## Expert 5

Fluid Dynamics has a computer simulation system we call Expert 5 which can take a water analysis and predict its scaling rate and how effective our product is on a certain water. It's similar to what the oil companies use to determine the rate of scaling in their oil wells but ours is adapted to calculate the effect our technology has on suppressing the formation of scale.

Developed using data from literally thousands of different water systems, it has given us a 100% success rate at predicting the effect.

We use it predominately for industrial systems. **Please note:** for single pass domestic/light commercial systems the use of the Expert 5 is **not** essential as municipal water is normally of stable enough quality and the applications are normally single pass, its real use is for re-circulating systems such as cooling tower/heat exchanger circuits.

We can take a raw water analysis and predict its behavior in various cycles through the system, how severe it will scale and how effective our treatment will be. Importantly it will calculate the optimum cycles of concentration (COC) the water in the system should be set at.

Just to refresh, cycles of concentration is the ratio of chloride concentration in the circulating water compared to the raw feed water. The introduction of fresh water is essential, as in a cooling tower water will evaporate and minerals such as calcium do not. As a result the ratio of minerals will become greater and greater as more and more water evaporates, eventually after enough cycles and no introduction of fresh water you will just have a sludge dropping scale everywhere.

Setting the cycles for a cooling tower helps maintain the perfect combination, a scale free system with as little water consumption as is possible.

With all water circuits there will be a complex set of either softeners chemicals or just chemicals. It is very rare that we see an effective combination of the two when it comes to preventing scaling for hard water. For example, Fluid Dynamics sold equipment to Europe's largest beef processer and they were using chemicals in their evaporative chillers that were still full of scale. Using Expert 5 readings that indicated a positive outcome equipment was specified and a significant impact on the scale issue has been achieved AND chemical dosing has been significantly reduced.

*The following tables show the information required for use of the Expert 5 simulator*

## Information Required for Expert 5 Analysis: Single Pass (1 of 2 slides)

### 1. Single Pass (e.g: water heater, calorifier)

| System name/ description: | |
|---|---|

**Water**

| Flow rate to be treated: | | | |
|---|---|---|---|
| Water source: | ○ River | ○ Town | ○ Well/Borehole |
| | ○ Sea water | ○ Lake | |

**System**

| Feed Water temperature: | state °C or °F |
|---|---|
| Estimated Temperature of Heat Exchanger Surface to be Cooled: | state °C or °F |
| Equipment to be protected (e.g. compressors, cooling tower, water heater): | |
| Material of pipework: | |
| Pipework diameters(s): | |

## Water Analysis

| Element | Raw water |
|---|---|
| Total alkalinity (caco3) as ppm | |
| Chlorides, Cl (ppm) | |
| Sulfates, SO4 (ppm) | |
| Total hardness (caco3) ppm | |
| Ca hardness (ca) as ppm | |
| Magnesium (mg) as ppm | |
| Ph | |
| Total Dissolved solids | |

## 2. Re-circulating systems (e.g: cooling towers)

**Water**

| Flow rate to be treated: | | | |
|---|---|---|---|
| Water source: | ○ River | ○ Town | ○ Well/Borehole |
| | ○ Sea water | ○ Lake | |

**System**

| Feed Water temperature: | | state °C or °F |
|---|---|---|
| Estimated Temperature of Heat Exchanger Surface to be Cooled: | | state °C or °F |
| Equipment to be protected (e.g. compressors, cooling tower, water heater): | | |
| Material of pipework: | | |
| Pipework diameters(s): | | |
| Current frequency of descaling: | | |

**Water Analysis**

| Element | Raw water | |
|---|---|---|
| Total alkalinity (caco3) as ppm | | |
| Chlorides, Cl (ppm) | | |
| Sulfates, SO4 (ppm) | | |
| Total hardness (caco3) ppm | | |
| Ca hardness (ca) as ppm | | |
| Magnesium (mg) as ppm | | |
| Ph | | |
| Total Dissolved solids | | |

| Cooling Tower | Units of Measurement | |
|---|---|---|
| Pipe Diameter | | |
| Tower Volume | | |

| Cooling Tower | Units of Measurement | |
|---|---|---|
| Circulation Flow rate | | |
| Make up water flow | | |
| Bleed % | | |
| Continuous Yes / No | | |
| Working Time | Hrs or Days | |
| Surface Temp at heat exchange | | |
| System Pressure | | |

Problems encountered in tower: Scaling: ☐ Corrosion: ☐ Biological Growth: ☐ Oil Contamination: ☐ (check problems)

Frequency of cleans?

| Current Water Treatment | Chemical Used | Chemical Used | Chemical Used | Other Treatment? e.g. Softener / R.O. |
|---|---|---|---|---|
| Tower | | | | |

# Information Required for Expert 5 Analysis: Low Pressure Steam Boilers

Note:

Steam boilers, due to their operating pressures and temperatures, are considered to be a special case due to liability issues.

Fluid Dynamics has a policy of only treating steam boilers that are showing visible evidence of scaling issues.

Please consult with a company principal if you have any questions or problems.

## 3. Low Pressure Steam Boilers: Water Treatment

| Element | Raw water | |
|---|---|---|
| Total alkalinity (caco3) as ppm | | |
| Chlorides, Cl (ppm) | | |
| Sulfates, SO4 (ppm) | | |
| Total hardness (caco3) ppm | | |
| Ca hardness (ca) as ppm | | |
| Magnesium (mg) as ppm | | |
| Silica as ppm | | |
| Ph | | |
| Operating pressure | | state bar or psi |
| Percent of condensate return | | state bar or psi |
| Operating pressure | | state bar or psi |
| State Chemicals used and purpose | | |
| Material of pipework | | |
| Pipework diameters(s) | | |
| Amount of Steam produced | | state unit of measurement |
| Current frequency of descaling | | |