

WATER TREATMENT PROCESS

FIELD OF INVENTION

The present invention relates to a water treatment process in the method of desalination, purification or decontamination of water. More particularly but not exclusively it relates to a method of processing water through a water treatment plant using this method.

BACKGROUND OF THE INVENTION

Desalination plants for the treatment of sea water and/or brackish water and/or contaminated water sources are well known throughout the world. In particular, climatic changes have increased hardships in certain areas due to the non-availability of potable water and water for agriculture, industry and domestic use. For this reason, small increases in the efficiency of desalination or treatment of water may mean that the lives of many people and/or industries may be altered beneficially.

Currently, it is known that sea water (having high total dissolved solids, [TDS]) and brackish water (having low TDS) can have their dissolved solids removed. The treatment and removal of the dissolved solids is done by way of conventional settling tanks, settling tanks using sand filter media or use of membrane-type filters made from polymers.

Conventional water treatment uses filter beds, large settling tanks and the use of sand filter media to filter coagulated particles in the raw input water, thus removing dissolved solids. The filtrate is then collected as product water. Typically, Reverse Osmosis (RO) membrane filters use pressure (higher than osmotic pressure) to force water molecules to pass through semi-permeable membranes that do not allow dissolved solids through. Clean permeate with few dissolved solids is disinfected into product water. Lower pressure operating RO membranes (BWRO) are

typically used in brackish (having a low TDS) water treatment and higher pressure RO membranes (SWRO) are used to treat sea water (having a high TDS).

The type of water which is to be treated in a treatment process (i.e. whether it is of a high TDS or a low TDS) will play an important part in the choice of membranes used for a typical reverse osmosis treatment facility.

Currently, seawater RO membranes widely used to treat high TDS input water do not afford efficient water recovery when the input water has low TDS. *Vice versa*, BWRO membranes typically used for treating low TDS input water afford low water recovery when the input water has a high TDS.

In this specification, where reference has been made to external sources of information, including patent specifications and other documents, this is generally for the purpose of providing a context for discussing the features of the present invention. Unless stated otherwise, reference to such sources of information is not to be construed, in any jurisdiction, as an omission that such sources of information are prior art or form part of the common general knowledge in the art.

It is an object of the present invention to provide improvements in or relating to a water treatment process and method of treatment of water that overcomes or at least ameliorates some of the above mentioned disadvantages or which at least provides the public with a useful choice.

SUMMARY OF THE INVENTION

In a first aspect the present invention broadly consists in a method of treating filtrate flow, or multi-flows, comprising the steps of

- providing a plurality of RO membrane element arrays;

- monitoring a characteristic of the input filtrate that is indicative of the total dissolved solids (hereinafter “TDS”) in the water; and
- controlling the flow of filtrate to and/or between the RO membrane element arrays according to the monitored characteristic.

Preferably, the controlling of the flow of filtrate is carried out in a manner to establish a flow path selected from one of

- a parallel processing configuration in which the filtrate flow is simultaneously processed in separate process streams, separately by two or more single passes, each pass including a said RO membrane element array; and
- a series or serial processing configuration in which the filtrate flow is first processed in a first pass and then processed in a second pass, each pass including a said RO membrane element array.

Preferably membrane element arrays in each pass may be of similar combinations of equivalent membrane types.

In a further aspect the present invention broadly consists in a method of treating a flow, or multi-flows, of filtrate comprising the steps of:

- providing a first pass that includes at least one RO membrane element array;
- providing a second pass that includes at least one RO membrane element array;
- monitoring a characteristic of the input filtrate flow(s) that is indicative of the total dissolved solids (hereinafter “TDS”) in the filtrate; and

- controlling the flow of filtrate to and/or between the first pass and/or the second pass according to the monitored characteristic.

Preferably, the controlling of the flow of filtrate water is carried out in a manner to establish a flow path selected from one of

- a parallel processing configuration in which the filtrate flow is simultaneously processed by both the first pass and the second pass in separate process streams simultaneously; and
- a series processing configuration in which the input filtrate flow is first processed as the first pass and the resultant permeate is then processed by the second pass.

Preferably change from the series to the parallel configuration or vice versa is effected without interruption of permeate flow from all membranes and preferably within a time duration not longer than 60 minutes.

Preferably change occurs without undue fluctuation of the operating pressure of the pumps and the permeate water production.

Preferably, the first pass comprises of or a combination of a plurality of seawater RO membrane elements and the second pass RO membrane array comprises of or a combination of a plurality of brackish water RO membranes elements.

Preferably, at least part of the filtrate flow from one pass may be controlled to flow to another pass after processing when the filtrate flow is controlled to flow in either the series or the parallel processing configuration modes.

Preferably, the characteristic of the input filtrate flow which is monitored may be any one selected from the salinity, the acidity, the clarity or the conductivity.

Preferably, the characteristic of the filtrate being monitored may be monitored by means of water quality sensors.

Preferably, the first pass may be adapted for treatment of high TDS water (such as seawater), while the second pass may be adapted for treatment of low TDS water (such as brackish water).

Preferably, the control of the filtrate flow between membrane elements may be by means of valves and pumps with variable speed motor drives.

Preferably, the control of the valves and motor drives may be by a controller.

Preferably, the controller may be a programmable logic controller (PLC).

Preferably, the filtrate flow may be carried out automatically by means of the controller in response to the monitored characteristics of the filtrate.

Preferably, the valves and pumps with variable speed motor drives for controlling the flow of filtrate may be automatically actuated by the controller.

In a further aspect the present invention broadly consists in a water treatment system for the treatment of a flow of water, said water treatment system comprising

- at least one inlet for the inlet of the water flow;
- fluid passages for guiding the flow of water for treatment;
- an outlet in fluid communication with the inlet through the fluid passages;
- a plurality of filter passes, each pass including at least one RO membrane element array, disposed between said inlet and outlet;
- a monitoring means for monitoring characteristics of the water indicative of the TDS of the water;
- a controller for controlling the flow of water in a manner to establish a flow path selected from one of

- a parallel processing configuration in which the water flow is simultaneously processed by both a first pass and a second pass in separate process streams; and
- a series processing configuration in which the input water flow is first processed in a first pass and then processed in a second pass; and
- a flow diversion system capable of operationally diverting the flow of water between the parallel processing configuration and the series processing configuration.

Preferably, the characteristic of the water indicative of the TDS may be any one selected from the salinity, the acidity, the clarity or conductivity

Preferably, the flow diversion system may include at least one valve and at least one actuator.

Preferably, the flow diversion system may include a plurality of valves, actuators and pumps with variable speed motor drives.

Preferably, the system may include a plurality of fluid passages.

Preferably, the controller may control the flow of water in a manner to establish a flow path comprising a combination of the series or parallel configurations described above.

Preferably, the RO membrane filter system may include one or more than one pump.

Preferably, at least part of the permeate from a RO membrane element array in a single pass configuration may be fed to the inlet of the another RO membrane filter pass.

Preferably, the flow diversion system can divert at least part of the permeate from a RO membrane element array in a single pass configuration to the inlet of another RO membrane filter pass.

Preferably, the flow diversion system can divert at least part of the reject from a RO membrane element array in a single pass configuration to the inlet of another RO membrane filter pass.

Preferably, the RO membrane filter system may include a pump or pumps with variable speed electric motor drives for creating a predetermined operating pressure or flow at the membrane elements.

Preferably, the membrane elements in a RO membrane system may be moveably configured between a parallel and a series configuration.

Preferably, the pass configuration in the RO membrane filter system may be moveable in response to the monitored characteristic of the water.

Preferably, the individual RO membrane elements may be adapted and/or configured for operation at varying pressures, and with varying salt removal effectiveness.

Preferably, the controller will control the flow of water through the first and second pass so as to optimise the effectiveness of the salt removal from the input water.

Preferably, the controller will control the flow of water through the first and second pass, so as to maximise the volume of flow of permeate from the system and minimise fouling of the membrane elements.

Preferably, the controller may control the speed of the pumps of the system in order to maximise optimum efficiency of the operation of the RO membrane elements for a given level of TDS in the water flow.

Preferably, the RO membrane system may include a plurality of inlets for the input of a plurality of filtrate water input flows, each differing from each other in their TDS levels.

Preferably, the controller will control the flow of filtrate from the plurality of inlets so as to maximise the volume and permeate from the system and avoiding compromising the recommended operation of the RO membrane elements as well as minimising fouling in the membranes.

Preferably, input flows of water may be diverted in various proportions to enable the water salinity to be optimised for the particular water treatments system.

In water treatment plant incorporating the present invention raw water abstracted is subject to pre-treatment processes by way of mechanical filters with microfiltration membrane filter media or ultrafiltration membrane filter media or equivalent treatment processes. The filtrate is then fed to the reverse osmosis(RO) membrane filter media described above. Such may comprise several RO membrane elements in arrays installed inside enclosed pressure vessels. Permeate from the RO membranes is further chemically treated to produce drinking water for commercial or domestic use.

Other aspects of the invention may become apparent from the following description which is given by way of example only and with reference to the accompanying drawings.

As used herein the term “and/or” means “and” or “or”, or both.

As used herein “(s)” following a noun means the plural and/or singular forms of the noun.

The term “comprising” as used in this specification [and claims] means “consisting at least in part of”. When interpreting statements in this specification [and claims] which include that term, the features, prefaced by that term in each statement, all need to be present but other features can also be present. Related terms such as “comprise” and “comprised” are to be interpreted in the same manner.

The entire disclosures of all applications, patents and publications, cited above and below, if any, are hereby incorporated by reference.

To those skilled in the art to which the invention relates, many changes in construction and widely differing embodiments and applications of the invention will suggest themselves without departing from the scope of the invention as defined in the appended claims. The

disclosures and the descriptions herein are purely illustrative and are not intended to be in any sense limiting.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will now be described by way of example only and with reference to the drawings in which:

Figure 1: Water Treatment Plant Schematic

Figure 2: shows a schematic layout of a RO Membrane filter system with two passes of membrane elements in a single pass parallel configuration;

Figure 2a: shows a schematic layout of a RO Membrane filter system with the membrane elements establishing for some of the flow a three stage, single pass configuration;

Figure 3: shows a schematic layout of a RO Membrane filter system with the membrane elements in a series two pass configuration;

Figure 4: shows a schematic of a single pass RO membrane system with a two-stage membrane element array configuration.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

With reference to the above drawings, a reverse osmosis (RO) membrane system according to a first aspect of the invention is generally indicated by the numeral 100.

Reverse Osmosis(RO) membrane filter process operates with two solutions separated by a semi-permeable membrane which does not allow the dissolved solids to move across the membrane but allows the water to permeate by way of higher than osmotic pressure applied at the solution of higher concentration. This results in a net water flow across the semi-permeable membrane to the solution with lower pressure and lower dissolved solids concentration. The semi permeable membrane is not

permeable to the dissolved solids. Typical RO membrane characteristics pertaining to this novelty are given below:

- Seawater semi permeable membranes elements, constructed from polyamide or equivalent material and can afford better than 98% dissolved solids(salt) rejection and boron rejection greater than 85%(at pH 8) under the following operating conditions:
 - operating pressure range up to about 70 bar;
 - SDI of input water <5;
 - pH between 4 and 10;
- Brackish water semi permeable membrane elements, constructed of polyamide or equivalent material and can afford better than 98% salt rejection and boron rejection greater than 90%(at PH 10) under the following operating conditions:
 - operating pressure range up to approximately 40 bar;
 - SDI of input water <5 ;
 - pH between 4 and 10.

In one embodiment now described, there is provided a RO membrane filter system 100 for the treatment of a flow of filtrate (shown as arrow A). The RO membrane system 100 comprising a pair of inlets 110 for the inlet of the filtrate water from a pre-treatment process. It may include a plurality of fluid passages 120 for guiding the flow of water for treatment. A pair of outlets 130 in fluid communication with the inlets 110 through the fluid passages 120 is also provided. The RO membrane filter system 100 further comprises a first pass that includes preferably two RO membrane element arrays in a single pass configuration 150a and a second single pass of preferably two RO membrane element arrays 150b. Each membrane element array preferably consists of an array of pressure vessels. Each pressure vessel preferably includes a series of RO membrane

elements. Such may be made up of spirally wound membrane leaves with several elements installed in enclosed pressure vessels. A single pass comprises membrane elements in a flow configuration with input water subjected to one or more stages of RO membrane treatment to produce the permeate. A single stage is a combination set of membrane elements subjecting the input water to a single RO membrane filtering treatment. A single stage pass is shown in Figure 2a as pass 150a. Pass 150b is a two stage pass. Characteristics of the membrane-type elements are given in Table A below.

Table A: Operating range of Key Parameters of RO Membranes

Filtrate Water Quality			RO Membrane Operation		
Total Dissolved solids (ppm)	Turbidity NTU	pH	RO (150a) Operating Pressure (bar)	RO (150b) Operating Pressure (bar)	Permeate pH
> 5000; < 45000	< 0.4	6 – 8	20 – 70	5 – 11	5 – 7
< 5000	< 0.4	6 – 8	10 – 25	5 – 11	5 – 7

The RO membrane elements of each pass are installed in various arrays to provide a single or two staged passage of treated water of each RO pass. The membrane elements and pressure vessels for each pass may be connected for water flow through a single or two stage configuration. The first and second passes are disposed along the fluid passages 120, and includes a monitoring means in the form of a water quality sensor 200, which measures the conductivity of the filtrate from the pre-treatment processes, for monitoring a characteristic of the input filtrate indicative of the total dissolved solids (hereinafter “TDS”) in the input filtrate flow A. It is envisaged that in a preferred embodiment, the characteristic being monitored by the monitoring means will be the conductivity of the filtrate

water, however it will be appreciated that various other characteristics may be measured, including the salinity, clarity, or acidity.

The RO membrane filter system 100 further includes a programmable logic controller (PLC) 220 for controlling the flow of filtrate water A in a manner to establish a flow path through the fluid passages 120 selected from one of a parallel processing configuration (**as shown in Figure 2**), in which the filtrate flow is simultaneously processed by both the first pass RO membrane element array 150a and the second pass RO membrane element array 150b in separate process streams; and a series or serial, processing configuration (**as shown in Figure 3**) in which the input filtrate flow A is first processed in the first pass RO membrane element array 150a and then processed in the second pass RO membrane element array 150b.

The RO membrane filter system includes a combination pump set 154 for generating a predetermined range of operating pressure and the filtrate flow A at the filter elements 150. The combination pump set 154 may consist of a single pump or two pumps in tandem with or without an energy recovery device. Alternatively, the combination pump set 154 can pressurise the entire set of plurality of membrane filter element arrays 150. The pumps shall operate with variable speed motor drives, automatically actuated valves and a PLC 220 to control the passage of flow of filtrate water to establish a parallel configuration or a series configuration mode of treatment, or any combination of series or parallel configuration modes (**as shown in Figures 2, 2a and 3**).

During the parallel configuration mode of treatment (figure 2), the input filtrate water is controlled to flow directly to both passes (150a and 150b) in a parallel configuration simultaneously.

An alternative to the parallel configuration mode of operation is to have the RO membrane system operate with three stages as a single pass. A single stage is a combination set of membrane element subjecting the

input water to a single pass RO treatment. Figure 4 is a schematic of a 2 stage RO treatment process. Each pass may have one or more stages of the RO membrane treatment of the input water flowing through. This can be effected as in figure 2a where the input water into the second pass 150b is from the reject filtrate water from the first pass 150a, instead of input water to the first pass. This is effectively a three-stage single pass configuration.

Typically, each membrane filter pass 150 comprises several RO membrane filter elements enclosed in pressure vessels and operating at various operating pressures to obtain varying efficiencies in the decontamination, desalination or purification of water flow A through them, although they do have optimum operating efficiencies at particular pressures. This is why separate sets of pumps 154 may be needed for each pass 150, according to the particular requirements. Each RO membrane pass, 150, may have the water flow through a single stage or two stages of RO membrane element sets.

The PLC 220 may control the pump 154 pressures by controlling the speed of the pumps 154, thereby causing the filter elements 150 to operate at predetermined range of recovery rates. The PLC 220 may utilise the operating parameters of the filter elements, pumps, the volume of input water available and the associated concentration of TDS in each of the input water flows, to control the operating conditions of the RO membrane element arrays to optimise a number of parameters, including but not limited to:

- total/rate amount of permeate water produced,
- total/rate amount of permeate water produced per volume of input water
- total amount of power used,

- the ratio of permeate water produced to the amount of reject water released at each pass
- the ratio of permeate water produced to the discharge pressure applied to the RO membrane elements.

The parameters listed above may be optimised by the PLC 220 by controlling the speed of the pumps as well as by controlling the permeate flows of water A between membrane element arrays or reject water flow from each pass in order to optimise the processing of the water according to the number of RO membrane elements present, as well as the TDS characteristic of the various input water flows at the inlets.

As a first example, where only high TDS input water is available for processing, then the water flow A will revert the series mode of treatment configuration as shown in fig 3 which is most effective at processing seawater to produce permeate of adequate quality for drinking purposes, and also to optimise power usage per volume of processed water whilst conserving RO membrane filter element integrity and minimising fouling of the membranes.

Where low TDS water or brackish water, becomes available (for example adequate water level in an estuary or river or rainwater or any other source) are available, the system may be controlled so that the fluid flows in a parallel mode configuration (**figure 2**). Abstraction of low TDS water is maximised and this configuration supports optimisation of the filtration treatment to maximise permeate water production. Treatment mode configured as in Fig 2a is an alternative mode with reject water from the first pass fed as input water into the second pass. This is a three stage single pass treatment mode which is to maximise recovery of treated water when the filtrate water has low TDS.

Lastly, the RO membrane filter system may comprises a flow diversion system in the form of a control valve diverting limited flow of permeate from the first pass 150a for direct processing into product water.

It is important to note that while only two sensor points are shown in the diagrams, it is envisaged that the characteristic of the water characteristic of the TDS of the water can be measured at any stage along the flow path of the water A.

Where in the foregoing description reference has been made to elements or integers having known equivalents, then such equivalents are included as if they were individually set forth.

Although the invention has been described by way of example and with reference to particular embodiments, it is to be understood that modifications and/or improvements may be made without departing from the scope or spirit of the invention.

In addition, where features or aspects of the invention are described in terms of Markush groups, those skilled in the art will recognise that the invention is also thereby described in terms of any individual member or subgroup of members of the Markush group.

CLAIMS

- 1) A method of treating filtrate water flow, or multi-flows, comprising the steps of
 - providing a plurality of RO membrane filter system;
 - monitoring a characteristic of the input filtrate that is indicative of the total dissolved solids (hereinafter "TDS") in the water; and
 - controlling the flow of water to and/or between the RO membrane element arrays according to the monitored characteristic.
- 2) A method as claimed in Claim 1, wherein the controlling of the flow of filtrate is carried out in a manner to establish a flow path selected from one of
 - a parallel processing configuration in which the filtrate flow is simultaneously processed in separate process streams, separately by two or more single passes, each pass including a said RO membrane element array; and
 - a series or serial processing configuration in which the filtrate flow is first processed in a first pass and then processed in a second pass, each pass including a said RO membrane element array.
- 3) A method as claimed in Claim 2, wherein the membrane element arrays in each pass may be of similar combinations of equivalent membrane types.
- 4) A method of treating a flow, or multi-flows, of filtrate comprising the steps of
 - providing a first pass that includes at least one RO membrane element array;
 - providing a second pass that includes at least one RO membrane element array;

monitoring a characteristic of the input filtrate flow(s) that is indicative of the total dissolved solids in the filtrate; and controlling the flow of filtrate to and/or between the first pass and/or the second pass according to the monitored characteristic.

- 5) A method as claimed in claim 4, wherein the controlling of the flow of filtrate water is carried out in a manner to establish a flow path selected from one of
 - a parallel processing configuration in which the filtrate flow is simultaneously processed by both the first pass and the second pass in separate process streams simultaneously; and
 - a series processing configuration in which the input filtrate flow is first processed as the first pass and the resultant permeate is then processed by the second pass.
- 6) A method as claimed in claim 5, wherein a change from the series to the parallel configuration or vice versa is effected without interruption of permeate flow from all membranes.
- 7) A method as claimed in claim 6, wherein the change is within in a time duration not longer than 30 minutes.
- 8) A method as claimed in claim 6 or 7, wherein the change occurs without undue fluctuation of operating pressure of pumps and permeate water production.
- 9) A method as claimed in claim 5, wherein the first pass comprises of or a combination of a plurality of seawater RO membrane elements and the second pass RO membrane array comprises of or a combination of a plurality of brackish water RO membranes elements.
- 10) A method as claimed in Claim 5, wherein at least part of the filtrate flow from one pass is controlled to flow to the another pass after

processing when the filtrate flow is controlled to flow in either the series or the parallel processing configuration modes.

- 11) A method as claimed in Claim 5, wherein the characteristic of the input filtrate flow which is monitored is any one selected from the salinity, the acidity, the clarity or the conductivity.
- 12) A method as claimed in Claim 5, wherein the characteristic of the filtrate being monitored is monitored by means of water quality sensors.
- 13) A method as claimed in Claim 5, wherein the first pass may be adapted for treatment of high TDS water (such as seawater), while the second pass may be adapted for treatment of low TDS water (such as brackish water).
- 14) A method as claimed in Claim 13, wherein the control of the filtrate flow between membrane elements is by means of valves and pumps with variable speed electric motor drives.
- 15) A method as claimed in Claim 14, wherein the control of the valves and motor drives is by a controller.
- 16) A method as claimed in Claim 15, wherein the controller is a programmable logic controller (PLC).
- 17) A method as claimed in Claim 16, wherein the filtrate flow is carried out automatically by means of the controller in response to the monitored characteristic of the filtrate.
- 18) A method as claimed in Claim 17, wherein the valves and pumps with variable speed motor drives for controlling the flow of filtrate are automatically actuated by the controller.
- 19) A water treatment system for the treatment of a flow of water, said water treatment system comprising
 - at least one inlet for the inlet of the water flow;
 - fluid passages for guiding the flow of water for treatment;

an outlet in fluid communication with the inlet through the fluid passages;

a plurality of filter passes, each pass including at least one RO membrane element array disposed between said inlet and outlet;

a monitoring means for monitoring characteristics of the water indicative of the TDS of the water;

a controller for controlling the flow of water in a manner to establish a flow path selected from one of

a parallel processing configuration in which the water flow is simultaneously processed by both a first pass and a second pass in separate process streams; and

a series processing configuration in which the input water flow is first processed in a first pass and then processed in a second pass; and

a flow diversion system capable of operationally diverting the flow of water between the parallel processing configuration and the series processing configuration.

- 20) A system as claimed in Claim 19, wherein the characteristic of the water indicative of the TDS is any one selected from the salinity, the acidity, the clarity or the conductivity.
- 21) A system as claimed in Claim 19, wherein the flow diversion system may include at least one valve and at least one actuator.
- 22) A system as claimed in Claim 19, wherein the flow diversion system may include a plurality of valves, actuators and pumps with variable speed motor drives.
- 23) A system as claimed in Claim 19, wherein the system may include a plurality of fluid passages.

- 24) A system as claimed in Claim 19, wherein the controller may control the flow of water in a manner to establish a flow path comprising a combination of the series or parallel configurations described above.
- 25) A system as claimed in Claim 19, wherein the RO membrane filter system may include one or more than one pump.
- 26) A system as claimed in Claim 19, wherein at least part of the permeate from a RO membrane element array in a single pass configuration may be fed to the inlet of another RO membrane filter pass.
- 27) A system as claimed in Claim 19, wherein the flow diversion system can divert at least part of the reject from a RO membrane element array in a single pass configuration to the inlet of another RO membrane filter pass.
- 28) A system as claimed in Claim 19, wherein the RO membrane filter system may include a pump or pumps with variable speed electric motor drives for creating a predetermined operating pressure or flow at the membrane elements.
- 29) A system as claimed in Claim 19, wherein the membrane elements in a RO membrane system is moveably configured between a series or a parallel configuration.
- 30) A system as claimed in Claim 19, wherein the pass configuration in the RO membrane filter system is moveable in response to the monitored characteristic of the water.
- 31) A system as claimed in Claim 19, wherein the individual RO membrane elements are adapted and/or configured for operation at varying pressures, and with varying salt removal effectiveness.
- 32) A system as claimed in Claim 19, wherein the controller controls the flow of water through the first and second pass, so as to optimise the effectiveness of the salt removal from the input water.

- 33) A system as claimed in Claim 19, wherein the controller controls the flow of water through the first and second pass, so as to maximise the volume of flow of permeate from the system and minimise fouling of the membrane elements.
- 34) A system as claimed in Claim 19, wherein the controller controls the speed of the pumps of the system in order to maximise optimum efficiency of the operation of the RO membrane elements for a given level of TDS in the water flow.
- 35) A system as claimed in Claim 19, wherein the RO membrane system includes a plurality of inlets for the input of a plurality of filtrate water flows, each differing from each other in their TDS levels.
- 36) A system as claimed in Claim 19, wherein the controller controls the flow of filtrate from the plurality of inlets so as to maximise the volume and permeate from the system and avoiding compromising the recommended operation of the RO membrane elements as well as minimising fouling in the membranes.
- 37) A system as claimed in Claim 19, wherein input flows of water may be diverted in various proportions to enable the water salinity to be optimised for the particular water treatment system.