KleinScale
Scientific Solutions

A QUICK GUIDE TO

Scaling Management

Increasing RO recovery, **responsibly**.

WHAT IS SCALING?

Scaling is the deposition of minerals (i.e. silica, carbonates, sulphates, phosphates, aluminium, iron, & manganese) on a membrane, causing it to plug.
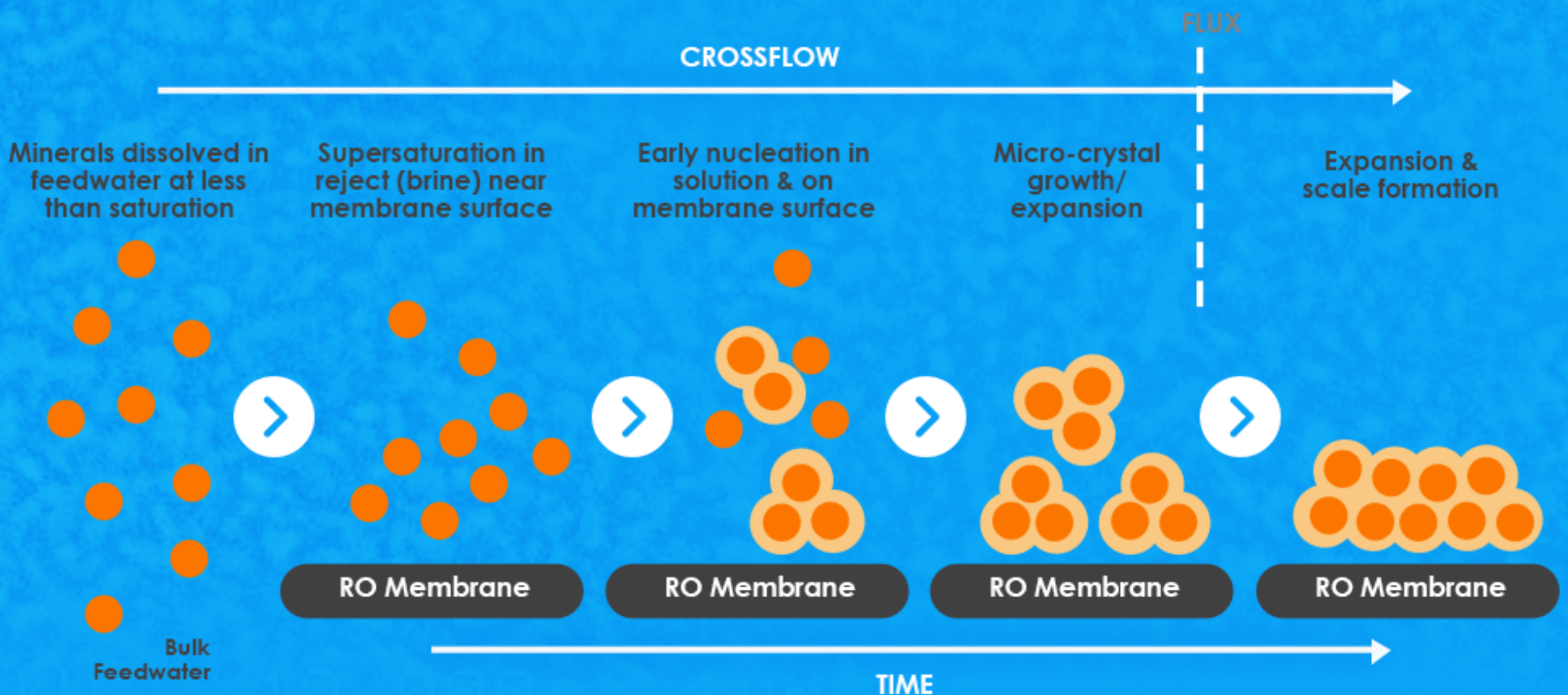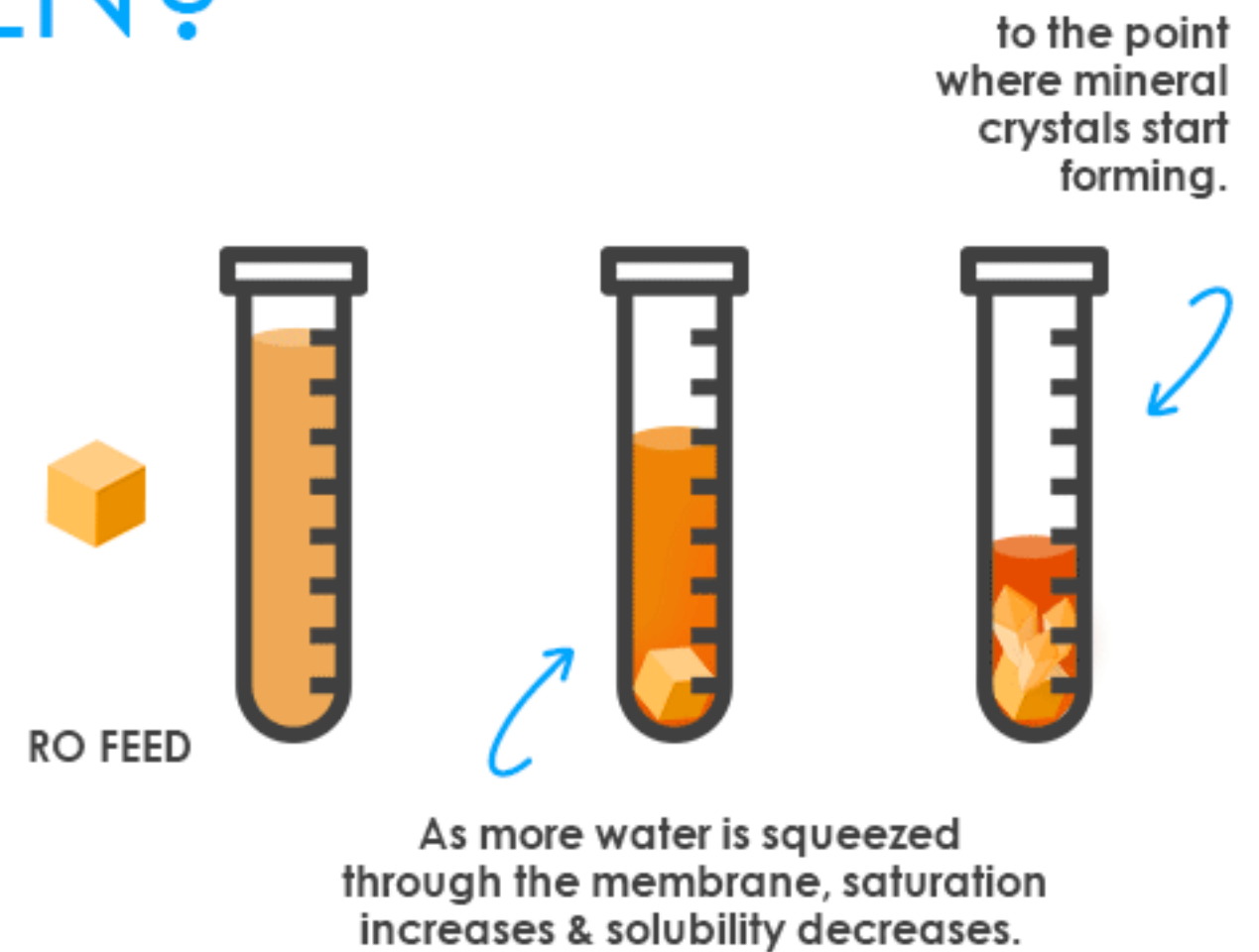
Scaling causes the nominal flux to decrease results in:

⌃ **A higher** energy use

⌃ **An increase** in the cleaning frequency

⌄ **A shorter** life span of the membranes

Adding anti-scalants to the system can prevent the precipitation of salts.

HOW DOES SCALING HAPPEN?

Supersaturation of Minerals in Water?

to the point where mineral crystals start forming.

RO FEED

As more water is squeezed through the membrane, saturation increases & solubility decreases.

FLUX

CROSSFLOW

| Minerals dissolved in feedwater at less than saturation | Supersaturation in reject (brine) near membrane surface | Early nucleation in solution & on membrane surface | Micro-crystal growth/ expansion | Expansion & scale formation |

Bulk Feedwater

RO Membrane

RO Membrane

RO Membrane
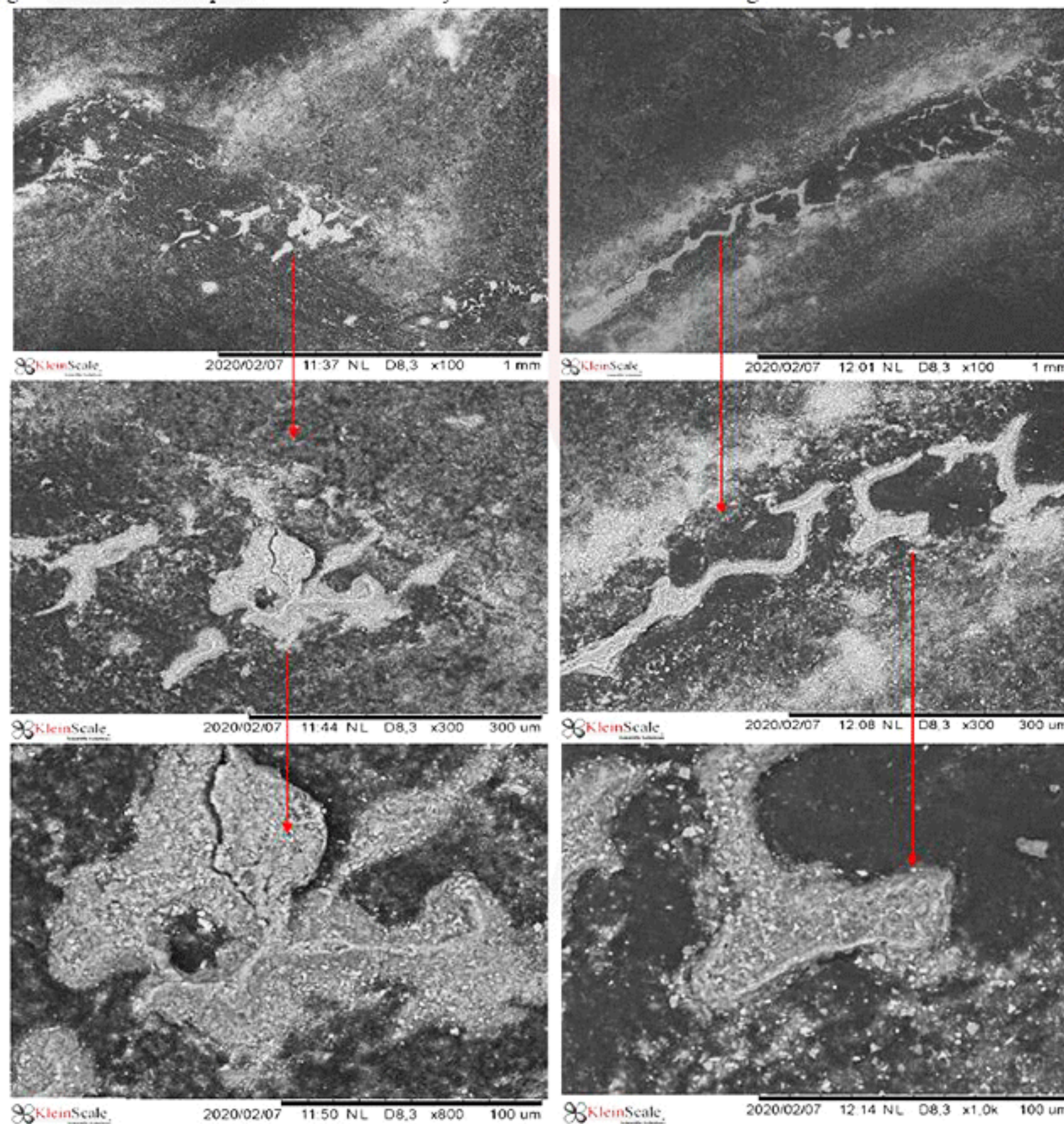
RO Membrane

TIME

WHAT DOES IT LOOK LIKE?

Image 2. SEM images acquired at 100x (top), 300x (center), 800x (bottom left) and 1.000x (bottom right).

WHAT ARE ANTI-SCALANTS?

Anti-scalants are pre-treatment chemicals that are used in Reverse Osmosis water purification process to prevent the Reverse Osmosis Membranes from scaling.

It plays a very important role in maintaining the quality and life of Reverse Osmosis Membranes.

A membrane filtration unit performs optimally at a maximum conversion and a minimal dose of anti-scalants, without the occurrence of scaling.

aKua 100

HOW TO

## FORMULATE AN **EFFECTIVE SCALING** MANAGEMENT STRATEGY

1. Sample representatively

2. Analyse

3. Balance the ions

4. Run the projection

5. Select the best anti-scalant

6. Ensure implemented properly

SELECTING THE RIGHT ANTI-SCALANT

Product	Water type	Application	CaCO₃	CaSO₄	BaSO₄	SiO₂	CaPO₄	Mg(OH)₂	Fe/Mn
aKua 100 ♠	All types	Wide range	●	●	●	●	●	●	●
aKua 101 ♠	Brackish water	High sulphates, LSI, tertiary	●	●	●	●	●	●	●
aKua 102	All types	Wide range	●	●	●	x	●	●	●
aKua 103 ♠	All types	Wide range	●	●	●	●	●	●	●
aKua 105	Brackish water	High silica, sulphates, LSI	●	●	●	●	●	●	●
aKua 100d ♠	All types	Wide range	●	●	●	●	●	x	●
aKua 111 ♠	Sea water	Wide range	●	●	●	●	●	●	●

♠ - Available for drinking water   ● - Best Option   ● - Effective   x - Not recommended

The selection of the **correct product** is supported by KleinScale's proprietary solubility **modelling software**
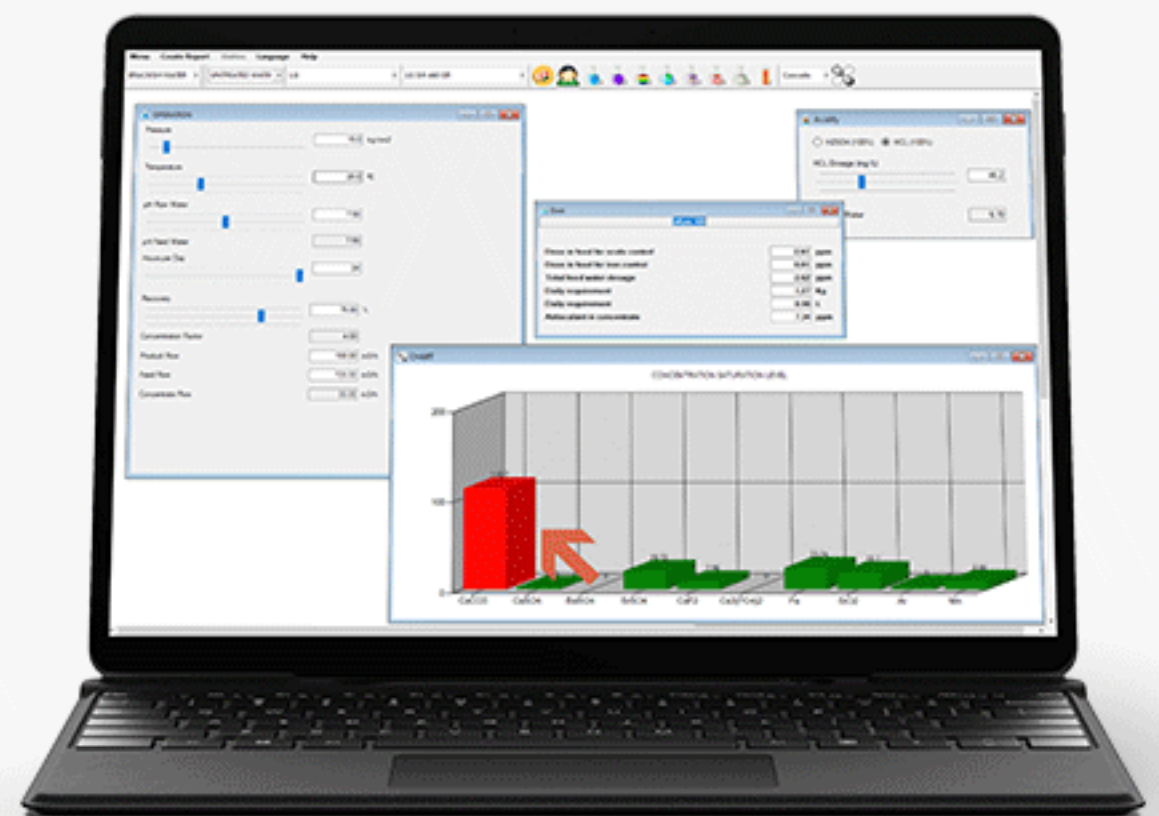
IN SUMMARY

By understanding the inorganic water chemistry we can;

1. Manipulate pH to suppress scale formation

2. Select the right anti-scalant to further increase recovery