3 – Examples

3-1 Flowchart of a dairy

This example deals with the procedure of milk processing, from the delivery to the dairy to the final filling and storage. It includes several pictures and slides. Based on the pictures, a flowchart for the major process steps is drawn and the water flows are integrated into the flowchart.

For the corresponding pictures and slides, please refer to the slides Example dairy

The example illustrates how to draw a flowchart based on an observed process. It can also be used as an additional exercise.

3-2 Water flow in a winery

This example illustrates a water flow analysis in a winery. First a flowchart was drawn and then the single consumers or consumption procedures were analysed and documented.

Measurements and a detailed water flow analysis were carried out over a period of more than two weeks. A first balance showed a water consumption of about 80 m³ per day. The single process steps are shown below.

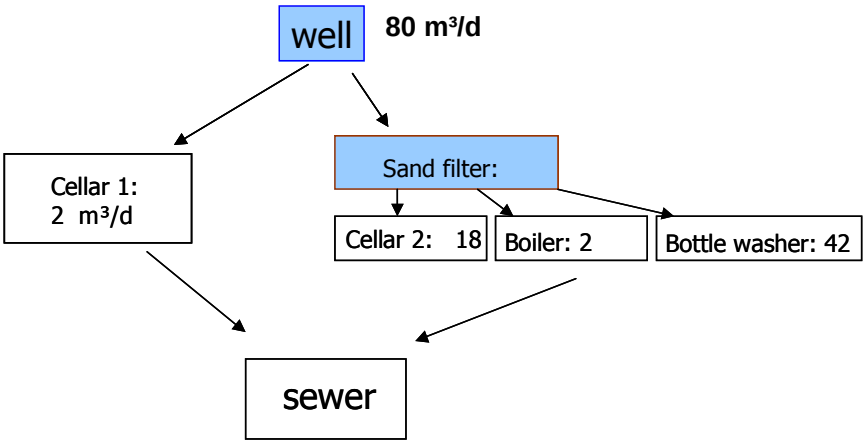

Figure 1: Flowchart for a winery

Procedures:

- Daily cleaning of cellar 1 and cellar 2;
- Make–up water for the boiler;
- Bottle washer.

The first time the balance was drawn up, the input and the output did not match. The input of 80 m³ per day was opposed to an output of only 64 m³ per day. 16 m³ of water were missing.

After a further analysis of the data and the process, it turned out that the water for the backwashing of the sand filters had been omitted. This amount of water adds up to 16 m³ per day.

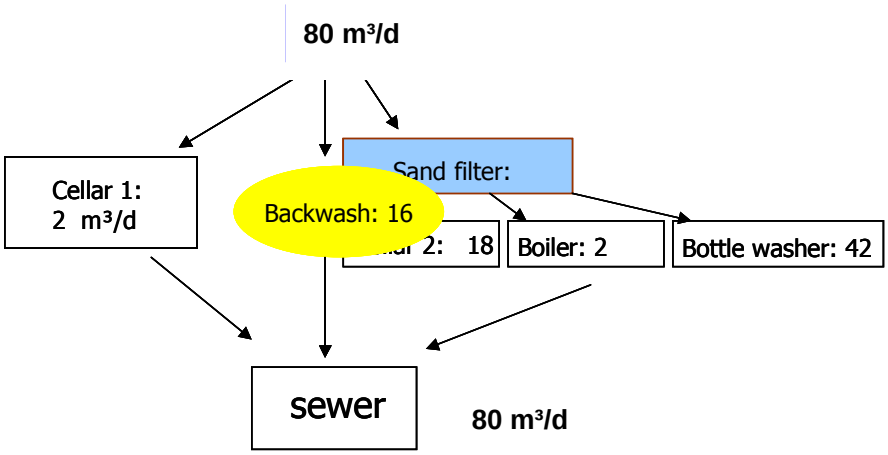

Figure 2: Flowchart for a winery including backwashing

Based on this analysis, several measures were taken:Optimization of sand filter backwashing (shorter and less frequent backwashing, automatic control);

- Repair of bottle washing machine;
- Installation of a new filling line;
- Collecting spilled wine;
- Multistage cleaning using the water from the first cleaning process for irrigation.

The Figure 3 shows the overall result of all measures implemented to reduce water consumption.

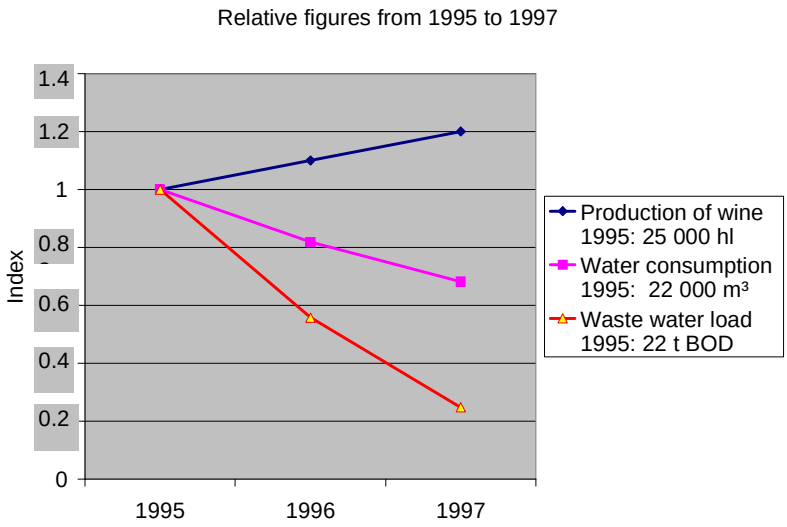

Figure 3: Overall results achieved due to the implemented measures

Cleaning in Place (CIP)

Cleaning of equipment, pipes and tanks is very important in the food industry. The cleaning is often carried out in several steps:

- Initial washing;
- Acid cleaning and/or alkaline cleaning;
- Washing;
- Disinfection;
- Final washing.

The whole procedure requires significant amounts of water, acids, alkaline and disinfecting agents.

A first step towards improvement is to collect the cleaning solution and to reuse it for additional cleaning steps rather than to use it only once (see Figure 4 on the next page).

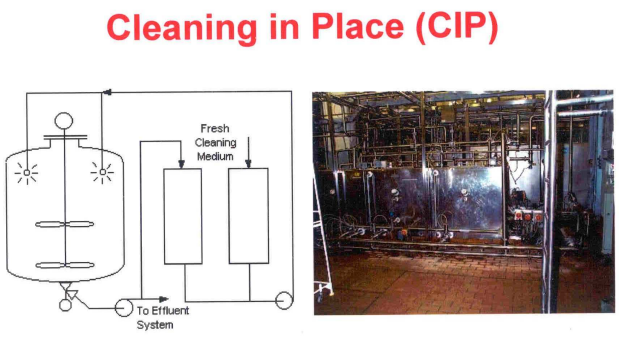

Figure 4: Cleaning in Place

In a more advanced solution, the washing water used for final rinsing is stored temporarily and reused for the first pre-washing procedure.

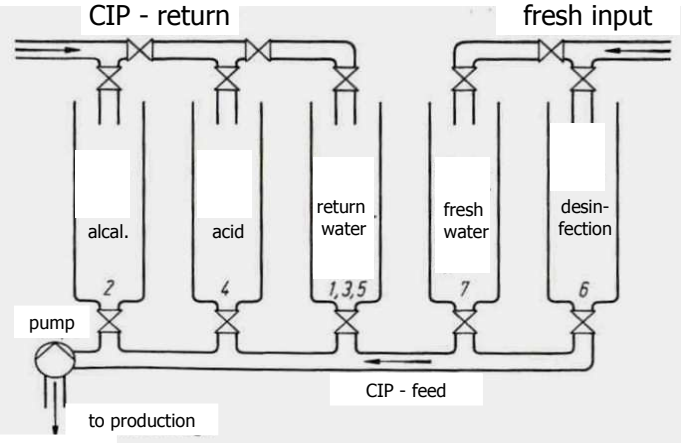

Figure 5: Reusing rinsing water for pre-washing

Thus the consumption of water and cleaning agents can be significantly reduced, as shown in the table below.

	Filling volume	Water in l	Alkaline solution kg (100%conc)	Acid kg (100%conc)
Pipe DN 50– 100 m	350 l	1 270 480	2.55 0.18	1.70 0.12
Tank 1 000 l	200 l	440 170	0.90 0.06	0.60 0.04
Tank 10 000 l	200 l	590 230	1.20 0.08	0.80 0.05
Tank 100 000 l	350 l	1 040 390	2.10 0.14	1.40 0.10

First value (red) one-way use, second value (blue) for multistage use

Source: DIN (ed.): Cleaning and disinfecting applying the CIP-procedure, 1988

3-4 "Close the shop" – metal manufacturer

A metal manufacturer produces frames for sun blinds and sun protectors for various windows. The metal profiles (mainly steel and aluminium) have all a length of 6 meters (Figure 6).

Figure 6: Metal profiles

Figure 7: Waste collected during one week

In the framework of a CP project, a material flow analysis on the cutting process and the accumulated metal losses was carried out. In order to collect data on the waste cuttings, the principle of "close the shop" was applied. Basically this principle means that waste and losses are not automatically removed but piled up for a certain period (in this case waste cuttings from the metal saw were collected for one week, see Figure 7). The waste is weighed and analysed to determine the potential for improvement.

In this case, it turned out that the cutting losses were in a range of 8% of the metal input, more or less as high as expected. Moreover, the remaining ends could not be used for further processing as they were not long enough.

The analysis of the process showed, however, that it would be more suitable to use metal profiles of a length of 5.50 meters for three specific frames which accounted for altogether 75% of the company's production in this sector. These metal frames could be cut into eight pieces thus producing less waste. Based on this analysis, the production manager and the procurement department negotiated a new, better-suited length for the profile with the supplier.

This example shows that by tracing the waste problem to its source, the company not only saved a small amount of money by reducing costs for waste disposal but, in addition, ten thousands of dollars per year because the wasted material simply did not have to be bought.