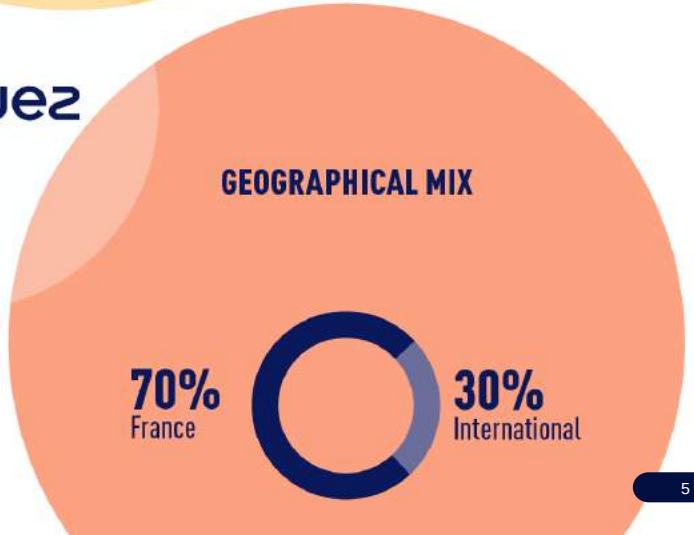
40,000 employees

more than 1,600 patents

9 R&D centers in France and Asia



suez



Mulhouse – Features of the Sausheim catchment

- Combined network built 1897-1902
- Sausheim Wastewater treatment plant: 490 000 population equivalent
- Network length: 791kms
- Including 46kms of ‘man-entry’ network (>1.4m diameter)
- 40 small stormwater storage facilities
- Assets managed by SIVOM Région Mulhousienne
- Operation of the plant and combined network delegated to Suez

Mulhouse combined network – The need to reach compliance

1. THE SITUATION

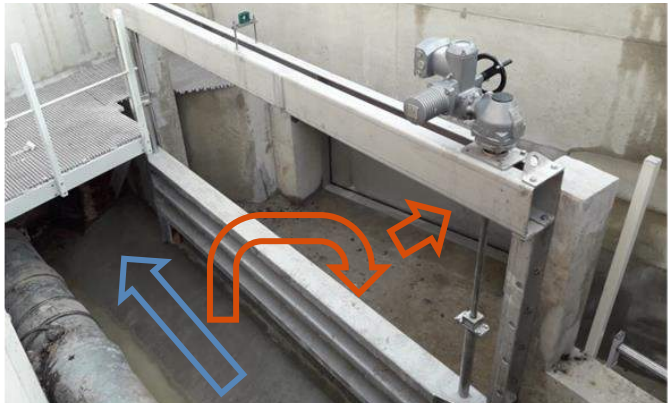
- Combined wastewater/stormwater network
- Non-compliance of the wastewater system: 15% of annual collected volume overflowing
- Network overflows into ecologically fragile stream environment
- Limited measurement points in the network
- Unused capacity at the wastewater treatment plant (max capacity 5.4m3/second)
- Regulatory requirement to reach compliance. Master plan concludes 45,000m3 of storage need to be built
- 2003: a government order demands this is built

2. THE ALTERNATIVE

- 2015: Alternative Master Plan developed, using real-time optimisation of the combined network
- Instead of a large storage tank, the new plan involves:
  - ❖ Creating a new pumpstation
  - ❖ Installing 9 large storage valves on the largest interceptors
  - ❖ Installing 13 controlled weirs on 80% of the main overflow points
  - ❖ Creating smaller storage tanks
  - ❖ Implementing the Suez AQUADVANCED® Urban Drainage real time optimisation software to control the operations of the network assets
- 2018: a new government order overrules the 2003 one and approves of the new Master Plan
- 2019: civil works start

The works start: building 13 controlled weirs

BEFORE



AFTER: Works almost completed

Direction of flows:

To the treatment plant

To the environment (overflow point)

The works start: building 9 storage valves

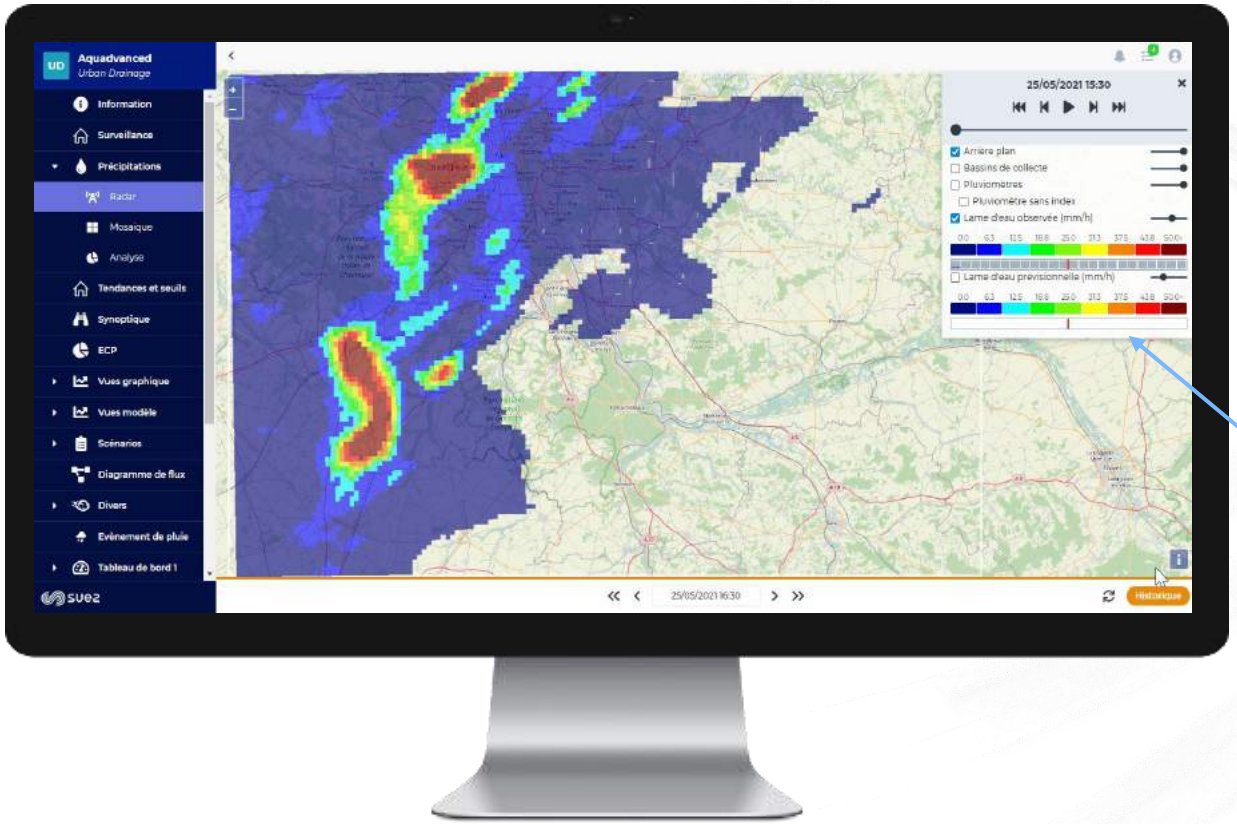
BEFORE

AFTER

Coupling raingauge data and the rain radar to manage the network

Map view of predicted rainfall (the **rainfall radar**), going from one hour in the past to one hour in the future

Zoom in on the map to identify rain on a particular area

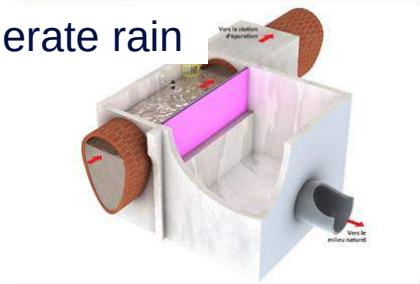


Objective: to anticipate water levels at any point in the network for the next 3 hours, and up to 3 days in the future

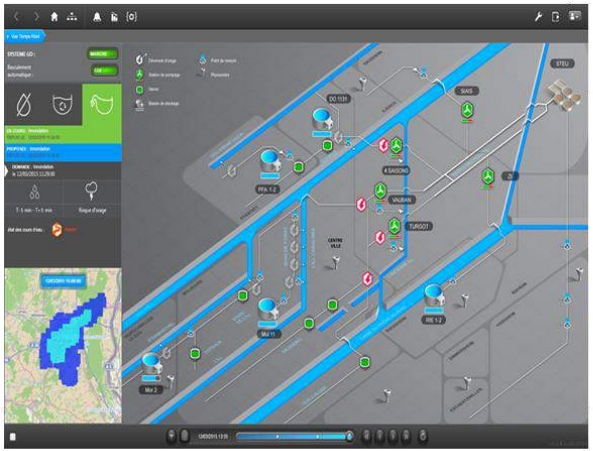
Visualisation of rainfall intensities of the past days (mm/hour)

AQUADVANCED® Urban Drainage – Strategies for system wide wet weather management

1. Moderate rain

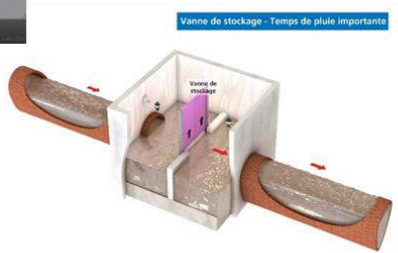


Storage strategy activated



2. Significant rain

Overflow strategy activated




Accueil
Déversoirs
Modèle
Pluviomètres
Radar
SITES
Stratégies de Gestion
Contrôle GD Mulhouse
Système GD :
Marche
Bascule automatique :
Oui
Phase hydraulique : Système aval non saturé
Stratégie en cours : Dépollution
Depuis le : 30/11/2023 18:10:00
Proposée : Dépollution
Proposée : 30/11/2023 10:42:14
Demandée : Dépollution
Le :30/11/2023 10:48:14
Changer de stratégie
Contexte météo
Risque d'orage
30/11/2023 17:45:00
SIAIS
STEU
4 SAISONS
ZI
VAUBAN
TURGOT
30/11/2023 18:10

Preliminary results (system is not fully in place yet)

- Volume overflowing from the combined system has reduced by **80%**
- Cost of the implemented masterplan is **21M€ compared with the 50M€** of the original one
- **Regulatory compliance reached**
- Better use of the network's and wastewater plant's existing capacity thanks to an increased interception of flows
- Smart automatically controlled network adapting to the weather conditions

Example – Quai du Forst overflows, September to May

September to May analysis	Overflow volume (m^3)
Prior to AQUADVANCED (average of 2018 to 2020)	385 000
2022	35

Next steps - 2024

- Complete construction works: 1 valve, 3 small stormwater storage tanks

- Generate further benefits from the implementation of AQUADVANCED® urban drainage:

❖ Network - Develop sub-catchment wet weather management strategies

-> potential to further reduce overflows

❖ Plant - Smooth the dry weather flows (evening peak) reaching the plant

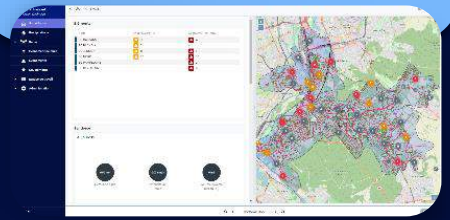
-> 250k€ potential savings in energy costs by treating flows at night using off-peak energy tariffs

AQUADVANCED® Urban Drainage – Three levels of decision support

Note: level implemented in Mulhouse

1. MONITORING

- Obstruction tracking
- Monitoring of Inflow & Infiltration
- Performance of network assets
- Options (e.g. system view, flow charts)



2. ANTICIPATION

- Monitoring and radar analysis
- Short and medium-term weather forecasts
- Coupled with hydraulic modelling
- Predictive alerts for overflows and spills (email, text messages, alarms to control room)

3. ADVANCED CONTROL

- Wet weather management strategies for the wastewater system
- Optimisation instructions sent in real time
- Customised system view
- Event-based reporting and analysis (replay)

COMMON BASE DASHBOARD & EVENTS

- **Monitoring and operation of assets**
- **KPIs calculation and display**
- **Event and alert management**
- **Monitoring of data acquisition**
- **Data access, validation review and reporting**
- **Rainfall monitoring and analysis of rainfall events**

Use case : real-time optimization of the Greater Paris area urban drainage system for 8.6 million people

Advanced Control

SIAAP (the inter-departmental authority for sanitation in the Greater Paris area) manages the urban effluents for Greater Paris. The hydrographic system covers 180 municipalities, 8.6 million inhabitants over 1,980 km².

CONTEXT AND OBJECTIVES

The wastewater network of the Paris agglomeration is 460 km long and includes 5 water treatment plants for 800,000 m3 of storage capacity and 150 monitoring points.

AQUADVANCED® Urban Drainage has been deployed to

- Control and reduce spills to the receiving body
- Limit the risks of overflow (health and hygiene in the urban environment)
- Protect the urban environment from flood risk
- Optimize treatment capacities of WWTP while enhancing the value of investments in flow management facilities.

RESULTS

- By reducing discharges by 35%, the system has reduced health risks as well as environmental pollution risks. The system can also manage flood crisis situations: local authorities are notified 6 hours before the flood occurs.
- By optimizing the capacity of existing installations, SIAAP has saved €250 million in additional storage tanks and increased the capacity of its wastewater treatment plant by 10%.

Use case: Stormwater management to protect beaches in Biarritz

Advanced Control

Biarritz is home to 30,000 people, but that number quadruples in the summer when the vacationers arrive. Shutting down a beach because of rain-induced pollution has major consequences for the city and its very important tourism sector.

⇛ CONTEXT AND OBJECTIVES

With the existing context, it was important to ensure a global view and a smooth operation of the network during the peak season:

- Understand the network
- Ensure operations as well as analysis of enabling the municipality to assess the impact of rainfall in terms of pollution
- Automated processing the data

⇛ RESULTS

- Installation of network sensors and weather forecasts tools
- Polluted water discharge has been reduced by 30-40%.
- The impact of impending rainfall and its related pollution can be predicted.
- Anticipation of beach closing based on flood risks and pollution : improved service to visitors. Reduced beach closing.
- Operations are fully automated and in real time
- Remote surveillance is carried out 24/7
- Scenario calculation and proposal related to water pollution discharge

Use case : management of the open-air stormwater network in the Marina watershed for the National Water Agency of Singapore

Advanced Control

With about 2,400 mm of rainfall every year and 5.5 million inhabitants over a land area of 720 km2, Singapore faces both flood risks and water scarcity. This unique challenge led to unique strategies designed and implemented by the PUB, Singapore's National Water Agency.

⇛ CONTEXT AND OBJECTIVES

In order to supplement raw water resources, local authorities have built large scale dams on the main estuaries to transform its rivers into city-scale rainwater storage. Its separate stormwater network transports runoff to the artificial Marina Barrage reservoir. Today, Singapore faces three main challenges for its stormwater network:

- Optimization of Marina Barrage operations to maintain reservoir level during rain events,
- Flash flood monitoring and anticipation,
- Water quality monitoring in the main rivers and the reservoirs.

⇛ RESULTS

- AQUADVANCED® Urban Drainage has been deployed and is currently being used in Marina Reservoir to help anticipate floods and propose optimal operation.
- Some innovative features have been added such as water quality forecasting
- Dam operations: saving water without increasing flood risks with advisory up to 1h lead time
- Flood control: Better situation awareness and crisis management
- Water Quality: faster anomaly detection and problem analysis

THANK YOU

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