- React, based on observations from the running process (= feedback control; for example stop heating when the temperature is too high).

These observations which are needed for controlling the chemical production process can be called process monitoring.

Besides visual observations there are principally two main groups of measuring techniques:

(a) Measuring devices for physical variables

Instruments for monitoring elementary physical variables such as temperature, pressure, flow and weight are in widespread use. They are present state of technology and their costs range from several hundred dollars to about $10,000.

(b) Measuring devices for concentrations

Contrary to the group (a) instruments, these measuring systems are normally much more complex and require a high level of maintenance. Standard analytical methods were introduced for process monitoring only some 10 years ago. The total investment costs for the the installation of such a process analyser can range up to $200,000.

For these reasons devices to measure concentrations are normally restricted to those cases where they are really needed.

PROCESS MONITORING UNDER A CHEMICAL WEAPONS BAN

Under a chemical weapons ban provisions would be needed to monitor the civil chemical industry to provide confidence that prohibited activities were not undertaken. There are principally two situations where process monitoring could play a helpful role:

1. Production of excessive volume of Schedule 2 chemicals

The aim of this control régime is to verify that quantities produced processed and consumed in declared facilities are consistent with purposes not prohibited by the Convention. Principally this is an inventory problem which has to be solved by standard bookkeeping in combination with flow measurements. Adequate instruments for determining flows and quantities during production and shipment are available today with accuracies better than 1 per cent. However significant attention must be given to different sources of errors, as for example:

- Bypassing of flowmeters;
- Variation in by-products;
- Variation in recycle streams.