

應用RO處理含TOC鹼性製程排水

水資源組

張均魁

Sr. Engineer

Micron Taichung

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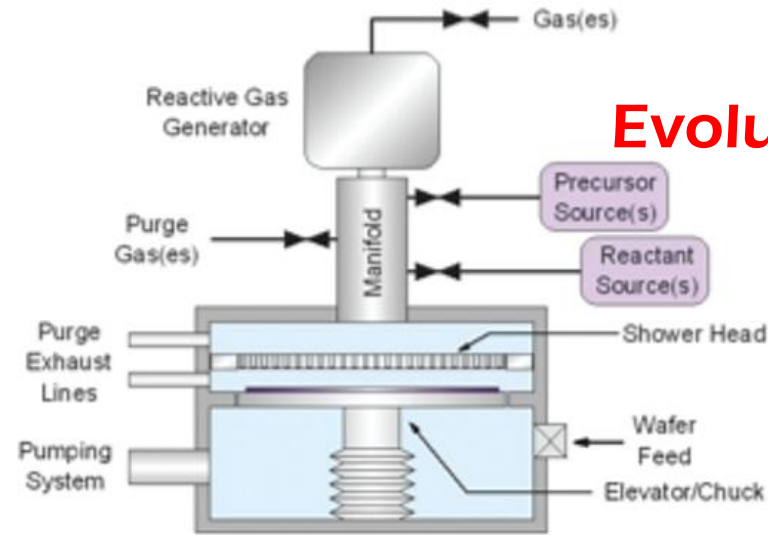
BACKGROUND

■ 機台型式演進改變

- 更好的良率
- 排水組成變得複雜

■ 氨氮管制

- 善進企業責任
 - 更好的處理效率
- 永續發展
 - 水資源回收



Evolution for Quality



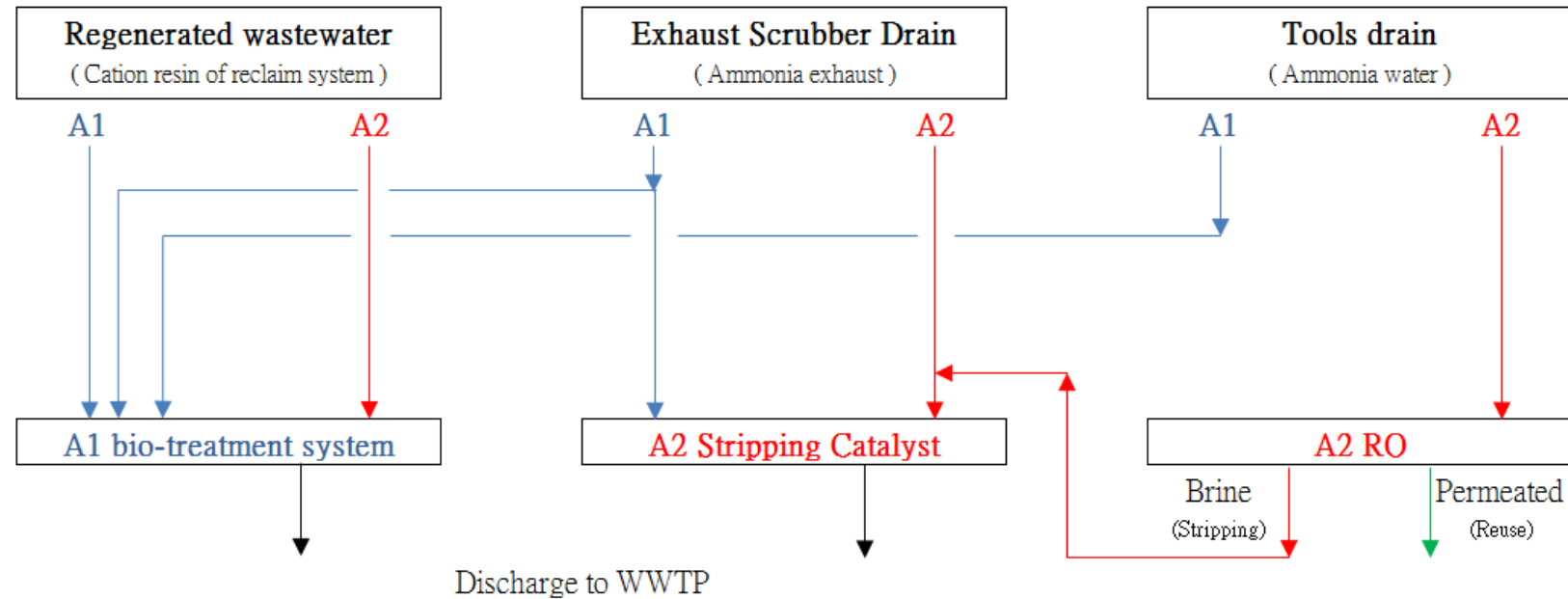
TREATMENT OF AMMONIA NITROGEN

■ 氨氮系統擴充

- Area 1 : 生物系統 (既有)
- Area 2 : **(RO)** 氣提觸媒

■ 設計概念

- 水質條件不同的合理分配
- 水回收的增加
- 提升系統的容錯時間



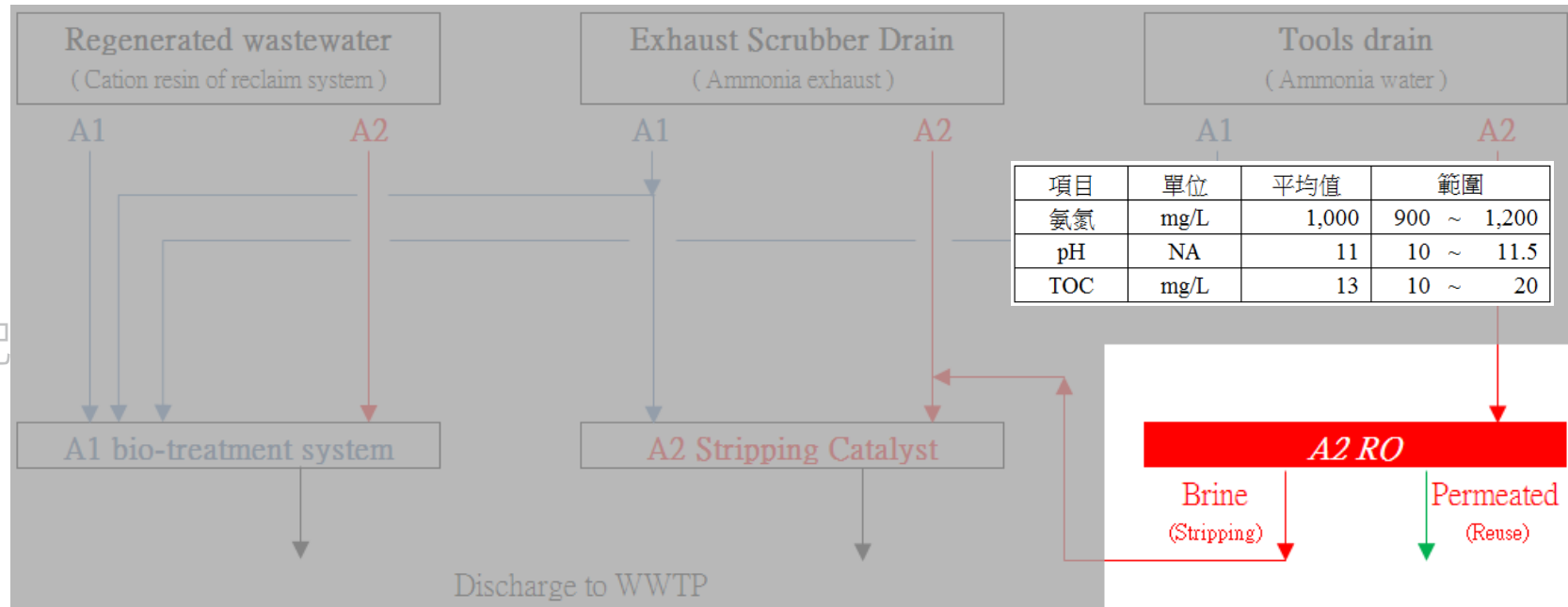
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RO UNIT WITH ALKALINE WASH FUNCTION

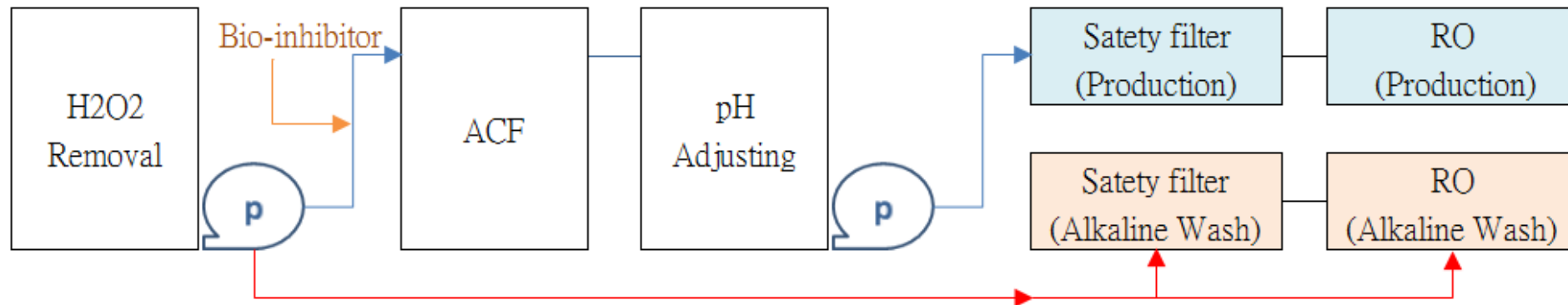
RO在中性偏酸條件下產水24小時；再以原水去除雙氧水後直接進行通水

RO進流原水條件

- TOC: 10 ~ 20 mg/L (主要是IPA)
- pH ~ 11 (>10.3), NH₄-N ~ 1,000 mg/L

RO黏泥抑制

- 添加生物抑制劑
- 非傳統CIP注藥鹼洗



H₂O₂
remove only
pH > 10

Go through the raw water without H₂O₂
directly, and immersioned for 24 hr.

SIMULATION OF SLIME-FOULING

ALKALINE WASH TEST

測試條件

- 乙醇：更容易被微生物所利用
 - Most of raw wastewater is IPA.
- NP加入：營造容易生物結構環境
 - No Phosphoric in raw wastewater
- 不添加抑菌劑
- 以 $10\ \mu\text{m}$ safety filter做模擬觀察

Alkaline Wash Test

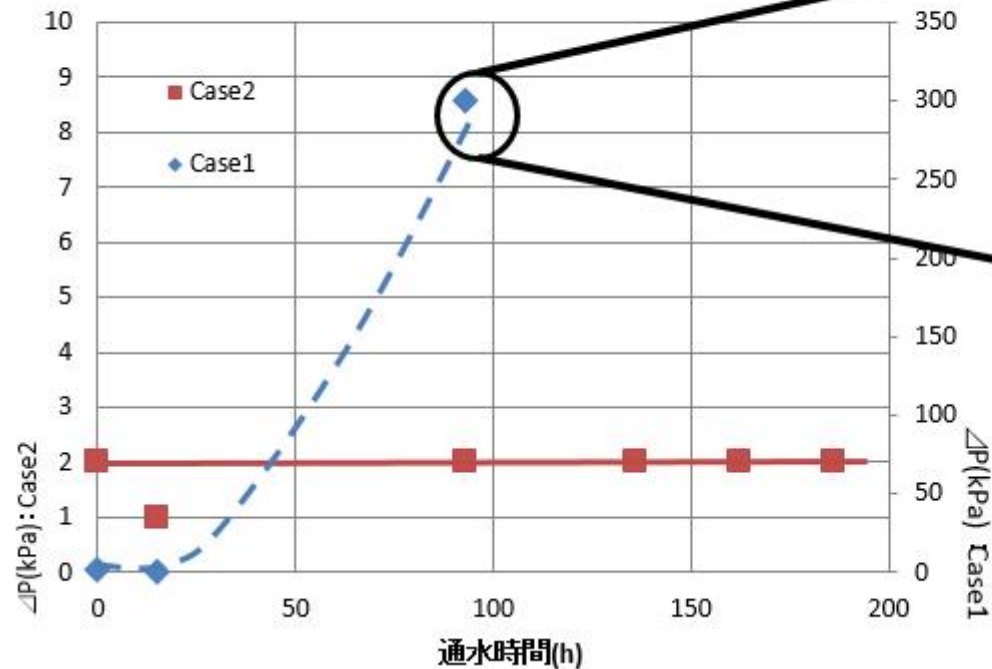
- Case 1:
 - 連續中性通水運轉
- Case 2:
 - 24小時進行中性通水
 - 每24小時進行Alkaline wash (pH 11)

項目	Case1	Case2
Raw water pH	11	
TOC Conc.	30mg/L	
調整pH	7	7(24h)
		11(24h)
S/F孔徑	10 μm	

ALKALINE WASH FUNCTION

PERFORMANCE TEST

- pH 11, Alkaline wash有效 (Only NaOH)



阻塞的Safety filter(Case1)

Case1：通水後觀測，約3天左右阻塞。
Case2：現狀（通水時間186hr）、並無觀測到有壓差上升的現象。

生菌檢測
Case1: 無檢測必要
Case2: Under analysis

高濃度TOC含有水（存在生菌）若變成鹼性的話，可以抑制Slime。

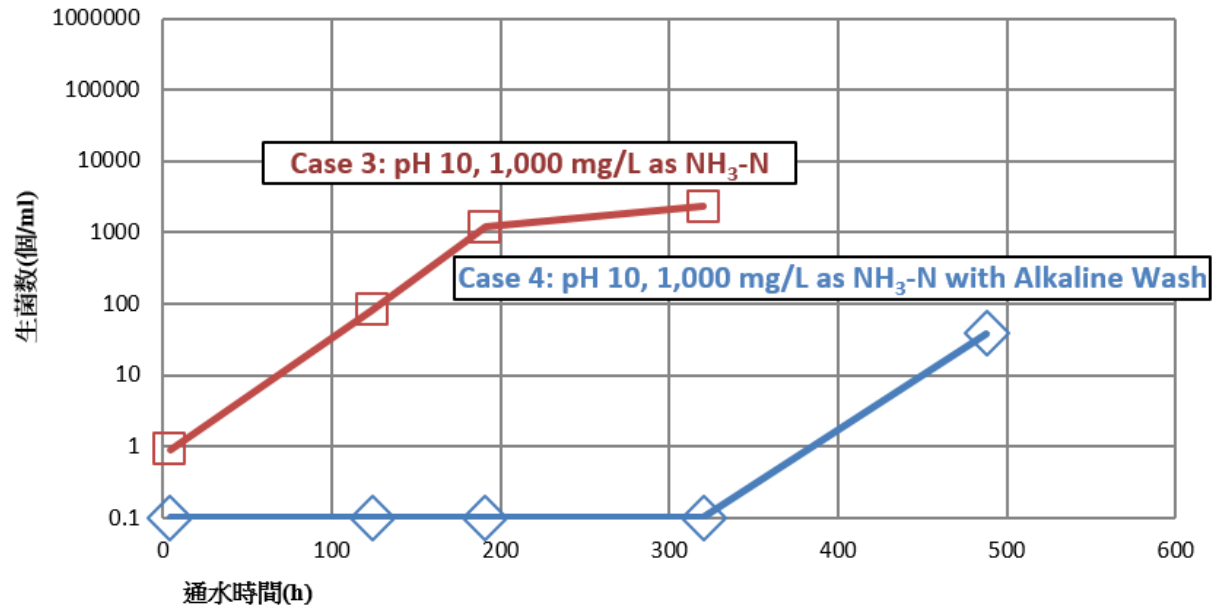
SIMULATION OF SLIME-FOULDING

降低鹼度比較含氨氮條件下ALKALINE WASH對生菌抑制的影響

測試條件

- Case 3:
 - pH 10, 含氨氮濃度1,000 mg/L (原水最低測得pH~10.3)
 - 中性偏酸條件下連續通水
- Case 4:
 - pH 10, 含氨氮濃度1,000 mg/L
 - 24小時中性通水，24小時Alkaline wash
- pH 10含氨1,000 mg/L > pH 11不含氨
 - 非常長時間運轉，應無生菌形成問題
 - 自由氨確實能有效抑制生菌

低鹼度含氨ALKALINE WASH影響



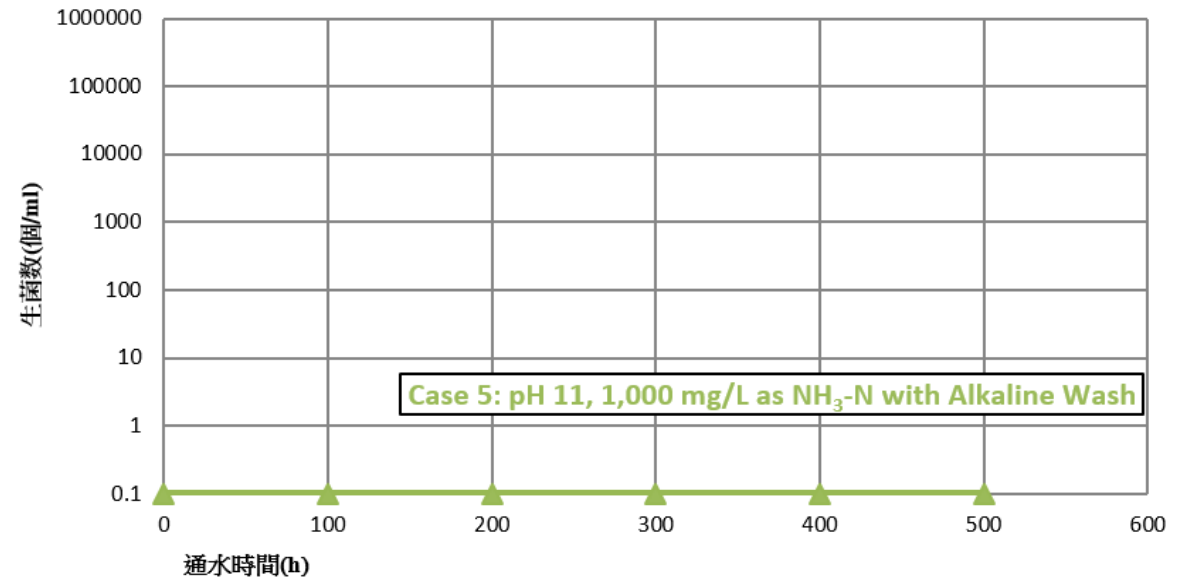
NORMAL OPERATION TEST

■ RO運轉條件

項目	單位	平均值	範圍
氨氮	mg/L	1,000	900 ~ 1,200
pH	NA	11	10 ~ 11.5
TOC	mg/L	13	10 ~ 20

■ 通水測試

- pH 11. 氨氮 1,000 mg/L
- TOC 30 mg/L as Ethanol
- C:N:P = 100:5:1 (P的添加)
- 搭配Alkaline Wash，測試500小時無生菌形成問題，可取代CIP unit



SUMMARY

AT CONDITION: 24HR PRODUCTION; 24HR ALKALINE WASH

- 足夠的鹼度 (pH > 11) 搭配 Alkaline Wash 對生菌數抑制有顯著的效果
- 低鹼度 (pH ~ 10)，原水含 NH₄OH 1,000 mg/L 以上，Alkaline Wash 對生菌抑制有幫助，但不適合長時間操作
- 每24小時 Alkaline Wash 能有效用來抑制生菌形成，可取代 CIP unit
 - TOC < 30 mg/L
 - pH ~ 11, NH₄-N > 1,000 mg/L
- 實際運轉6個月以來，RO一二段壓差皆無上升情形

****Thanks for system vendors to work together to achieve the idea***

ADVANTAGE of RO APPLICATION

REDUCE QUANTITY

- 穩定的去除率與增加水回收
- Stripping-Catalyst維護保養，可增加緩衝時間
- 更高TOC的想法？
 - High pH RO + Alkaline wash function RO
 - Tolerance up to 1,000 mg/L as TOC

Q & A

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