MICROTURBINES FOR USE IN WATER NETWORKS

#WATEFCON 2018

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Water Efficiency Conference
5-7 September 2018
University of Aveiro, Portugal

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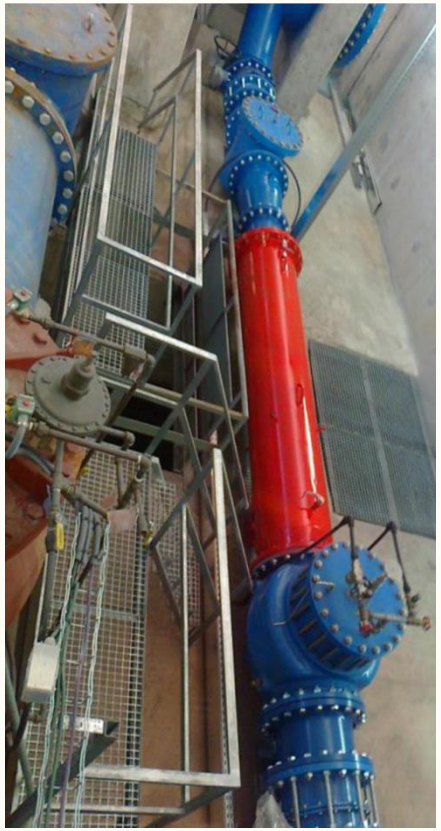
PAM SAINT-GOBAIN

The 3 pillars of MICRO-TURBINE PAM

RENEWABLE ENERGY	INOVATION	ECONOMY
SUSTAINABLE DEVELOPMENT Recover energy dissipated by water and generate electricity	**AXIAL SOLUTION** The only turbine with axial axis in the direction of the fluid	**RETURN ON INVESTMENT** Competitive solution High efficiency Service Life: 25 years Eligible for applications in European funds



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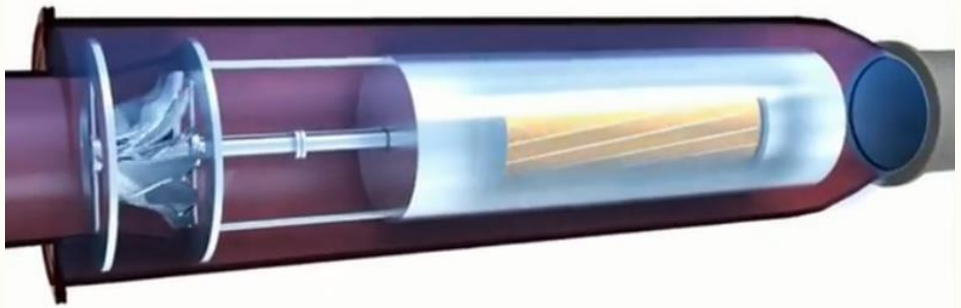
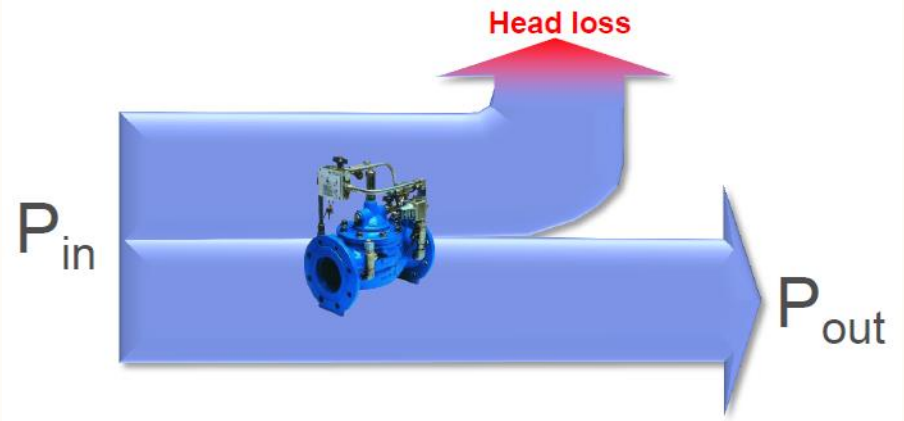
An innovative solution to produce electrical energy whether for self consumption or to sell, by the use of over Head available in water/irrigation supply systems

- **It's a green production of electricity, renewable and environment-friendly**
- **It offers reasonable "pay-back" in view of needed investment (purchase and installation costs are not high)**
- **Availability of energy in remote locations**
- **Low maintenance and estimated service life of 25 years**



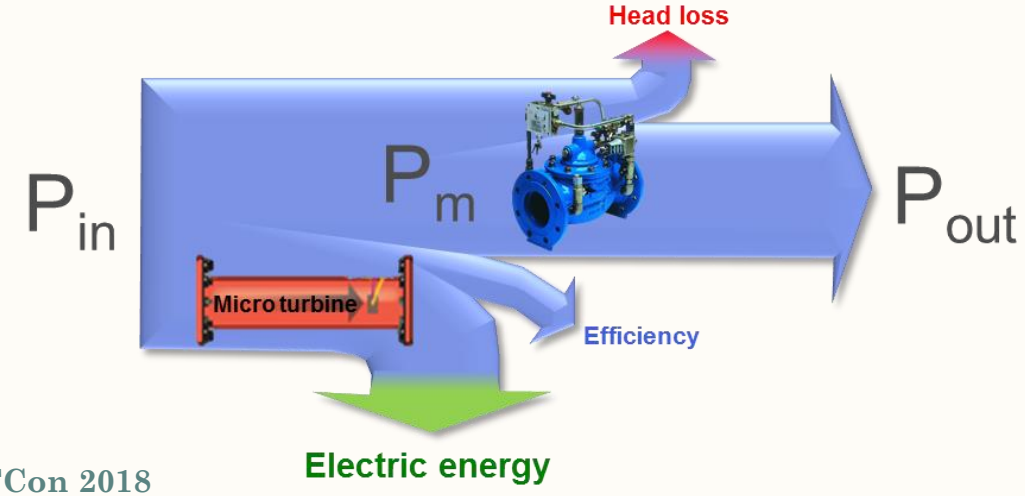
MICROTURBINES FOR USE IN WATER NETWORKS – TARGET AND PRINCIPLE

CURRENT NETWORK WITH AN AUTOMATIC CONTROL VALVE



Head loss ($P_{in} – P_{out}$) by cavitation = Reduces service life of the automatic control valve

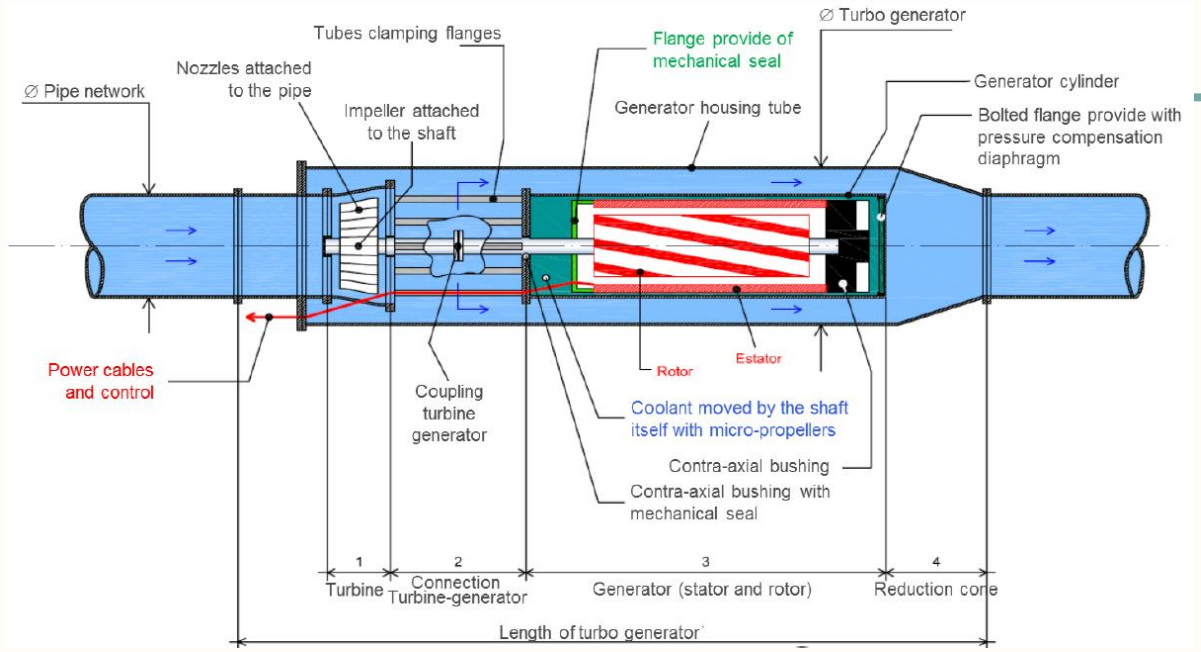
MICRO-TURBINE INSTALLED IN PARALLEL WITH THE AUTOMATIC CONTROL VALVE

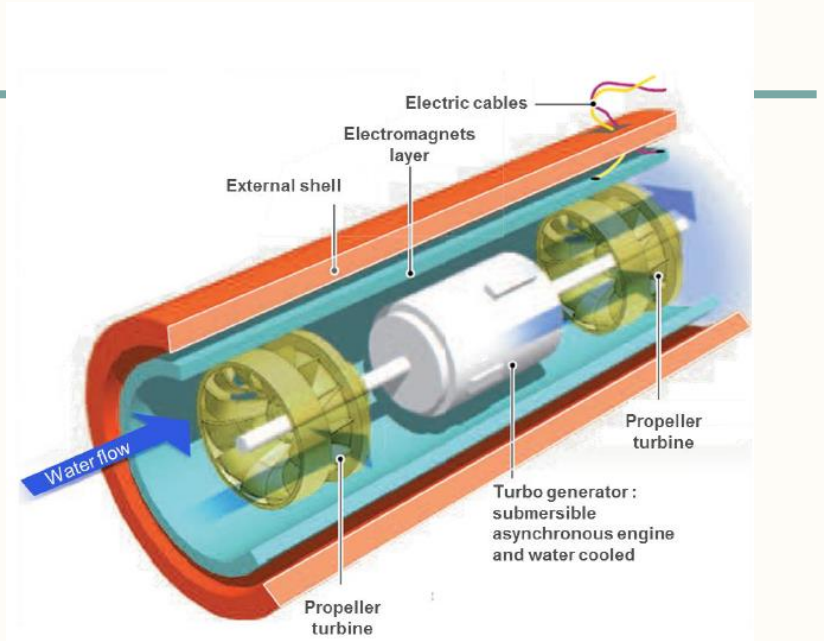


Reducing Head loss = ($P_{in} – P_{out}$) = increase service life of the ACV

Electric energy recovery trough micro-turbine

MICROTURBINES FOR USE IN WATER NETWORKS – HOW DOES IT WORK?

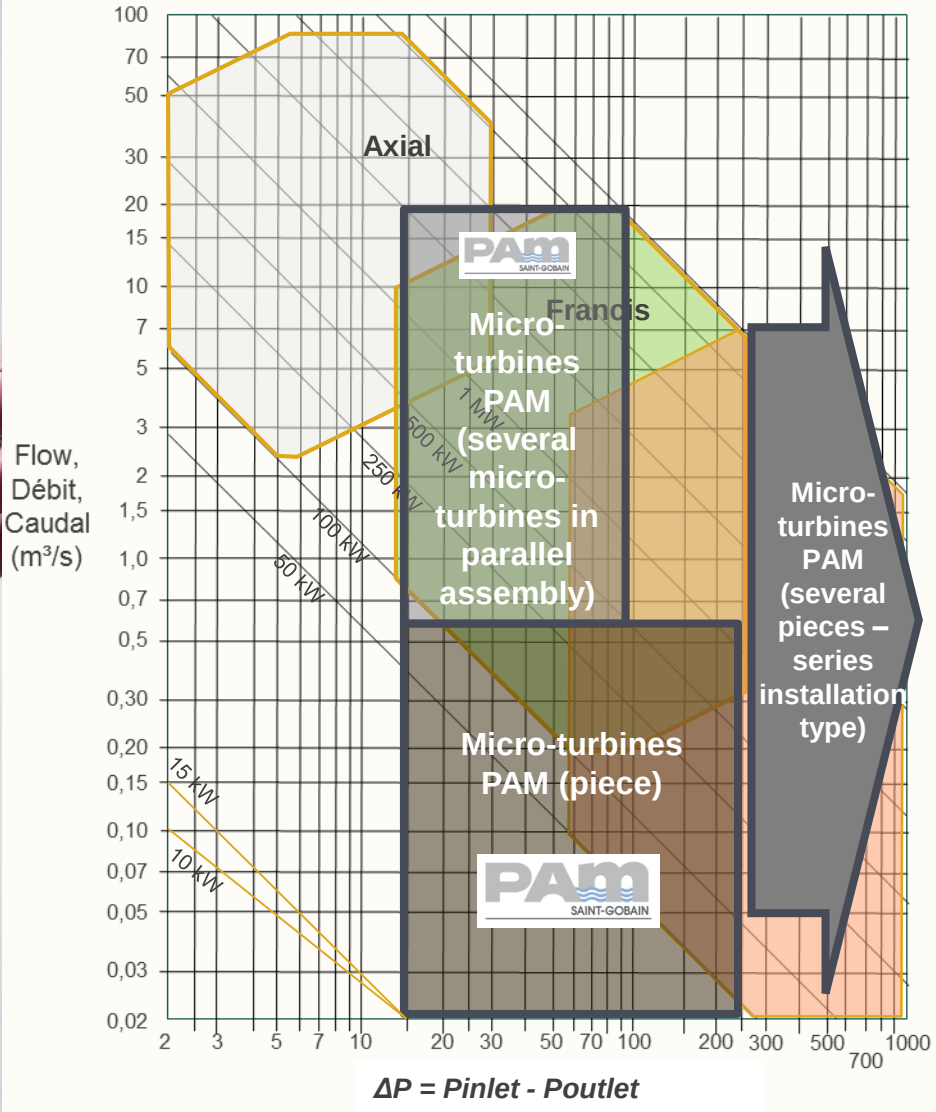




Compact Equipment consisting:

- Turbine (single stage or multi-stage), one or several diffusers and rotors (1000, 1500 or 2000 rpm)
- One three-phase asynchronous generator (voltage: 400, 690,1000 or 3300 volts)
- All inserted in a metallic carbon steel flanged pipe (ext.shell), red color epoxy lined and coated (drinking water approval)
- Nominal Sizes: DN 50 – DN 600
- Nominal flow rates: 5 l/s up to 600 l/s
- Power: 0,2 kW/piece (DN 50) – 350 kW/piece (DN 600)

MICROTURBINES FOR USE IN WATER NETWORKS
RANGE/FIELD OF APPLICATION

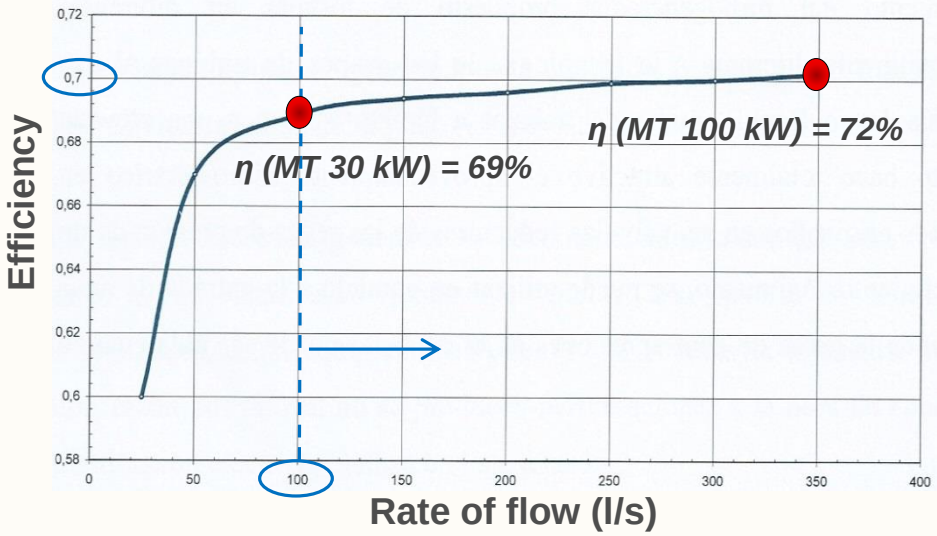


For flow rates > 100 l/s, Efficiency > 69 %

Applications:

- Drinking Water (ACS Approval)
- Irrigation
- Raw Water
- Sea water (tests undergoing)

Micro-turbines of 30 up to 100 kW
Conditions: Head = 40-45 mWh



$$P = g \times Q \times H_n \times \eta$$

P: available power (kW)
g: acceleration of gravity (9,81 m/s²)
Q: water flow (m³/s)
H_n : Falling heigth, Head (m)
η : Eficciency

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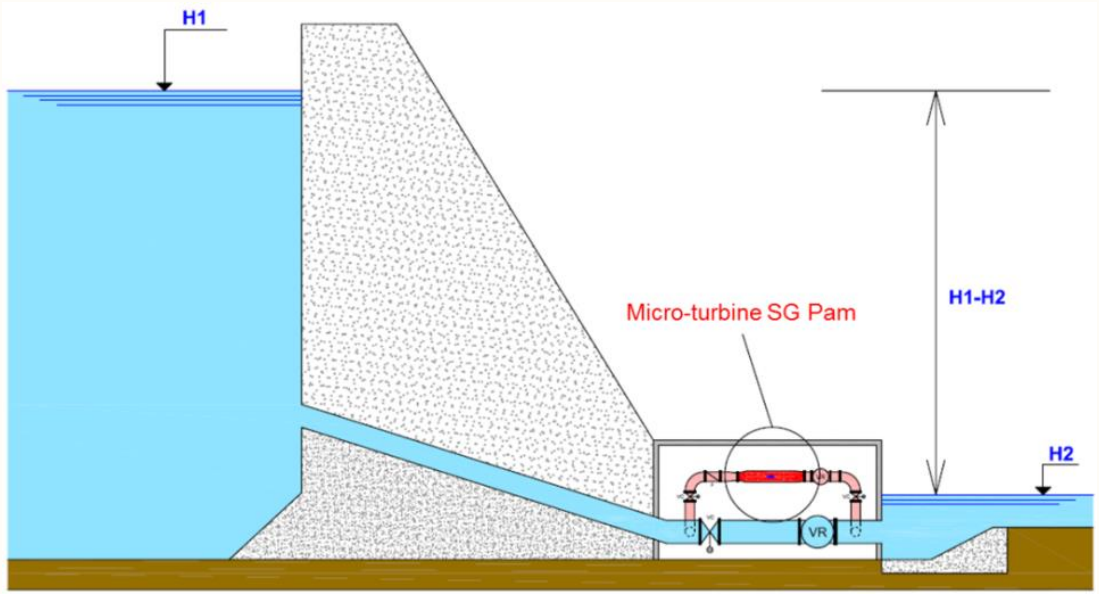
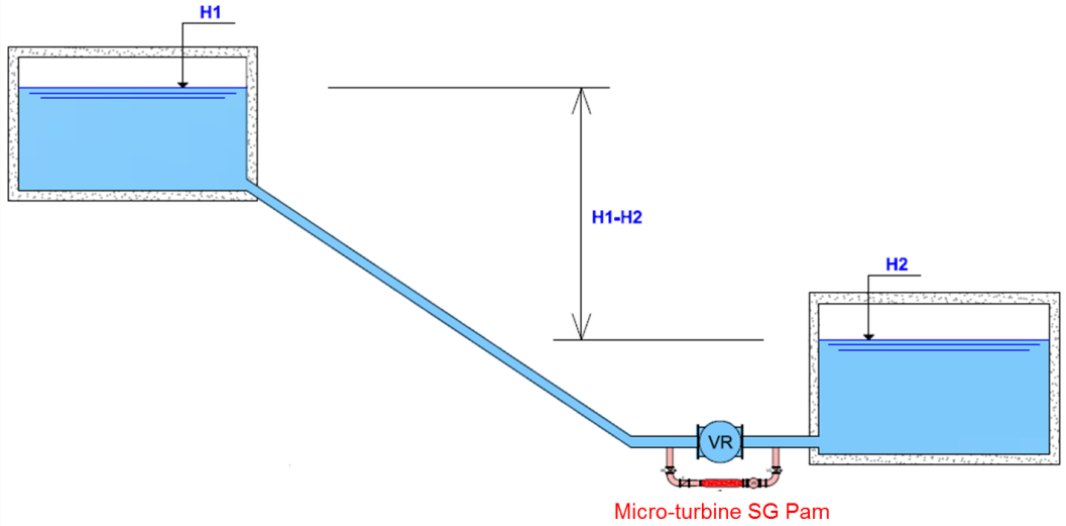
MICROTURBINES FOR USE IN WATER NETWORKS – USUAL FACILITIES TYPE



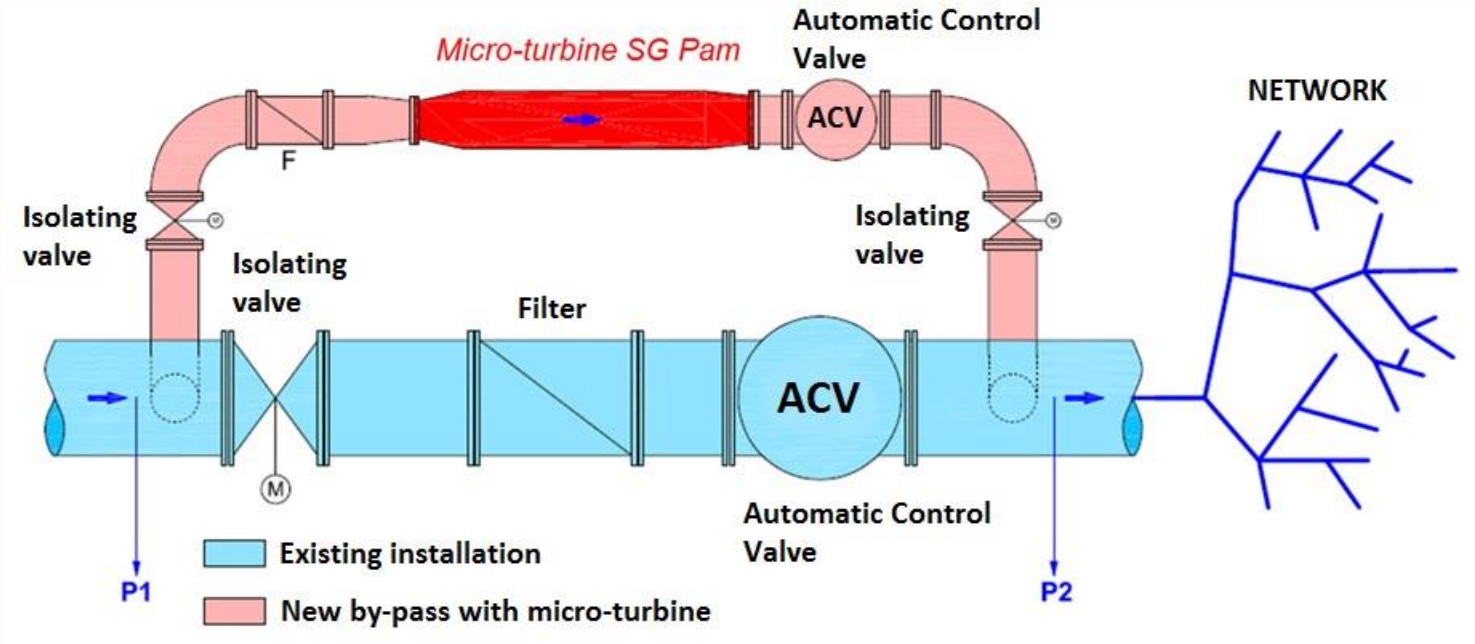
Ecological compulsory flows in Dams: in the chamber of the flow regulating valve



For water supply facilities such as:

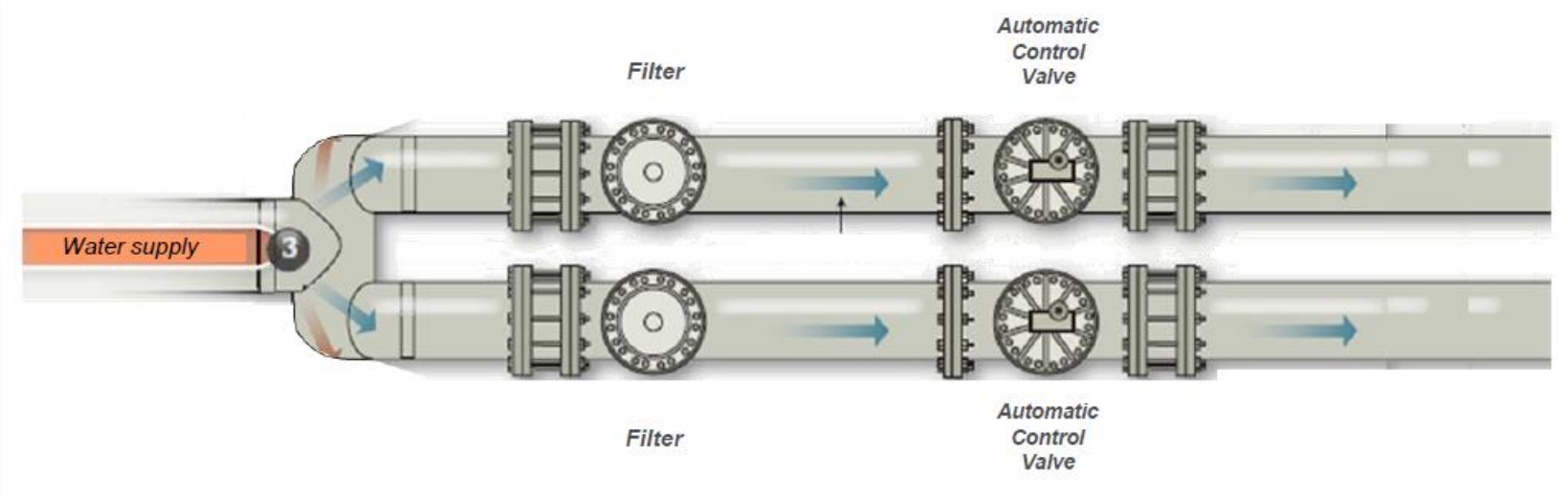
- Reservoirs
- Water Treatment Plants
- Automatic Control Valves Chambers
- Irrigation Networks

MICROTURBINES FOR USE IN WATER NETWORKS
USUAL FACILITIES TYPE



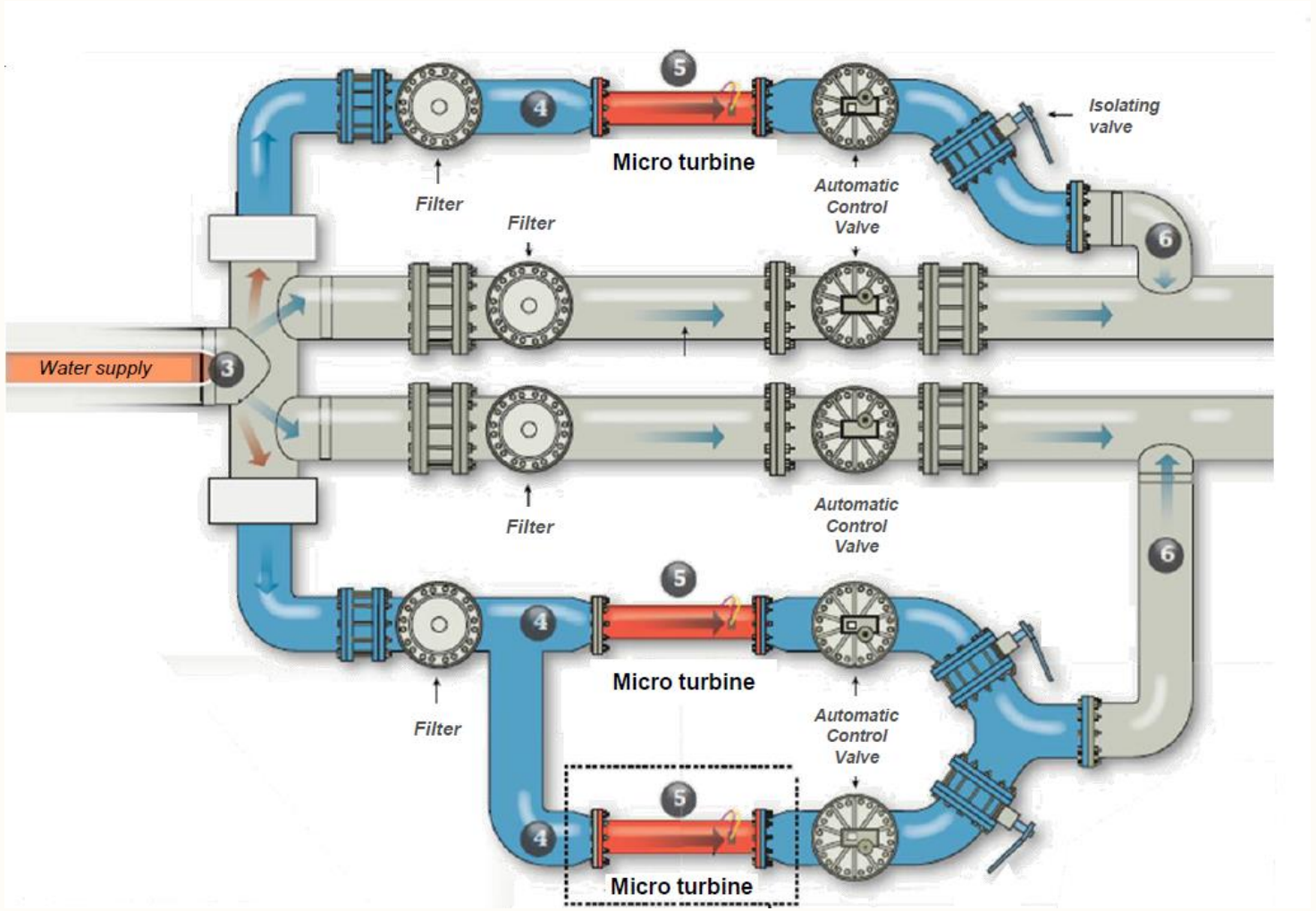
Easy and common assembly: in parallel with the already applied pressure reducing valves

Before



Water Supply main for 2 reservoirs

After


Water supply
3
Filter
Filter
Filter
Filter
4
5
Micro turbine
Micro turbine
Micro turbine
Automatic Control Valve
Automatic Control Valve
Automatic Control Valve
Isolating valve
6

MICROTURBINES FOR USE IN WATER NETWORKS
FINANTIAL ESTIMATION

Data:

- kWh selling price = 0,06 EURO/kWh
- Eficiency = 70 %
- Working time = 7000 hours
- Costs of amortization 15 years (6,6 %): not included/subsidies: not included

POWER (kW)	Investment			Maintenance Costs	ENERGY RECOVERY (per year)		EBDITA Year 1	PAY BACK
	Purchasing MT + ECP* (EURO)	Installation (EURO)	Total (EURO)	(EURO/year)	(kWh)	(EURO)	(EURO)	Years
10	35.250	9.200	**44.450**	**1.334**	70.000	**4.200**	2.867	**15,5**
20	64.762	18.400	**83.162**	**2.495**	140.000	**8.400**	5.905	**14,1**
50	161.625	46.000	**207.625**	**4.153**	350.000	**21.000**	16.848	**12,3**
75	249.300	52.000	**301.300**	**6.026**	525.000	**31.500**	25.474	**11,8**
100	318.450	58.500	**376.950**	**7.539**	700.000	**42.000**	34.461	**10,9**
200	580.000	60.000	**640.000**	**12.800**	1.400.000	**84.000**	71.200	**9,0**
300	825.000	61.875	**886.875**	**17.738**	2.100.000	**126.000**	108.263	**8,2**

(*) - Set Micro-Turbine + Electrical control panels (valves and other fittings not included)
EBDITA: Earnings before depreciation, interests, taxes and amortization

THANK YOU

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