Why EHEDG?

Food-born diseases (1990 – 10Mio) as a result of not hygienically designed food processing equipment, process lines or plants forced the EU to react with regulations.

Although manufacturers and food companies comply with the documents

- Directive 93/43/EC Food Hygiene
- Directive 98/37/EC Hygienic Design of Machinery
- EN 1672/2 Hygienic Requirements
- ISO 14159 Safety of machinery

and implemented the GMP and HACCP,

there are two major gaps.

- Lack of practical guidelines
- educational gap
To fill these gaps,

**EHEDG** the **European Hygienic Engineering & Design Group** started in 1989, with experts from

- Equipment Manufacturers
- Food Industries
- Research Institutes
- Public Health Authorities

but voluntary.

To delivered more guidelines, new test methods and training material, the EU supported this volunteers out of the 5th Frame work program from 2000 to 2004.
Doc. 16 Hygienic pipe couplings

**EHEDG certified**

- Easy in-place cleanable
- Sterilisable in place
- Impervious to micro-organisms
- Easy installation
- Reliable

**EHEDG Recommended Pipe Connection**

DIN 11864-2

**DIN 11851**

**Not recommended**

DIN 11864-1
Expension of elastomers: 15 times higher than stainless steel
Expansion on product side

Expansion on non product side
European Hygienic Engineering & Design Group

Gap to product side

contamination

No metal stop

Knuth Lorenzen, GEA, EHEDG President Elect and 3-A Steering Committee
Hygienic installation of the segments to a functional system by welding

Doc. 9 Welding stainless steel to meet hygienic requirements
Doc. 35 Hygienic welding of stainless steel tubing in the food processing industry

Surface preparation

A - Plan and cross section showing misalignment and lack of penetration. Crevices will harbour micro-organisms

B - Plan and cross section showing effects of lacking gas shielding. Roughened weld and heat affected zone promote adhesion of soiling

Gas shielding
Orbital vs. Manual
butt weld, no filler wire
Plot not true to scale:

- Flow velocity
- Bacteria in product
- Laminar boundary layer
- Inside surface of tube
- Outside surface of stainless steel tube
- Porosity crack caused by improper weld process
- Beginning colonization of bacteria and adaption on environment in weld defect
Colonization of porosity by bacterias, formation of biofilm and plaque, excretion of slime and grease improves adhesive power of bacterias on sidewall of weld defect.

About 80% of all known bacterias tend to form states and therefore channels for provision and disposal are created to improve metabolism of colony.
Knuth Lorenzen, GEA, EHEDG President Elect and 3-A Steering Committee

October 2007

European Hygienic Engineering & Design Group

Underneath biofilms corrosion grows 10 to 1000 times faster causing loss of material and increasing porosity
Cleaning and desinfection fluids will only affect the biofilm on the outside lip of the crack.

Biofilm inside the pore will not be wetted by c+d fluids.

Corrosion particles will be flushed out of weld defect.

Only a part of biofilm will be flushed away by c+d fluids.
To kill bacteria in biofilms, higher temperatures are needed than in a liquid environment. Under normal circumstances, weld pores and cracks cannot be sterilized.

Saturated steam at 121°C for 30 minutes.
Arithmetic estimation:

Product flow e.g. 30,000 l/h

Volume of pore app. 40,000 cµm = max.. 40,000 germs

Within 20 min 120,000 germs per hour could contaminate the product (worst case calculation)

Theoretical maximum contamination level: 4 germs / litre
Doc. 10 Hygienic design of closed equipment for the processing of liquid food

STATE OF THE ART

Varivent Inline Access Unit

DEAD ENDS in pipe connections
LIVELY
DEAD
AREAS

EASY TO AVOID!!
LIVELY DEAD AREAS

EASY TO AVOID!!
Doc. 34 Integration of hygienic and aseptic systems
Mixproof intersections can be designed by a suitable combination of shut-off valves and / or shuttle valves.

- **3 shut-off valves**

- **1 shut-off valve 1 shuttle valve**

Mixproof valves permit establishing mixproof intersections with the least possible contamination risk.

**or one Varivent Mixproof valve**
FLOOR DRAINS

Drainage under equipment is inaccessible
Motor must not drip lubricant onto product.

Drip tray have to be cleaned regularly.
Thank you for your attention.