of online analysis. The analyser is reliable and inexpensive and will improve the control of chemical use in chlorinated water systems such as swimming pools.

The ability to calculate the volume dispensed is useful in diagnostic analysis of the performance of the analyser itself. The absence of an absorbance reading of the reference may indicate mechanical, detector or electronics malfunction, blockage of a fluid line or exhaustion of reagent. A reference absorbance reading may be compared to previous readings to provide an alert of abnormal behavior of the system to allow the process control to be stopped in real time.

The simplified construction with one moving part reduces the cost of the analyser and improves reliability. The use of small volumes also reduces operating costs. At a sampling rate of 1 micro litre every 15 minutes, 35 ml of reagent will last about 12 months.

Those skilled in the art will also realise that this invention can be implemented in embodiments other than those described without departing from the core teachings of this invention.

The invention claimed is:

1. An on-line chemical analyzer for analyzing sample portions of fluid taken from a line, the on-line chemical analyzer comprising:

a longitudinal chamber incorporating:

a sample inlet port to allow entry of a sample fluid into the longitudinal chamber,

a reagent inlet port to allow a reagent fluid into the longitudinal chamber, and

an outlet port in fluid communication with the sample inlet port and the reagent inlet port;

a piston moveable in the longitudinal chamber, wherein a series of seals is mounted on the piston such that movement of the piston sequentially allows fluid communication along the longitudinal chamber;

a measurement cell located in the longitudinal chamber to receive the sample fluid, the reagent fluid, or a mixture of sample and reagent;

a detector located in or adjacent to the measurement cell;

a substantially rigid container in fluid communication with the longitudinal chamber;

a compressible reagent reservoir positioned within the substantially rigid container, wherein the compressible reagent reservoir is in fluid communication with the reagent inlet port; and

a piston controller to position the series of seals within the longitudinal chamber to subsequently allow fluid communication along the longitudinal chamber;

wherein the piston controller moves the piston so that fluid communication is established from the longitudinal chamber to the substantially rigid container to pressurize the compressible reagent reservoir and cause injection of the reagent fluid into the measurement cell.

2. An on-line chemical analyzer as claimed in claim **1**, wherein the amount of the reagent fluid injected into the measurement cell is controlled via the length of time the compressible reagent reservoir is under pressurization.

3. An on-line chemical analyzer for analyzing sample portions of fluid taken from a line, the on-line chemical analyzer comprising:

a storage container having a compressible reservoir and a storage area around the compressible reservoir;

a longitudinal chamber having:

a first fluid inlet configured to provide a sample fluid,

a second fluid inlet configured to receive a reagent fluid from the compressible reservoir,

a first fluid outlet configured to dispense fluid to the storage area to thereby place pressure on the compressible reservoir,

an outlet port, and

a mixing area between the first fluid inlet and the outlet port; and

a piston movable in the longitudinal chamber and having a plurality of spaced apart seals mounted thereon, the piston having at least two positions in which interactions of the seals with the longitudinal chamber create different fluid pathways, the at least two positions including:

a first position in which the first fluid inlet is (a) in fluid communication with the mixing area, and (b) isolated from the first fluid outlet; and

a second position in which the first fluid inlet is (a) isolated from the mixing area and (b) in fluid communication with the first fluid outlet, wherein pressurized sample fluid can move from the first fluid inlet into the storage area to constrict the compressible reservoir and force reagent fluid into the mixing area.

4. The on-line chemical analyzer as claimed in claim **3**, wherein the piston is configured to move sequentially through the first position and the second position to thereby respectively (a) inject sample fluid into the mixing area but not the storage area, and (b) inject sample fluid into the storage area, but not the mixing area, to compress the reservoir and inject reagent fluid into the mixing area.

5. The on-line chemical analyzer as claimed in claim **3**, wherein the piston has a third position in which the first fluid inlet is isolated from the mixing area and from the first fluid outlet.

6. The on-line chemical analyzer as claimed in claim **5**, wherein the piston is configured to move sequentially through the first, second and third positions, wherein a transition from the second position to the third position isolates the first and second fluid inlets from the mixing area and expels collected fluid in the mixing area through the outlet port.

7. The on-line chemical analyzer as claimed in claim **5**, wherein the piston has a fourth position in which the first fluid inlet is isolated from the mixing area and from the first fluid outlet port, and movement of the piston from the third position to the fourth position draws fluid into the mixing area from the outlet port.

8. The on-line chemical analyzer as claimed in claim **3**, further comprising an external reservoir connected to the outlet port and downstream from the longitudinal chamber.

9. The on-line chemical analyzer as claimed in claim **8**, further comprising a detector located in or adjacent to the mixing area.

10. An on-line chemical analyzer as claimed in claim **9**, wherein the detector is an optical absorbance detector.

11. An on-line chemical analyzer as claimed in claim **3**, wherein the second fluid inlet is associated with an injection control mechanism that includes one of a filter, a valve, or a diaphragm.

12. An on-line chemical analyzer as claimed in claim **3**, wherein the longitudinal chamber is in fluid communication with a vent fluid line.

13. An on-line chemical analyzer as claimed in claim **3**, wherein the compressible reservoir comprises a wall material that excludes oxygen from the reagent fluid.

14. An on-line chemical analyzer as claimed in claim **3**, wherein the outlet port is configured to expel the sample fluid or a mixture of the sample fluid and the reagent fluid.

15. An on-line chemical analyzer as claimed in claim **3**, further comprising a piston controller that positions the piston.