



Industrial Applications

Integrated Systems - Case Studies

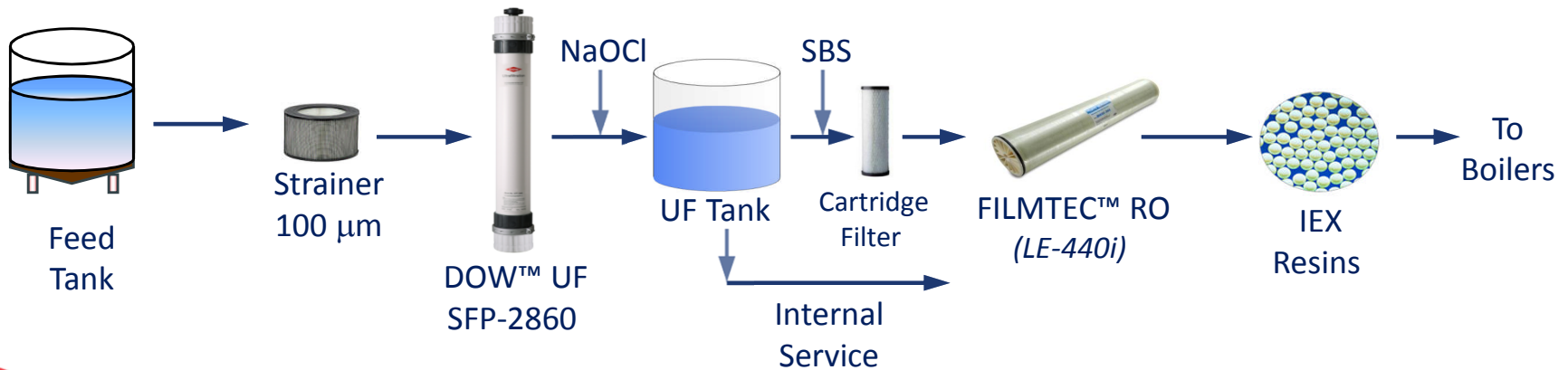
Case Study 1

Food Additives Industry

Food Additives Industry

General Information

- **Water Source:** Well Water
- **Application:** Boiler Feed and Internal Service
- **Start-Up:** February 2009 (rep. sand filters)
- **Plant Capacity:**
 - 240-320 m³/h (UF)
 - 200 m³/h (RO)
- **Product:** DOW UF SFP2860 + FILMTEC™ RO (LE-440i)

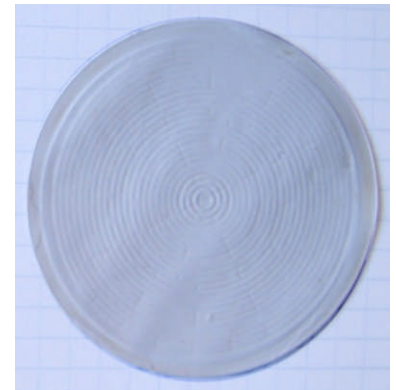


Food Additives Industry

- **Main Challenge:** High iron and hardness levels in feed water; SDI >>5
- **UF Design and Performance data:**
 - ✓ **Footprint Reduction of +50%** vs sand filters (~16 m² vs 38 m²)
 - ✓ UF Operating Flux 60-80 LMH
 - ✓ UF Recovery > 96%
 - ✓ 60 minutes between backwashes (no Chemicals added)
 - ✓ Short maintenance CIP's (1/month) + regular intensive UF CIP's (every 3-4 months) with organic acids.
 - ✓ UF Filtrate Turbidity < 0.10 NTU; SDI₁₅ < 0.5 %/min (>95% time)
 - ✓ **RO unit CIP reduction from once every 3-6 months to ONCE PER YEAR!**



SDI Filter UF feed



SDI Filter UF filtrate



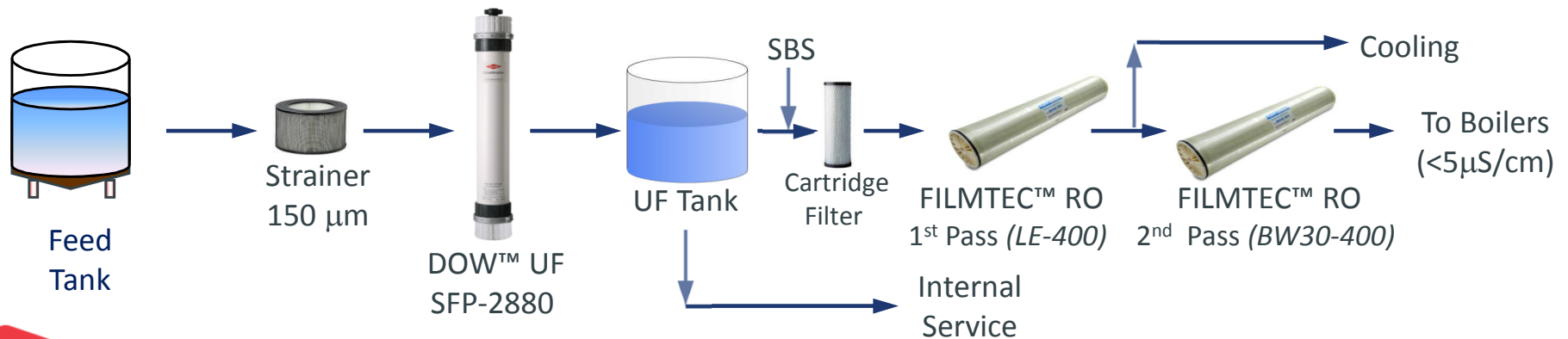
Case Study 2

Mining Industry

Mining Industry

General Information

- **Water Source:** River Water
- **Application:** Cooling Towers, Equipment Refrigeration, Boiler Feed, Internal Service
- **Start-Up:** May 2010 (replacement sand filters)
- **Plant Capacity:**
 - 90 m³/h (UF)
 - 40 m³/h (RO 2nd pass)
- **Product:** DOW UF SFP2880 + FILMTEC™ RO



Mining Industry

- **Main Challenge:** Variable feed water quality, with TSS from 5 to 50 mg/L and Turbidity from 5 to 60 NTU
- **UF Design and Performance Data:**
 - ✓ **Footprint Reduction of ~ 40%** vs sand filters
 - ✓ UF Operating Flux 50-60 LMH
 - ✓ UF Recovery > 90%
 - ✓ Backwash every 20-25 minutes
 - ✓ Regular CEB's with NaOCl +NaOH (pH 11-12) and HCl (pH 2). CIP's twice a year.
 - ✓ Filtrate Turbidity < 0.10 NTU; SDI₁₅ < 1.5 %/min (>95% time)
 - ✓ **RO unit CIP every 8-10 months**



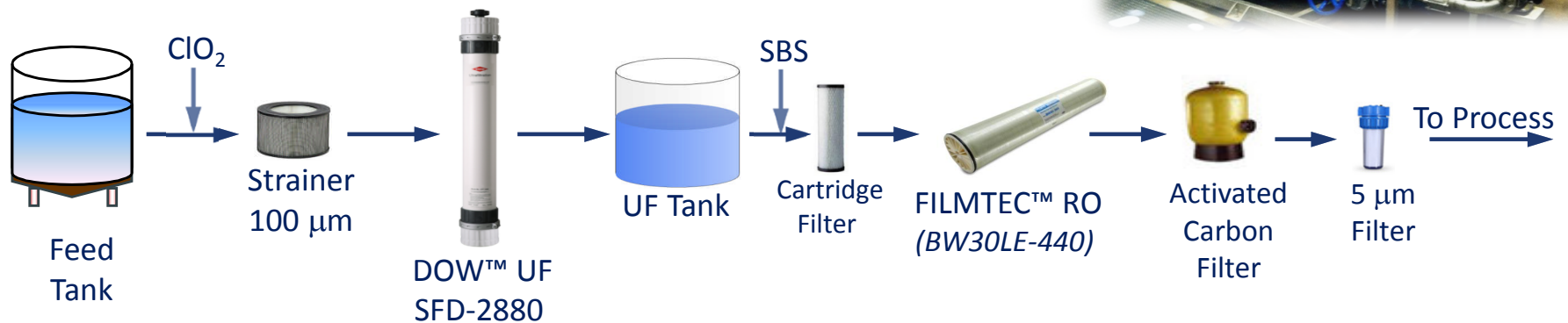
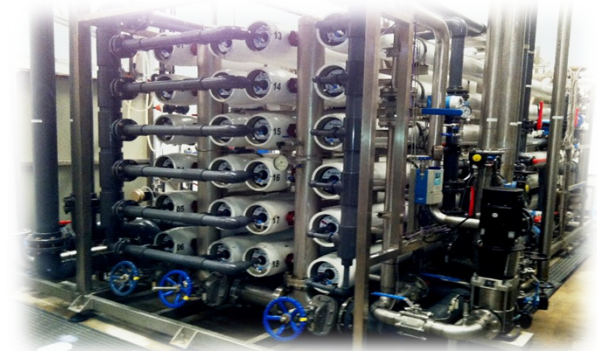
Case Study 3

Soft Drinks Industry

Soft Drinks Industry

General Information

- **Water Source:** Well Water
- **Application:** Soft Drinks production
- **Start-Up:** June 2010 (replacement sand filters)
- **Plant Capacity:**
 - 200 m³/h (UF)
 - 100 m³/h (RO)
- **Product:** DOW UF SFD2880 + FILMTEC™ RO

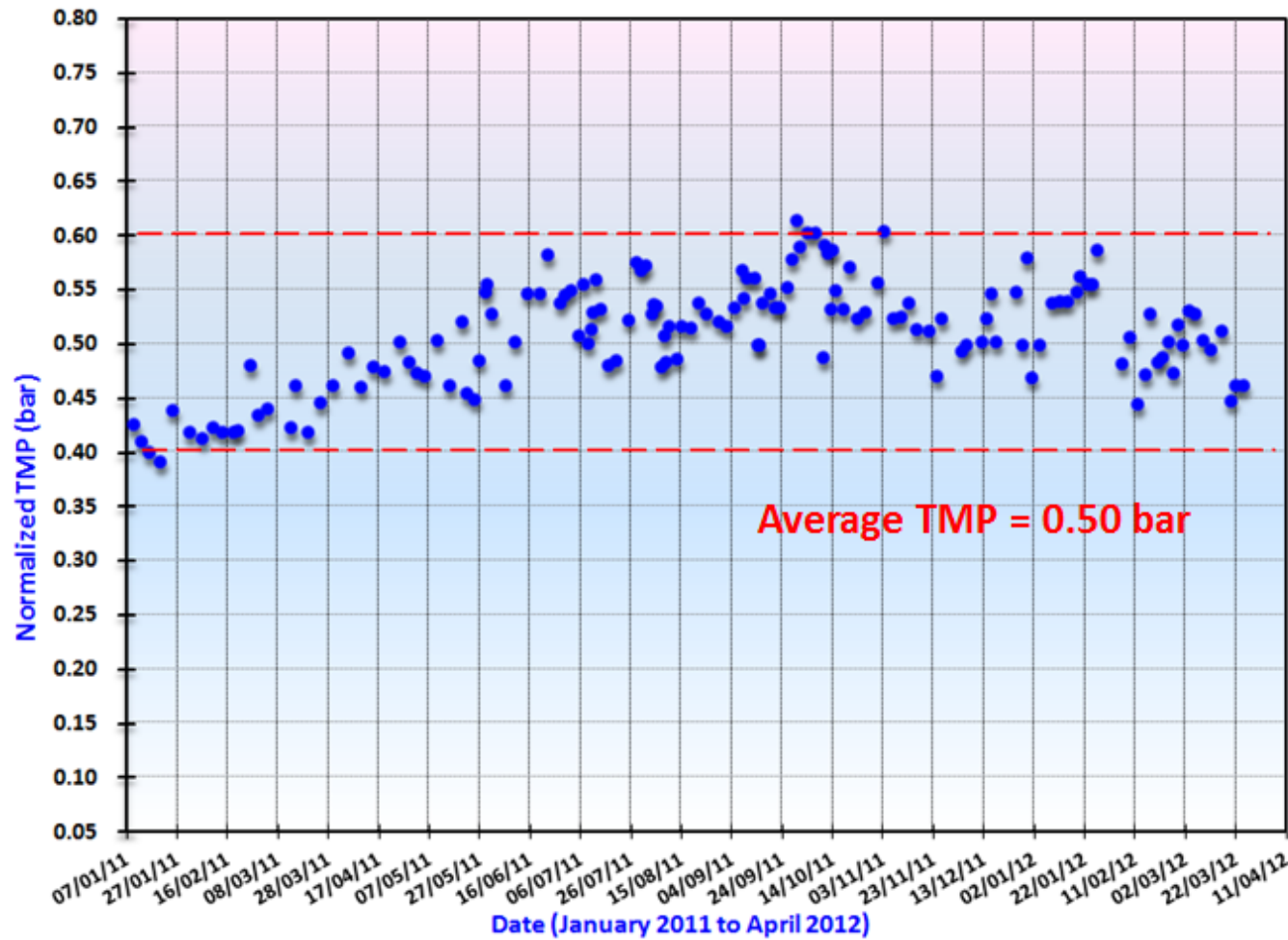


Soft Drinks Industry

- **Main Challenge:** Minimization of chemical consumption
- **System Performance:**
 - ✓ UF Recovery > 95%
 - ✓ UF Operating Flux 60 LMH
 - ✓ 60 minutes between backwashes (no chemicals added)
 - ✓ **No CEB's.**
 - ✓ UF Maintenance CIP's every 4-6 months
 - ✓ Average Filtrate Turbidity < 0.05 NTU
 - ✓ **RO unit CIP reduced from every 4-6 months with sand filters to one after 2.5 years of operation with UF!**



Soft Drinks Industry



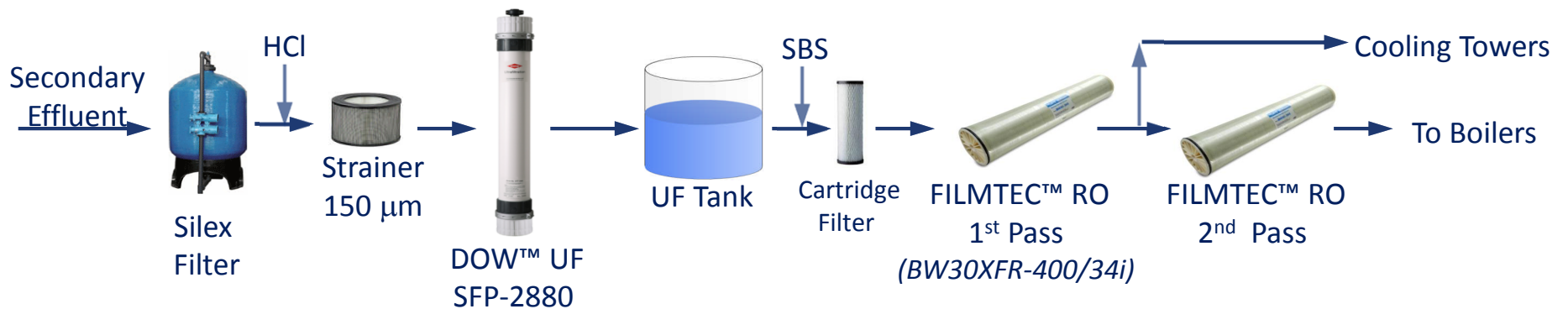
Case Study 4

Power Industry (Biomass)

Power Industry (Biomass)

General Information

- **Water Source:** Secondary Waste Water
- **Application:** Cooling Towers and Boiler feed.
- **Start-Up:** May 2011 (replacement of competitor)
- **Plant Capacity:**
 - 60-80 m³/h (UF)
 - 40 m³/h (RO 2nd pass)
- **Product:** DOW UF SFD2880 + FILMTEC™ RO



Power Industry (Biomass)



Retrofit of another UF product



Only UF Skid was replaced

Auxiliary equipment (e.g. strainer, tanks, pumps, general piping, dosing pumps, etc.) remained.



Power Industry (Biomass)

- **Main Challenge:** Retrofitting of existing UF system + raw water from 5 to 50 mg/L TSS.
- UF Performance:
 - ✓ UF Recovery > 92%
 - ✓ UF Operating Flux 45-60 LMH
 - ✓ Backwash every 50 minutes
 - ✓ Regular CEB's with NaOCl +NaOH and HCl.
 - ✓ UF CIP's once in 10 months since start-up.
 - ✓ UF Filtrate Turbidity < 0.10 NTU; SDI₁₅ < 1.5
 - ✓ TMP: 0.4-1.1 bar (clean/fouled condition)
 - ✓ **RO unit CIP frequency reduced from 1-2 WEEKS to every 3-4 MONTHS!**



Cost Analysis

UF System Only

Cost Analysis

	Food Additives Industry (240 m ³ /h, Well Water)	Mining Industry (90 m ³ /h, Surface Water)	Soft Drinks Industry (200 m ³ /h, Well Water)	Power Industry (80 m ³ /h, Waste Water)
Energy	0.010	0.012	0.010	0.010
Chemicals	0.001	0.009	0.001	0.009
UF Membrane Replacement	0.009	0.018	0.010	0.028
Labor/Personnel	0.008	0.021	0.008	0.024
Maintenance Spares	0.005	0.007	0.005	0.003
Amortization of Capital	0.012	0.011	0.010	0.002
Overhead	0.001	0.002	0.001	0.002
TOTAL OPERATING COST (€ per m³ of UF filtrate produced)	0.047	0.080	0.044	0.077



Cost Analysis

	Food Additives Industry <i>(240 m³/h, Well Water)</i>	Mining Industry <i>(90 m³/h, Surface Water)</i>	Soft Drinks Industry <i>(200 m³/h, Well Water)</i>	Power Industry <i>(80 m³/h, Waste Water)</i>
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Amortization of Capital	0.012	0.011	0.010	0.002
Overhead	0.001	0.002	0.001	0.002
TOTAL OPERATING COST (€ per m ³ of UF filtrate produced)	0.047	0.080	0.044	0.077
INSTALLATION COST (€ per m ³ /day of installed UF capacity)	70.5	73.5	64.7	40.5



Summary and Conclusions

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- Optimization of water usage is crucial in the Industry, in order to achieve **cost improvements and lower water footprint.**
- **UF provides a consistent and reliable product water** (typical turbidity < 0.10 NTU and SDI < 2)
- **UF adapts to variable water sources and qualities** without compromising filtrate quality.
- **UF provides footprint advantage** vs Conventional.
- **UF helps to reduce cleaning needs in the RO stage.**
- **UF Pilot trial is recommended** to optimize UF system design and operation and reduce long term cost.

