

# Convergence Inspector SDI/MFI

Why measure SDI & MFI? 为什么要测试 SDI 和 MFI

Principles 测试原理

SDI or MFI? SDI 或 MFI

Why the Convergence Inspector SDI/MFI?

How does it work? 如何工作

Is it worth the investment? 是否值得投资?

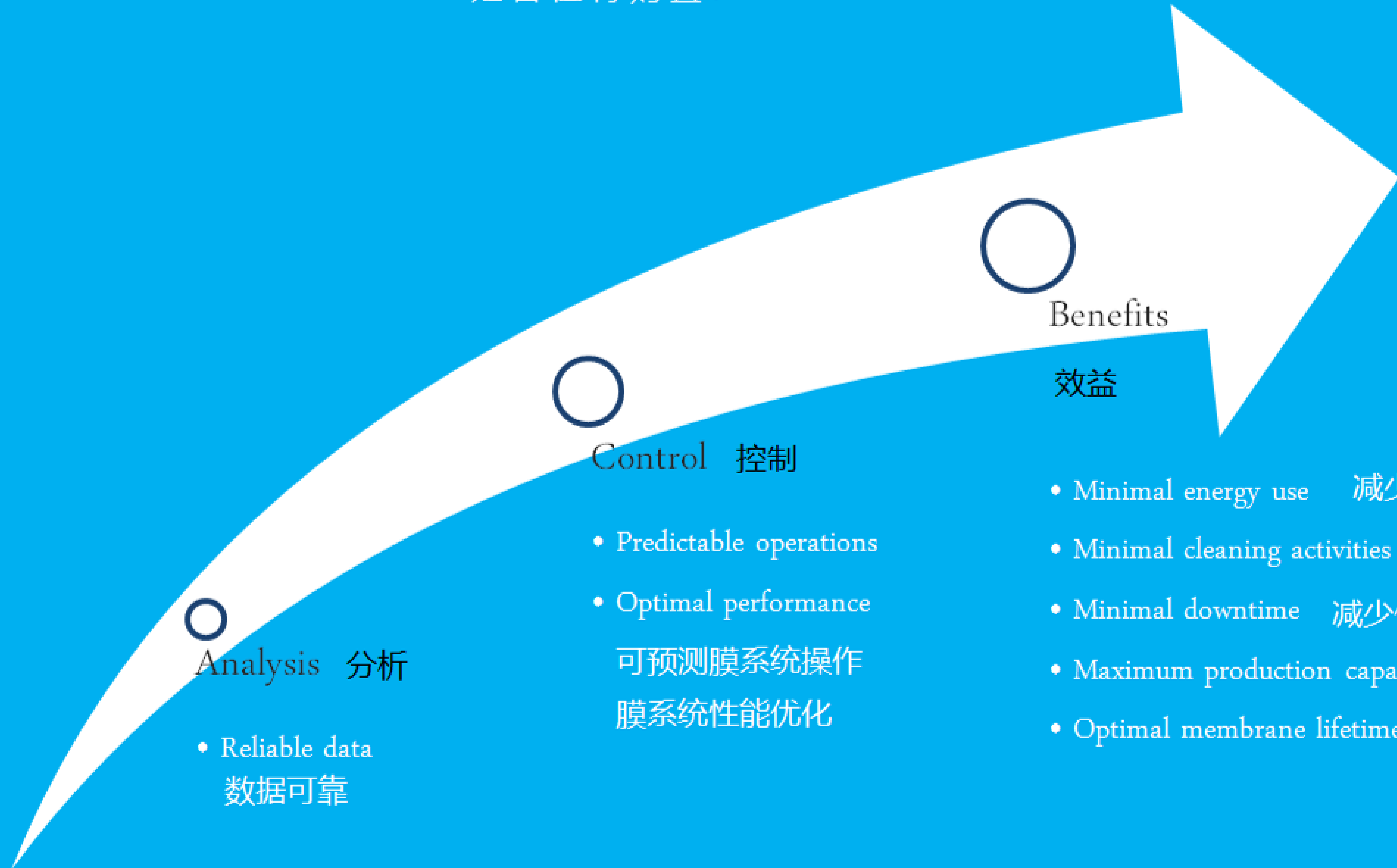




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## Is it worth the investment?

是否值得购置？



Analysis 分析

- Reliable data  
数据可靠



Control 控制

- Predictable operations  
可预测膜系统操作
- Optimal performance  
膜系统性能优化



Benefits

效益

- Minimal energy use 减少能耗
- Minimal cleaning activities 减少膜清洗
- Minimal downtime 减少停机时间
- Maximum production capacity 提高系统产能
- Optimal membrane lifetime 优化膜使用寿命

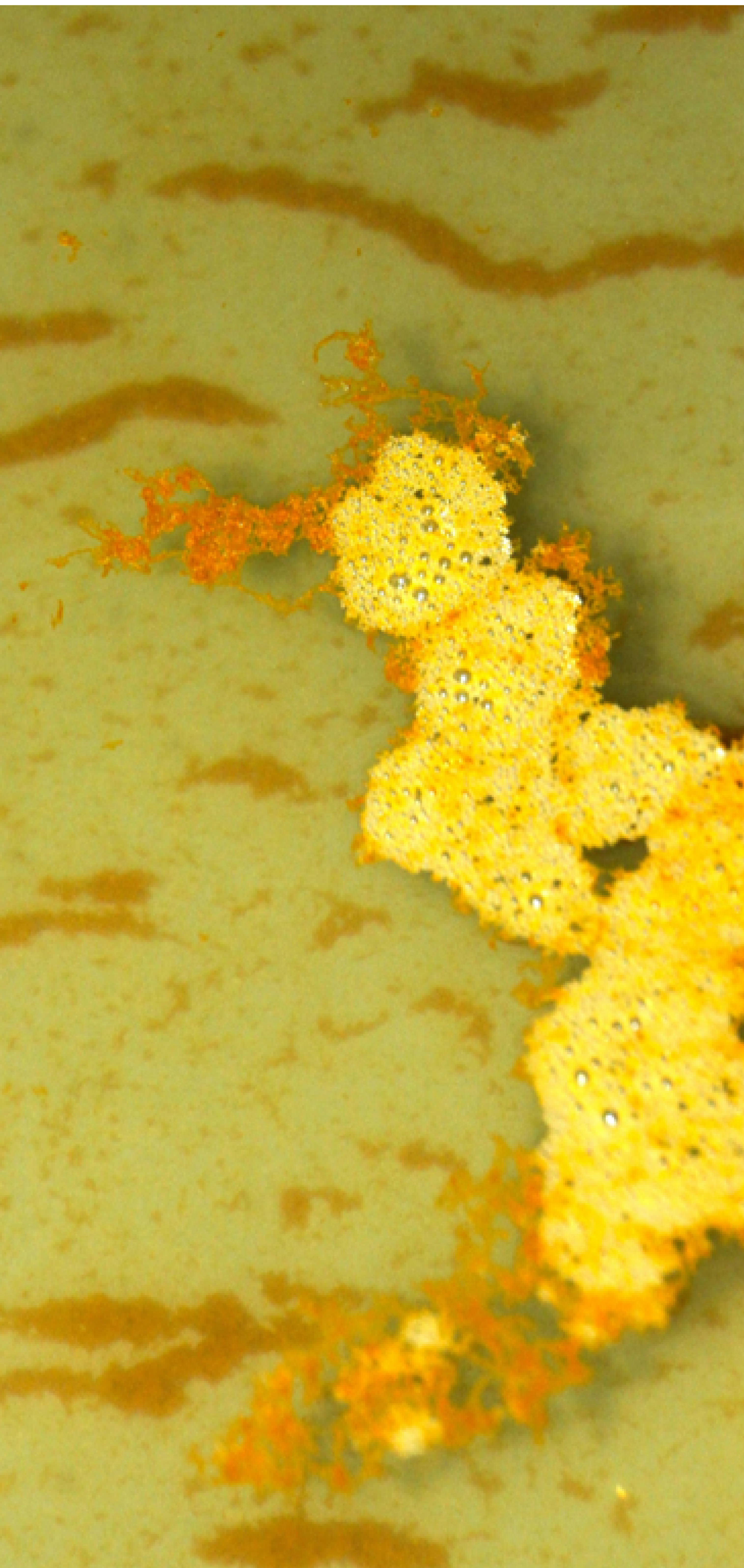
# Based on scientific articles 基于诸多科研文献

## References:

### 参考:

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9. SFE Boerlage, et al. *Desalination*, 2004. 161: p. 103-113.
10. SG Salinas Rodríguez, 2011, Delft: CRC Press/Balkema. ISBN 978-0-415-62092-5
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15. LN Sim et al. *Desalination*, 2011. 273: p. 184-196.
16. LO Villacorte, 2014, Leiden: CRC Press/Balkema. ISBN 978-1-138-02626-1





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## Why measure SDI & MFI?

### 为什么要测试SDI 和MFI?

- Characterize fouling potential of feed water for membrane systems  
表征膜分离系统原水的潜在污染程度
- Local clogging will disturb flow distribution within the membrane  
局部的堵塞会影响膜的流量分布
- Results:
  - Lower permeability 更低的透过率
  - Lower permeate flow 更低的透过流量
- Consequences:
  - More energy use 更高的能耗
  - More cleaning is needed 更多的清洗需要
  - More (unexpected) downtime 更多的系统停机
  - Decrease in capacity 降低系统工作的能力
  - Decrease of membrane lifetime 降低膜的使用寿命



# Principles 原理

## SDI 淤泥密度指数

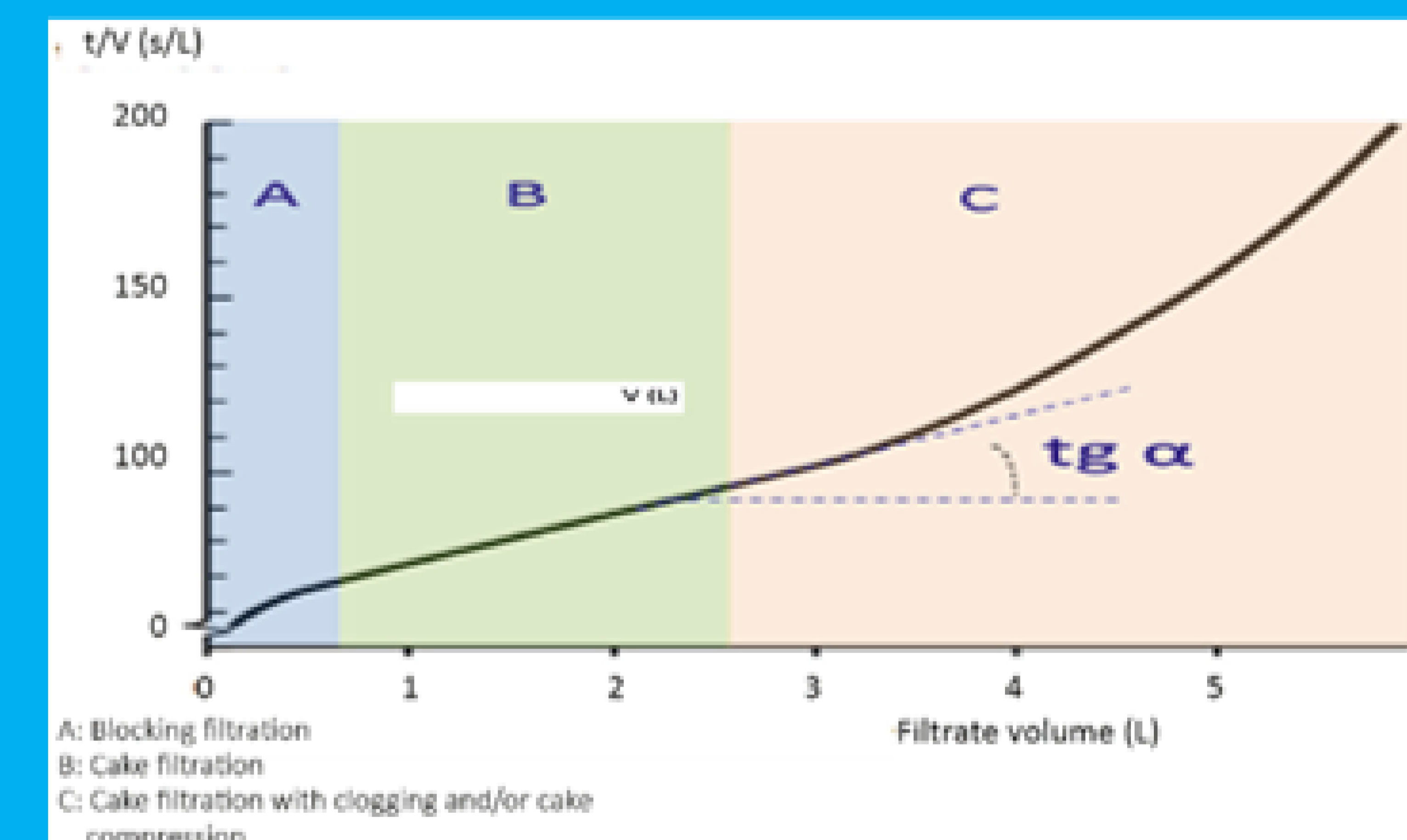
Filtration of feed water through a 0.45  $\mu\text{m}$  membrane at constant pressure. Rate of plugging is measured and expressed as % flux decline per minute.

在恒定压力下测试原水透过0.45um标准膜的过滤情况。  
测试堵塞系数和以单位时间内通量的衰减百分比%来表示

## MFI 修正污染指数

Determination from the stage of cake/gel filtration. Defined as the minimum slope in the filtration curve.

由滤饼过滤阶段确定，  
定义为过滤曲线的最小斜率  
如右图所示



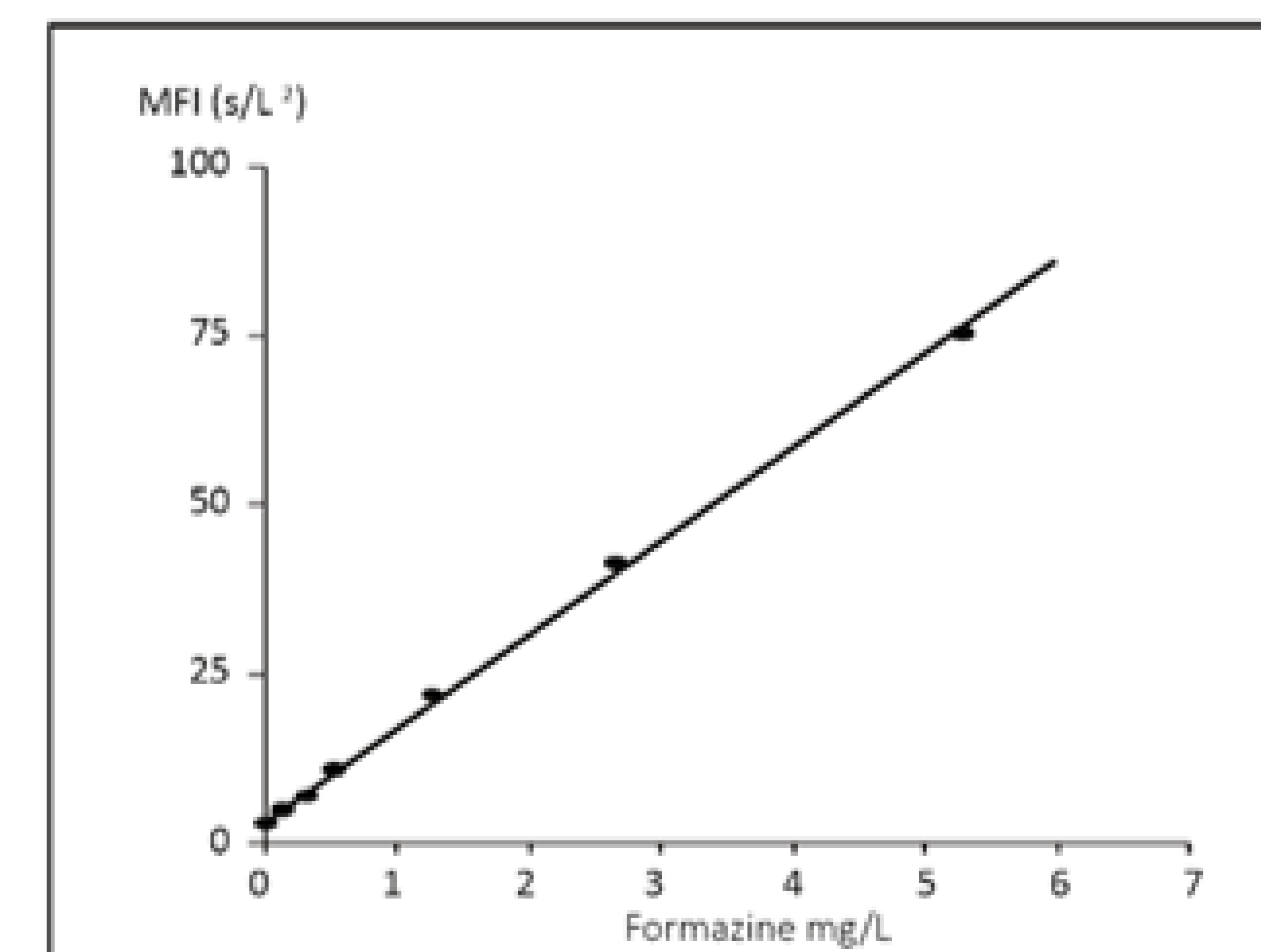
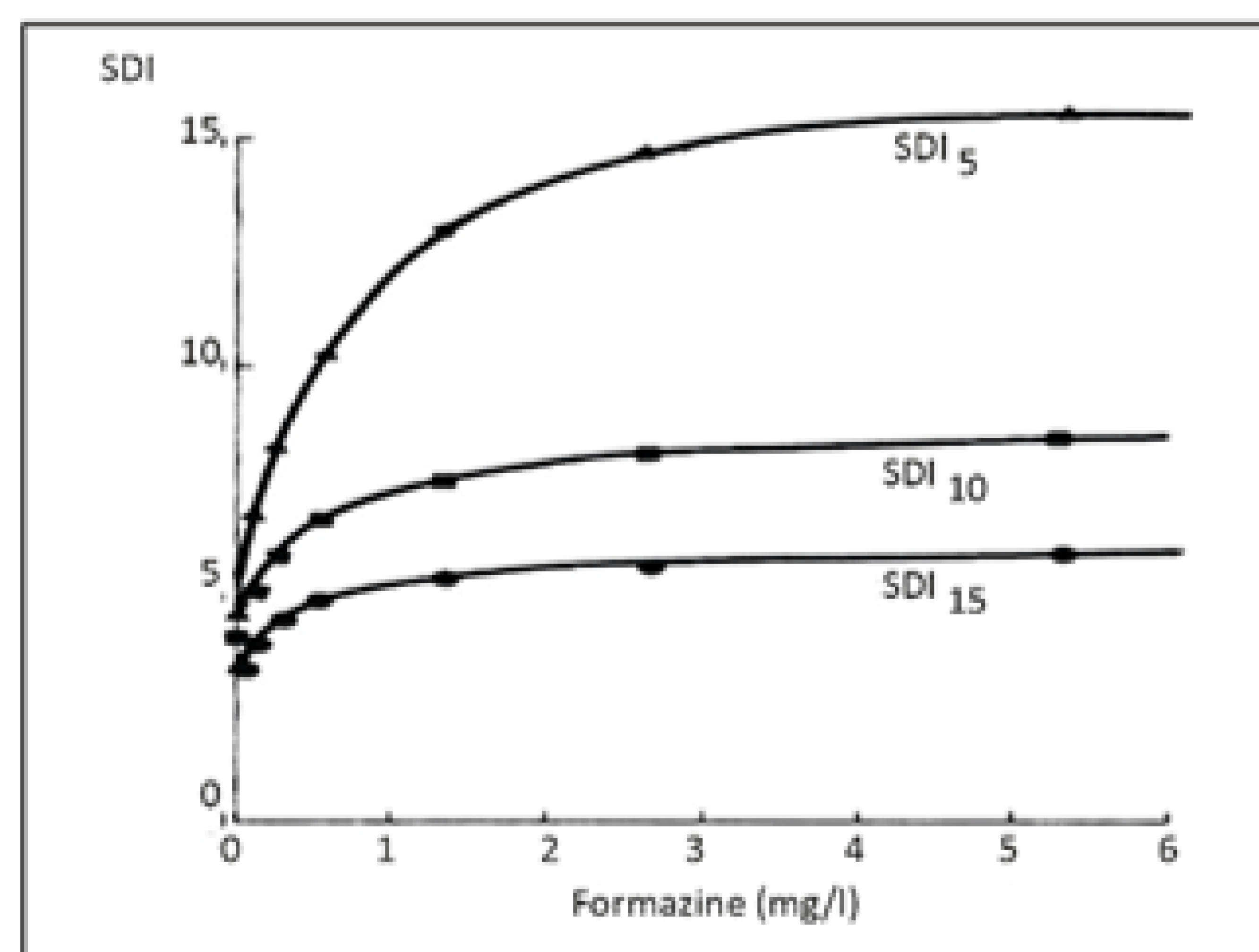
## RESULTS

### 结论

MFI指数能够表征原水溶液的浓度的变化

Non-Linear

非线性相关



Linear

线性相关

## SDI or MFI?

### SDI (Silt Density Index) 淤泥密度指数

#### Advantages 优点

Simple & cheap

简单 便宜

Standardized by ASTM

ASTM 标准

#### Limitations 局限性

No temperature correction

无温度校正

Not applicable for highly fouled feedwater

不适合高污染的原水

Dependent on test membrane permeability

依赖测试膜的渗透性

Not applicable for UF permeate (feed to RO)

不适合超滤的纯水

No linear correlation with colloidal/ suspended matter

与胶体和悬浮颗粒含量无线性相关

Fouling potential of particles  $< 0.45 \mu\text{m}$  not measured

不能测试小于0.45um的污染颗粒物



## SDI or MFI?

### MFI (Modified Fouling Index) 修正污染指数

#### Advantages 优点

Accurate measurement to predict feed- and driving pressure

精确测试可预测进液驱动压力

Temperature corrected

温度校正

Linear correlated with colloidal/ suspended matter

与胶体和颗粒物含量线性相关

Fouling potential of particles  $< 0.45 \mu\text{m}$  is measured

可测试低于 $0.45\mu\text{m}$ 颗粒物的潜在污染程度

Applicable for highly fouled feed water

适合高污染的进液原水

Not dependent on test membrane permeability

不依赖测试膜的渗透性

Applicable for UF permeate (feed to RO)

适合超滤的透过纯水( RO的进水)

#### Limitations 局限性

No ASTM-norm yet

暂无ASTM标准





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## Why the SDI/MFI Inspector?

为何选择Convergence SDI/MFI 测试仪

Simultaneous SDI & MFI measurement

同时测试SDI 和 MFI

Fully automated

全自动

No human error

无人人为错误

Portable

便携式

Plug & Play

即插即用





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## Operational advantages

### 操作优点

- Compact and battery powered

紧凑设计和电池动力

- Highly accurate/ liable/ robust

高度精确/可靠/自动化

- Digital data output

数字式的数据输出

- Easy to clean

易于清洗

- No pressurized feed line needed

无需进液端的压力

Measure whenever & wherever you want

随时随地的测试

Trust your data

可信的数据结果

Import your .csv directly in Excel

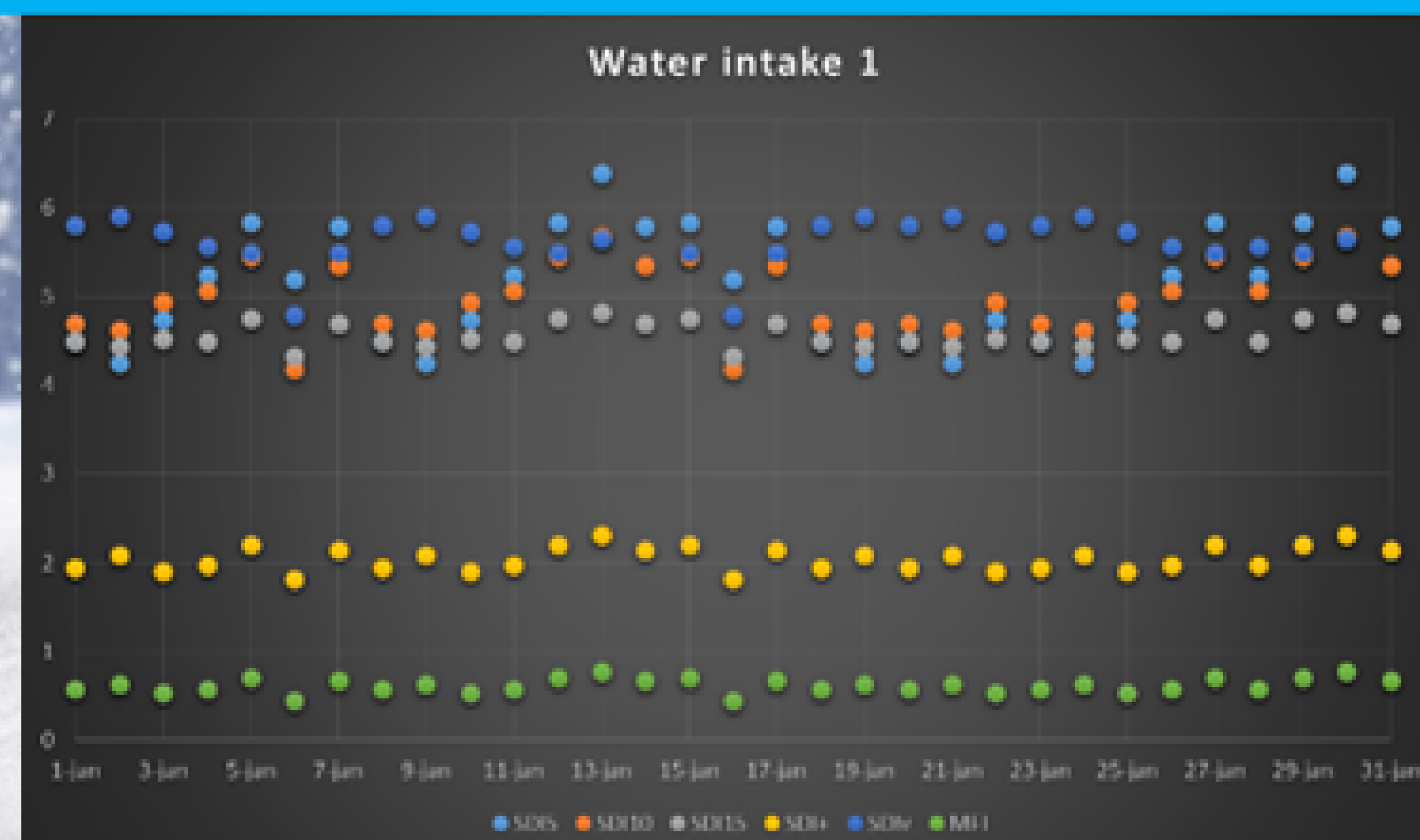
直接导出csv到EXCEL

No contact with chemicals

不接触化学物质

Integrated pump

内置一体化的泵



# How does it work

如何工作？

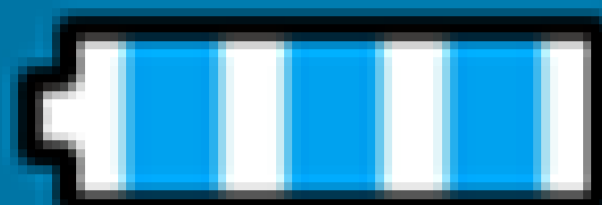


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### SDI Results

SDI 5	4.98
SDI 10	3.73
SDI 15	3.00
MFI	0.80
SDI+	2.36
SDIv	3.94

 SAVE

 BACK

结果

Results:

- MFI
- SDI-5
- SDI-10
- SDI-15
- SDI+
- SDI-v

Export by USB in .csv format (import to Excel)

通过USB接口导出CSV文件(可导入Excel)