

# CASE STUDY

RO | NF | UF | MF

Pantai Indah Kapuk (PIK)  
Jakarta, Indonesia



## Toray's Integrated Membrane System (IMS) Alleviates Pressures of Rapid Urbanization



### BACKGROUND

Jakarta is one of the fastest-growing metropolises in the world. The World Bank estimated that Indonesia's urban population increased at an average annual rate of 4.1 percent between 2000 and 2010, and the greater Jakarta region added 7 million people during this period (The World Bank 2016). As a result, about two-thirds of Jakarta's population is expected to migrate to suburbs like Pantai Indah Kapuk (PIK) in northern Jakarta.

Accordingly, PIK has become a bustling region that is now notable for gated communities, numerous tourist attractions, and businesses. However, as Jakarta continues to grow, the effects of rapid urbanization lead to challenges with water quality.

### URBANIZATION & WATER QUALITY

A network of 13 rivers pass through Jakarta and serves as the primary water supply. As the city does not have an adequate drainage and sanitation system, these rivers have become an outlet for domestic and industrial sewage. More than 50 percent of the shallow wells had E. coli contamination, and iron and manganese were found in more than 10 percent of these wells (Apip 2015). Turbidity and Total Suspended Solids (TSS) would fluctuate anywhere between <100 ppm and as high as 1,000 ppm during the dry seasons. Furthermore, excessive land development has led to increased contamination of the rivers due to the severity of flooding, and also the decay of the groundwater quality due to soil subsidence and seawater intrusion.

A conventional treatment scheme was in operation but would no longer be able to produce water quality sufficient

Table 1 – Quick Facts

Feed source	Surface water	
Treatment scheme	DAF–Submerged UF–RO	
System capacity	14,000 m <sup>3</sup> /day	
Membrane type	UF	RO
Model	HSU-1515	TM720D-400
Membrane material	PVDF	Polyamide
Active area [m <sup>2</sup> (ft <sup>2</sup> )]	20 (215)	37 (400)
No. of skids	3	4
System design	152 modules per rack	20:11 (7M)
System recovery	90%	75%
End use	Potable use	
Commissioned	Aug 2018	

to sustain healthy standards of living. PIK's water utility had previous installations using Toray's UF and RO technologies and would seek out the membrane manufacturer's expertise. The heightened deterioration of water quality and increased demand for clean water, PIK's private utility was forced to look for improved measures. PIK already had installations with Toray UF and RO products and once again sought out Toray's expertise.

### SOLUTION

Technical evaluations revealed that two lines of treatment would be required, one to reduce the high levels of BOD and TSS resulting from the sewage in the feed. Secondly, as PIK is situated close to the ocean, a second barrier would be needed to reduce the salinity. The solution would be Toray's Integrated Membrane System (IMS) design incorporating TORAYFIL™ submerged PVDF ultrafiltration (UF) membrane modules followed by ROMEMBRA™ high-rejection reverse osmosis (RO) membranes. The low-pressure UF modules provide ease of operation, high mechanical and chemical durability for effective separation of target contaminants, and protection of the downstream RO. The RO elements would polish the UF filtrate and produce a quality acceptable for potable use. The treated water quality is noted in Table 2.

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**Table 2 – Water Quality** (temperature 29–32°C)

Item	UF feed	RO permeate
TDS, mg/L	2,000–8,000	<500
TSS, mg/L	100	<0.1

## REFERENCES

1. "Indonesia's Urban Story." *The World Bank Group*. Jakarta, Indonesia. June, 2016.
2. Apip, Sagala, Saut AH, Pingping, Luo. "Overview of Jakarta Water-Related Environmental Challenges." *Water and Urban Initiative Working Paper Series, Number 04*. United Nations University. April 2015.

**Figure 1: Integrated Membrane System Process**

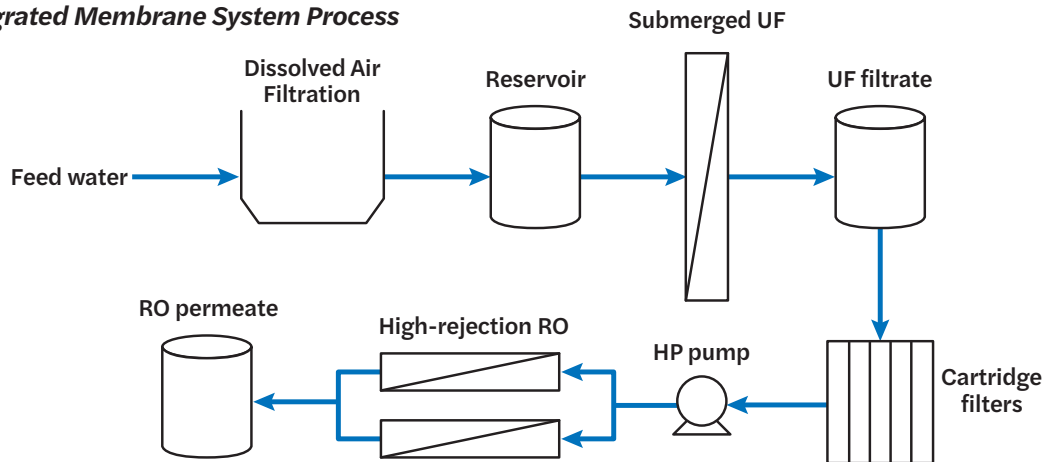


Figure 2 (left): Submerged PVDF UF skid  
Figure 3 (above): RO skids

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