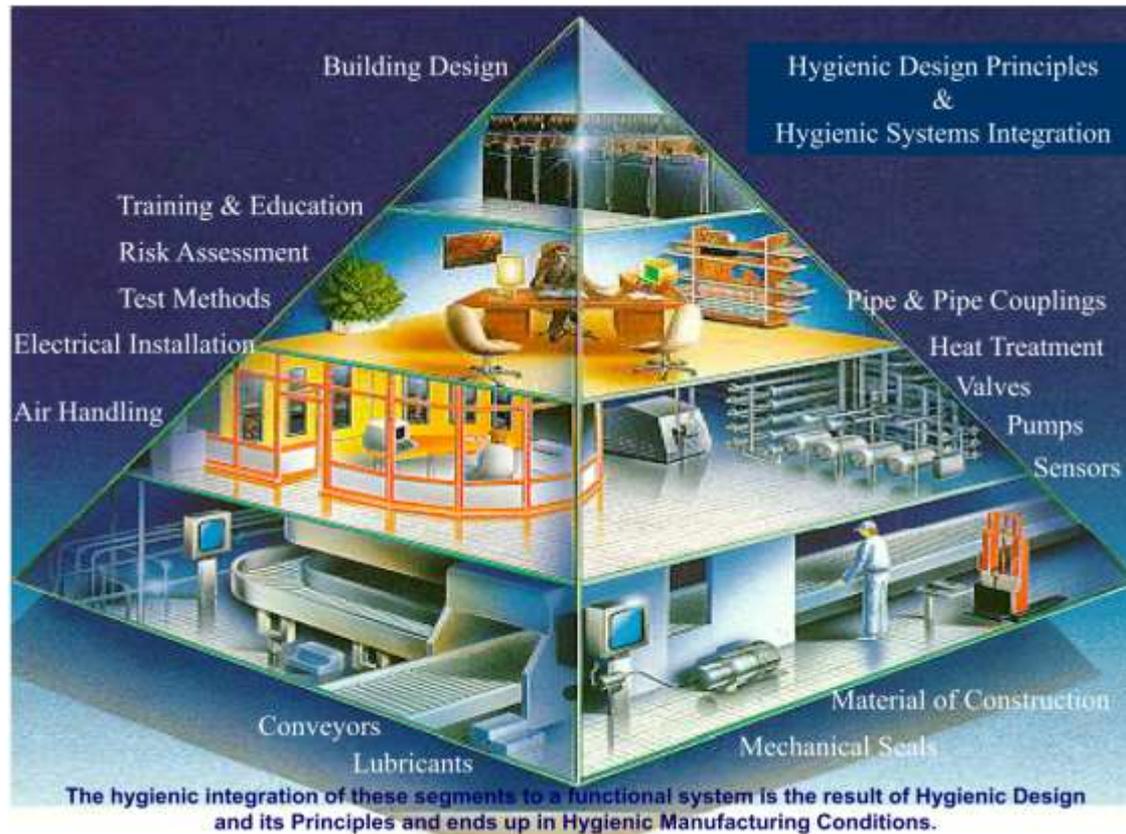


# *The true cost of hygienic design*

- Rolando Gonzalez
- Vice President of Food Safety
  - Bühler, Inc.

# Hygienic Design of Equipment/Facilities: Definition

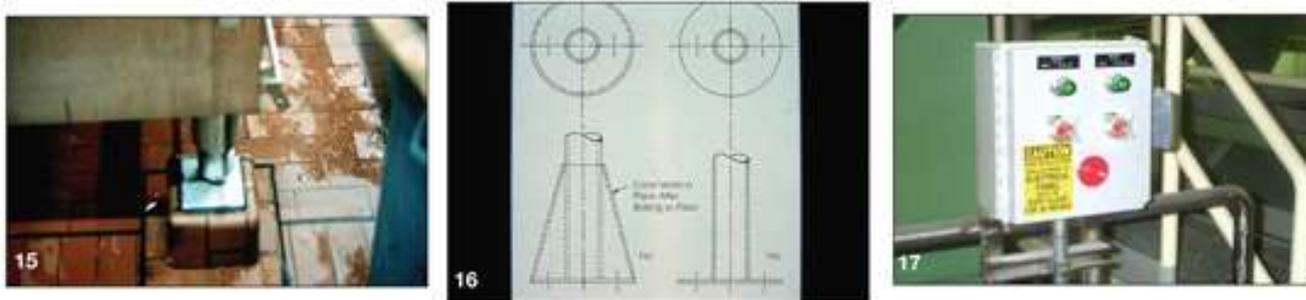
Application of design techniques which integrated allow the timely and effective cleaning of the entire manufacturing asset.



Source: K. Lorenzen, GEA Tuchenhagen

# Hygienic Design of Equipment/Facilities: Definition

- Design of equipment and layout of facilities in line with hygiene-oriented standards that allow for good cleanability and the avoidance of dead spaces and corners that are inaccessible or hard to reach where food residues can be trapped
- *“If you can’t see it and you can’t reach it, you can’t clean it or sample it.”*, Dave Kramer, Vice President of Engineering, Sara Lee Foods
- Sanitary principles of design apply to both facilities and equipment



Source: <http://www.foodsafety magazine.com/article.asp?id=926&sub=sub1>

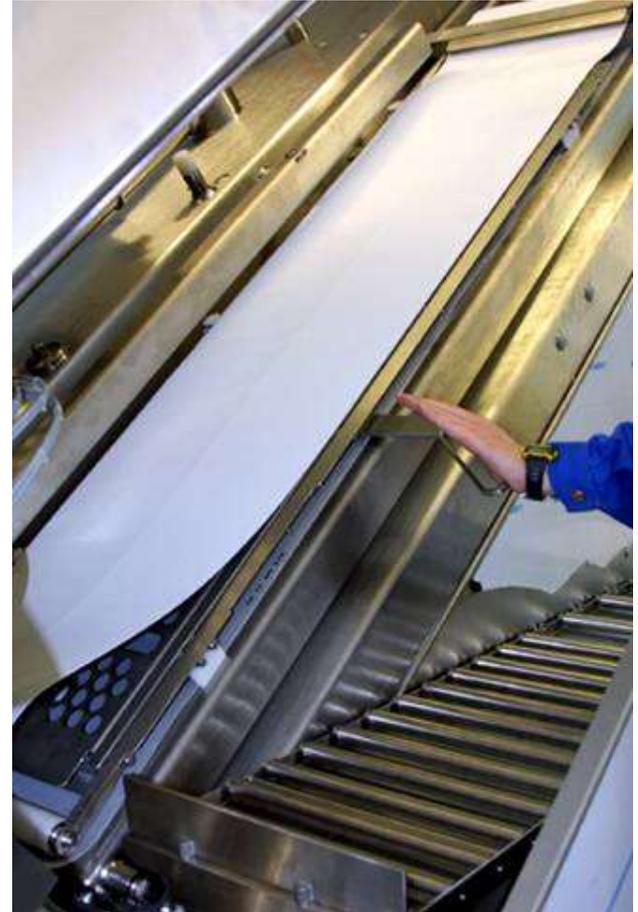
# Hygienic Design of Equipment/Facilities: Principles

- Generally accepted principles of sanitary design of equipment:

- ✓ Cleanability
- ✓ Accessibility
- ✓ No niches
- ✓ No liquid collection (drainability)
- ✓ Maintenance enclosures
- ✓ Food grade construction materials

- Generally accepted principles of hygienic design of food facilities:

- ✓ Zoning
- ✓ Appropriate layout
- ✓ Pest prevention
- ✓ Hygienic construction materials
- ✓ Sanitary insulation of piping
- ✓ Chemical and wear-resistant floors



# Sanitary Design is Integral to Food Safety

- Ease and level of cleaning of equipment and manufacturing facilities are directly related to potential for cross-contamination (e.g., microorganisms or allergens) and other undesired safety and quality effects on food
- Regulations, industry standards and best practices demand that equipment and facilities must be hygienically designed so that they can be easily and thoroughly cleaned

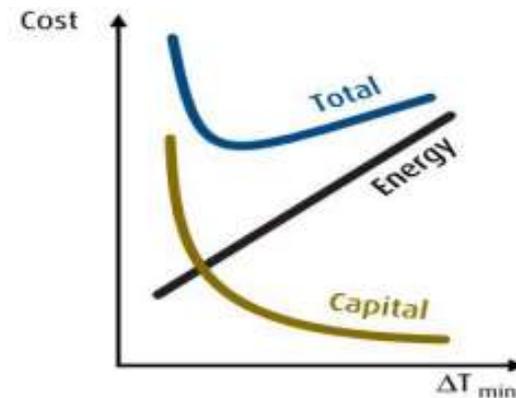


**Allowing for proper  
cleaning and sanitation  
enables safe food  
processing!**

Source: <http://www.foodsafetymagazine.com/articlePF.asp?id=1163&sub=sub1>

# Sanitary Design Challenge: Economic Impact

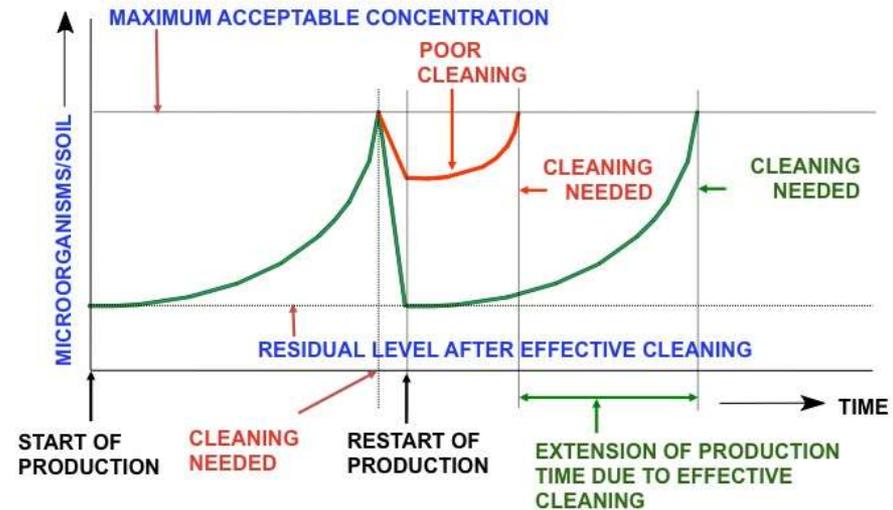
- Capital spending business (ROI) philosophy – expectation that the organization will gain a future return for any capital dollars committed to a project; for many companies the timeframe for a positive return (payback) on the capital invested is 2-3 years
- Looking at sanitary design solely from a capital perspective (upfront cost of equipment, and short time frame for ROI), may prevent the inclusion of sound sanitary design principles in equipment buying and facility layout decisions, or more often result in significant cut back after a design has been accepted
- Not considering the overall impact to an entire process line may also portray a disproportionate picture



Source: NR Canada, 2003

# Hygienic Design of Equipment/Facilities: ROI

- Equipment and facilities that are difficult to clean require more chemicals, water and labor, and lead to reduced life expectancy, increased maintenance and consequently higher operating costs
- Utilizing hygienic design principles in production may result in the following additional benefits:
  - ✓ Less rejected product
  - ✓ Less product placed on hold
  - ✓ Less product reworked
  - ✓ Less product destroyed
  - ✓ Less consumer complaints
  - ✓ Less quality controls
  - ✓ Less investigative swabbing expenses
  - ✓ Less effluent and biochemical oxygen demand
  - ✓ Less pre-operational testing expense
  - ✓ Less chemical products and cleaning time
  - ✓ Lower potential for a recall of contaminated product



Courtesy: Huub Lelieveld, GHI

# Hygienic Design of Equipment/Facilities: ROI

- Hygienic design is much more than principles that support an organization's food safety program. Hygienic design principles can also be a driver of multi-year operational efficiency gains!
- To understand how hygienic design helps to drive operational efficiency gains, let's look at this example about sanitary facility design...:

**Sloped floor to prevent water collection (upfront cost): \$1.2M**

If not sloped, 22 employees × 1.25 hours per day × 220 days required to drain the floor = 6,050 hours/year

6,050 hours/year × \$30.00/hour fully loaded pay rate = **\$181,500/year to squeegee water to a drain**

ROI of \$1.2M divided by \$181,500/year = **6.61 years**

A properly sloped floor would have lasted much longer than this,

with **savings of \$181,500 on manufacturing costs every year thereafter!**

Example provided by Randy Porter, VP of Quality & Product Safety at Post Foods

Source: <http://www.foodsafety magazine.com/article.asp?id=3938&sub=sub1>

- and the example from the EHEDG 2011/2012 Yearbook about the effect of hygienic design on cost savings around clean-in-place (CIP) procedures

I have to clean this for the next 20 years?  
What were they thinking?

# Life Cycle for Equipment in a Plant



## During the 20 year life cycle we will:

- Produce 2 billion meals
- Train 250 employees on how to clean
- Introduce and train 80 production supervisors
- Spend up to 33,000 hours cleaning it
- Spend 2,500 hours doing pre-op inspections
- Generate 15 million gallons of effluent and BOD
- Generate 78 million lbs of rework
- Generate 17 million lbs of inedible waste

2013

2033

## Proactively we will need to:

- Redesign to improve effectiveness
- Educate management on risks
- Spend capital to reduce risks
- Redesign to improve cleaning
- Redevelop cleaning procedures

Courtesy: Campden BRI, UK

# So, Does Hygienic Design Cost More???

- Adopting sanitary design principles may provide greater benefit from the capital than previously thought
- Key might be to look at it not from an ROI perspective but from an on-going operational perspective that may return substantial savings to the bottom line for many years to come
- **Very little published data to support providing an answer to capital expenditure decision makers!**
- Current PhD dissertation at University of Minnesota will address



# ***Estimating the True Cost of Hygienic Design: Approach***

- Goal:
  - ✓ Estimate the lifetime value of hygienic design of food processing equipment
  
- Hypotheses:
  - ✓ Hygienic design is about food safety, quality and operational efficiency. **The basic principles of hygienic design can be implemented at no additional cost, or even at a profit!**
  
  - ✓ Embracing sanitary design results in a competitive advantage because of:
    - Reduction of food safety (and quality) risks
    - Reduction of manufacturing costs
    - Improvement in operational efficiency
  
- Scope
  - ✓ Data from real food operations
  - ✓ Wet and dry clean environments (multiple food platforms)
  - ✓ Equipment (and possibly facilities), sanitary and non-sanitary designs
  - ✓ Total cost of ownership, environmental impact, and risk reduction

# Estimating the True Cost of Hygienic Design: Methods

## ○ Methodology

### ✓ Calculate Total Cost of Ownership (TCO)

- Investment, operational and hidden costs
- Performance indices: NPV, IRR, ROI, PI, PBP
- Decision matrix for evaluating financial versus other business criteria

### ✓ Estimate Environmental Impact (LCA)

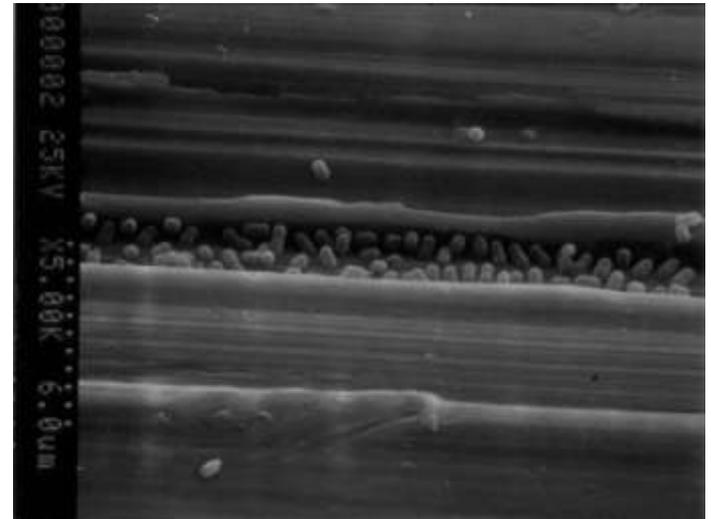
- Goal and scope
- Inventory analysis (LCI)
- Impact assessment (EIA)
- Interpretation

### ✓ Apply Quantitative Risk Assessment (QRA)

- ✓ Microbial and allergen risks
- ✓ Baseline
- ✓ Multiple scenarios (e.g., hygienic vs non-hygienic)
- ✓ Endpoint risk reduction

# ***Estimating the True Cost of Hygienic Design: Challenges***

- Minimizing assumptions
- Reducing uncertainty
- Achieving broad industry collaboration
- Finding sanitary and non-sanitary equipment in similar environments
- Communicating significance of findings (e.g., can you guarantee that recalls would not occur with improved designs?)
- Others



Source: University of Wisconsin-Madison

**Questions? Comments? Suggestions?**



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