Technological approaches to reduce the concentration of inert particles in filtered beer

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Introduction:

In almost every beer you take from the shelf you will be able to find small particles after detailed visual inspection. Very often they appear cotton- or cellulose-like and sometimes crystal-like. These particles have nothing to do with the typical colloidal instability which is mainly caused by proteins, tannins, carbohydrates and minerals.

"Floc" formation (a)

Colloids (b)

Inert particles (c)

Interestingly the particle size distribution of these components shows that in any case they are big enough so that they should be taken out by regular trap filters. So it is hard to explain why they can be found in bottled beer after filling.
The target of this poster is to show which technical and technological parameters can influence the formation of these particles. A major focus is put on the nature of the components these particles consist of.

Method for particle evaluation:

To get a better idea about the severity of this phenomenon within the "Boonrawd" group and to compare "Boonrawd" brands with other products on the Thai market, we developed a monitoring scheme to evaluate the degree of particle formation in bottled beer.
This means that the samples are visually inspected in a light beam using bottles without label and rated by a figure within a range of 0 – 10.
10 equals the "FLOC"-formation shown in a, 5 equals a particle formation which would possibly lead to a consumer complaint and 0 – 2 is our internally accepted range with an "inevitable" concentration of small particles.

Marketscreening:

The situation on the Thai market is shown in diagram 1. No beer has been allocated with no particles at all. Domestic brands as well as international brands have been included in the test

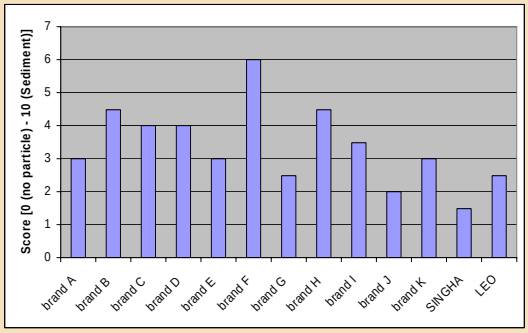
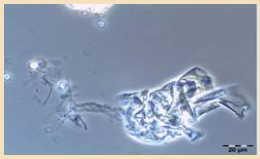


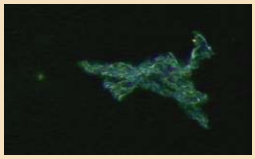
Diagram 1

Results:

To get a better idea about how to reduce particle concentration in the liquid it has been necessary to characterize the nature of the visible components in the beer.
The following (microscopic) pictures 1, 2 give a good view of typical particles in beer.
Investigations on particle composition revealed the following components:

- Protein
- Carbohydrates
- Minerals
- Hop components





Pictures 1, 2

Provided there is an equilibrium of components in the liquid the filtration process should guarantee a bright product without any insoluble components in the bottled beer. Taking this into account all steps in the process which could potentially disturb the formation of a proper balance of different components or any activities after filtration have been examined.
This includes: Use of different raw materials, technology variations, stabilization, pasteurization, filter modifications, blending, carbonation and packaging.
None of the aforementioned parameters is triggering the formation of particles in the bottled beer.

Summary:

We found out that the particles in the liquid originate from foam collapsing in the filler and in the bottle after the filling step. Bubbles adhere to the glass wall of the bottle and the bottom of the crown. Especially while passing through the bottle heater before labelling (very common in tropical countries) the components enriched on the surface of the bubbles dry very quickly.
Any subsequent shaking of the bottles re-suspends these components in the beer again.
Beer foam consists mostly of components which have been found in the particles mentioned above.