Drinking Water Treatment Challenges in Iran

National Water and Wastewater Eng.co.

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A brief report

Iran population: about 84 million

Urban water coverage: 99.82%

Rural water coverage: 82.68%

Urban wastewater coverage: 52.5%

Average rainfall in Iran: 240 mm

Average rainfall in the world: 800 mm

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The National Water & Wastewater Engineering Company

Specialized holding Company for 34 Provincial water and wastewater companies throughout the country.

In charge of discharging the Ministry of Energy's duties in the water and wastewater sector.

Responsible for planning, budget allocation, governance, project approval and supervision and monitoring the operations of the affiliated subsidiaries.

The main missions

1

Supply and Distribution of Potable Water to Urban and Rural Residential Areas

2

Collection, Treatment and Sanitary Disposal of Wastewater from the Urban and Rural Areas

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WATER KEY FIGURES IN IRAN

Item	Explanation
Municipal Water Service Coverage (%)	99.82 % in Urban Areas and 82.95% in rural areas
No. of Customers (households & businesses)	17,506,616 (households: 15,239,968 – businesses: 2,266,648)
Water supply	6647 MCM
Service companies	34 Water and Wastewater companies (31: Provincial and 3: Urban)
Network & Transmission Line	196,747 Km
In operation WTPs	162 WTPs with 4298 MCM

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WASTEWATER KEY FIGURES IN IRAN

Item	Explanation
Municipal Wastewater Service Coverage (%)	52.5 % in Urban Areas and less than 1% in rural areas
No. of Customers (households & businesses)	8,258,785 (households: 7,516,811 – businesses: 741,974)
Industrial Wastewater	Responsibility: Industries are required to meet the standards of the Environmental Protection Agency before discharging their effluent to receiving sources.
Service companies	34 Water and Wastewater companies (31: Provincial and 3: Urban) for collecting and treating the wastewater based on the Environmental Protection Agency Standards
Network & Transmission Line	69,432 Km
In operation WWTPs	243 (53% of total number with Activated Sludge Process[In terms of volume, include 66%

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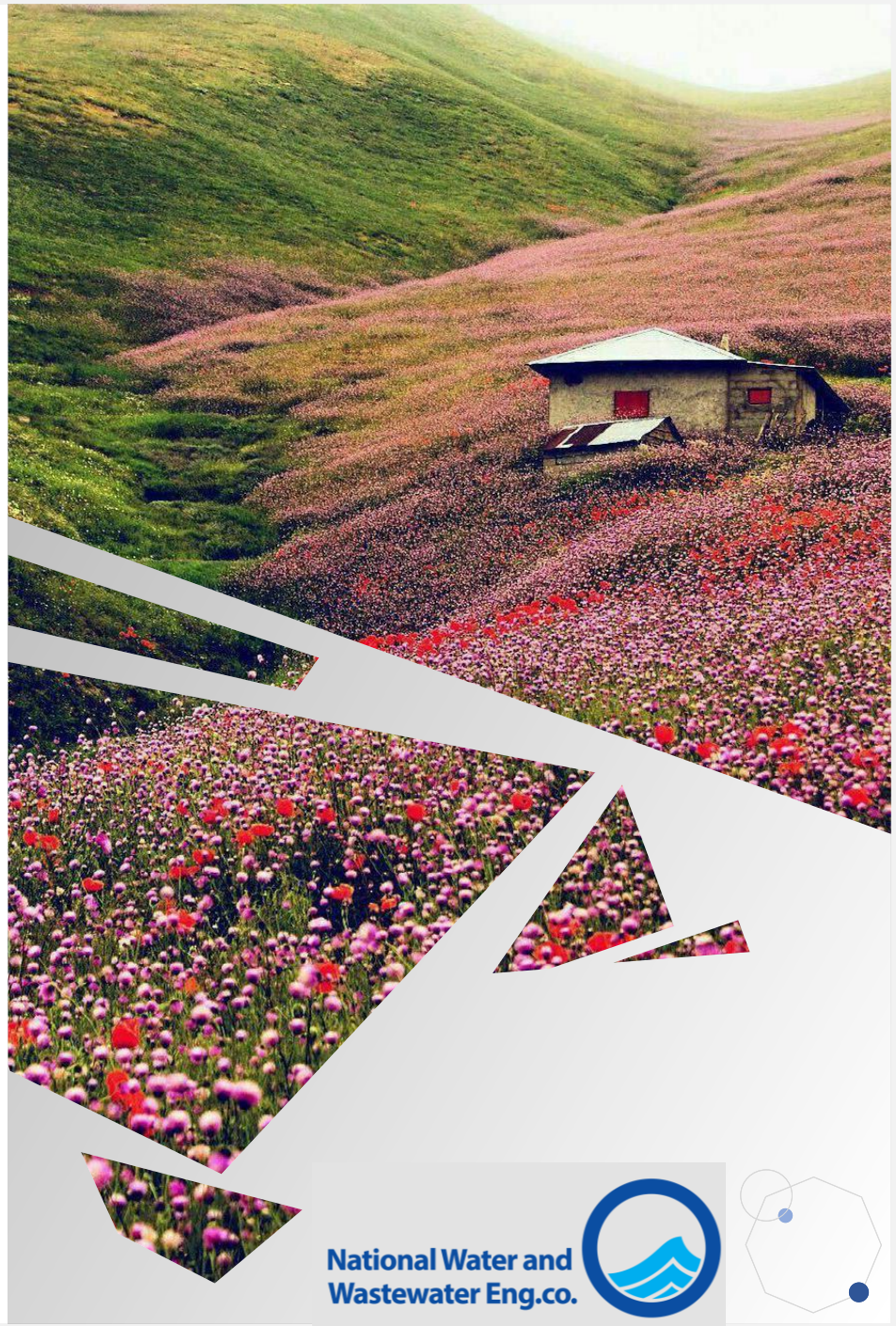
Objectives of water treatment in Iran

Water treatment plants are designed to meet water quality objectives with reasonable ease and cost, Optimal treatment process (*Health-based criteria*, *Aesthetic criteria*, *Operational criteria)*

Analysis of raw water resources quantity and quality of water available from each source, based on Drinking Water Quality Guidelines and Standards

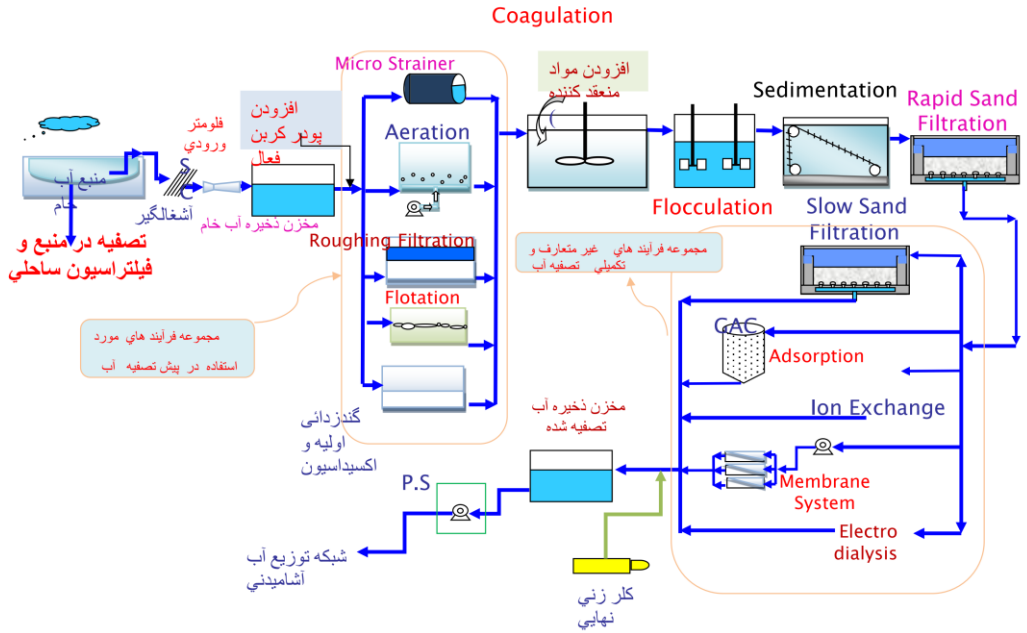
An integral system of procedures, processes and tools that collectively prevent or reduce the contamination of drinking water from source to tap in order to reduce risks to public health

Minimizing the use of chemicals and energy, Minimizing the water use and waste generation



Water treatment processes used to remove major contaminants in water

Contaminant	Treatment Process
Pathogenic organisms	Chlorination, ozonation
Turbidity and suspended matter	Screening, sedimentation, filtration Coagulation/flocculation/ sedimentation/filtration
Color	Adsorption, Ion exchange, Coagulation/flocculation/sedimentation/filtration
Taste and odors	Aeration, Adsorption, Chemical oxidation
Natural organic matter	Adsorption, Ion exchange, Ozonation, Coagulation/ flocculation/ sedimentation/ filtration



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Selection of Treatment Processes

Treated water specification

Relative costs of different treatment processes

Raw water quality and its variation

Operational simplicity

Local constraints

Ease of upgrading

The primary factors influencing the selection of treatment processes

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Approach

Process Troubleshooting – Coagulation
(Example)

Indicator	Operator Action	Possible Process Change
Changes in: • Turbidity • Alkalinity • pH	• Evaluate source water quality. • Perform jar tests as indicated • Verify process performance: (a) Coagulant feed rate(s), (b) Flash mixer operation. • Make appropriate process changes. • Verify response to process changes at appropriate time.	• Adjust coagulant dosage • Adjust flash mixer intensify (if possible). • Adjust alkalinity or pH.

Process Troubleshooting – Sedimentation
(Example)

Indicator	Operator Action	Possible Process Change
Changes in: • Floc Settling • Rising or Floating Sludge	• Observe floc settling characteristics: (a) Dispersion, (b) Size, (c) Settling rate • Evaluate overall process performance. • Perform jar tests if indicated: (a) Assess floc size, settling rate (b) Assess quality of settled water (clarity and colour). • Make appropriate process changes • Verify response to process changes at appropriate time.	• Adjust coagulant dosage • Adjust flocculator/ flash mixer intensify • Change frequency of sludge removal (increase or decrease). • Remove sludge from basin. • Repair broken sludge rakes.

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Approach

Process Troubleshooting – Filtration

(Example)

Indicator	Operator Action	Possible Process Change
Changes resulting in: • Head loss increase • Short filter run • Media surface sealing • Mudballs • Filter media cracks, shrinkage • Short filter run • Media boils • Media loss • Excessing head loss • Turbidity breakthrough	• Asess overall process performance • Perform jar test if required • Make appropriate process changes • Verify response to process changes at appropriate time. • Manually remove mud balls • Replace lost media • Clear underdrain openings of media, corrosion or chemical deposits when filter is out of active service • Check head loss indicator for correct operation	• Adjust coagulant • Adjust flocculator/ flash mixer intensify • Change frequency of sludge removal • Decrease filtration rate • Adjust backwash cycle

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Challenges

- **Anticipated changes in raw water quality and drinking water quality requirements/standards**
- **Growth pattern of the service area, increasing the capacity in future**
- **Performance of WTP because of poor design**
- **Financial aspects (trends in interest rates, cost of present and future construction, and availability of funds)**

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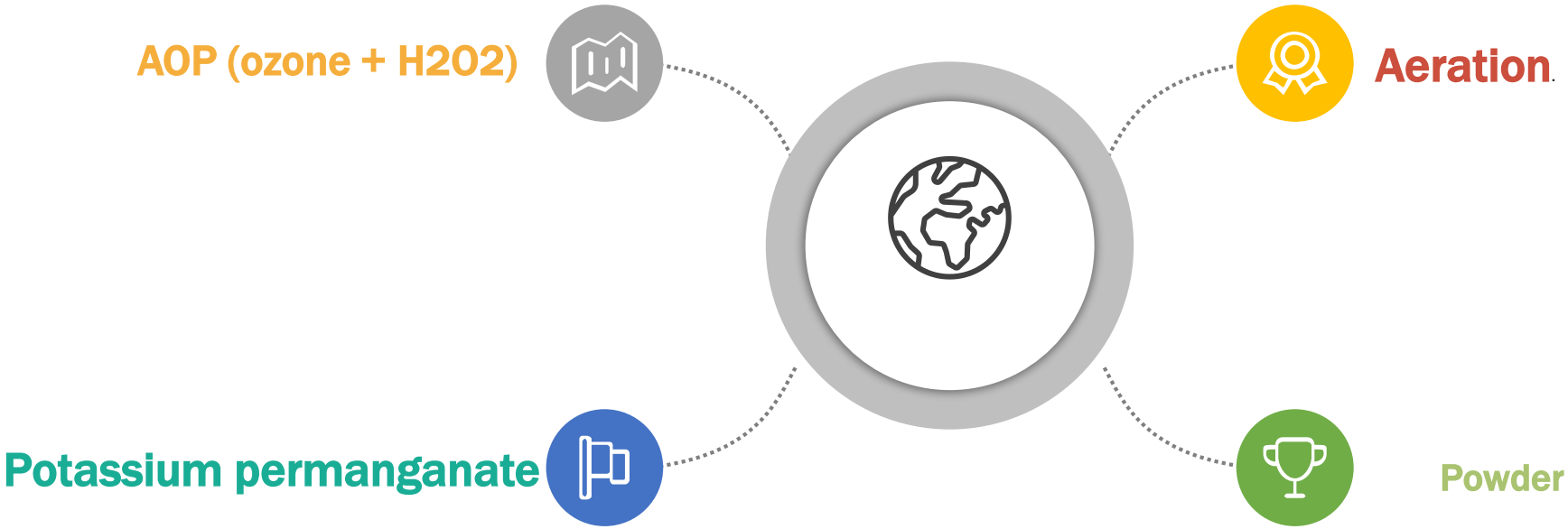
Challenges: taste and odor (case study) because of utrification of dam



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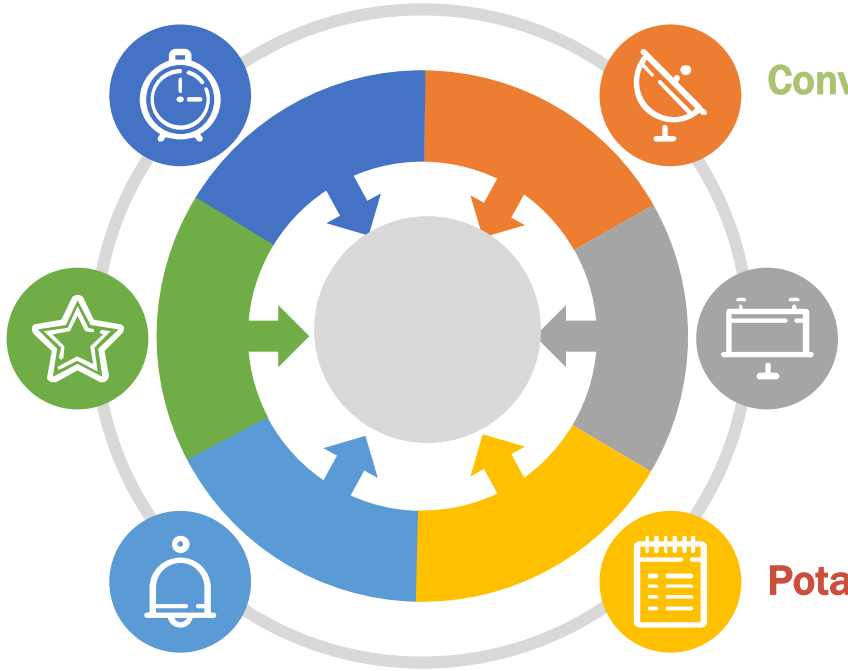
Challenges: alga(case study) because of inadequate intake

Micro strainers

Dissolved Air Floatation

Ozonation + absorption



Conventional Treatment

Ultrasonic system

Potassium permanganate

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Challenges: High turbidity in small case(case study)

Ceramic filters

Enhanced coagulation

Conventional treatment with pretreatment

Ultrafilters

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Challenges: High TDS(case study)

Electro dialyze

RO membrane

Nano filters

Distillation

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Conclusion

Need to new methods or new technologies to decrease all contaminant to achieve standards and to reduce risks to public health

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Thank You