Implementation of Food Safety Management in Developing Countries: Is GMP/HACCP confusing?

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Overview

• Food Safety Management
  - Management at Industry Level
• Constraints in Implementing GMP/HACCP in Developing Countries
• Problems and Confusions in Understanding GMP/HACCP
• Problems in HACCP Plan Development
• Case Studies
Food Safety Management

Government

Generic, law, regulation, guidelines

Producer/Industry

Specific, Operationa,l GMP/HACCP

Food Safety Management at Industry Level

GMP

Basic and general requirements for premises, equipment, workers, process control
Food Safety Management at Industry Level

- GMP
- SSOP
- Implementation and documentation of sanitation and hygiene program

Food Safety Management at Industry Level

- HACCP
- SSOP
- Control of hazards in critical steps of process
- GMP
### Constraints in Implementing GMP/HACCP in Developing Countries:

- Infrastructures
- Size of food industry
  - Finance
- Language
- Foods of Tradition
  - Attitude

### Infrastructures

**Lack of Potable water**

- Drinking water is not always available in some area
- Tap water in some area does not meet drinking water requirement
- Is clean water sufficient?
- Sometimes water quantity is not adequate
- Big industries have water treatment installation, small industries don’t
Infrastructures

• Lack of Cold Chain

• cause product to spoil rapidly
• support pathogen growth
• has prompted some irresponsible producer to abuse illegal chemicals as preservatives, e.g. use of formalin for food preservation (wet noodle cases in 2006)
  - ironically efforts made were geared toward looking for "magic bullets", not to take care of the roots of the problem: GMP not implemented. GMP is hampered by use of chemicals such as formalin

Infrastructures

• Lack of Cold Chain: wet noodle

Growth of bacteria in wet noodle made in a small industry implementing GMP during room temperature storage

(DFS, 2005)
Infrastructures

- Lack of Cold Chain:

<table>
<thead>
<tr>
<th>Wet-noodle type</th>
<th>Total Plate Count (Log CFU/g) at producer’s level</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Small industry (no of industry)</td>
</tr>
<tr>
<td>Raw</td>
<td>3.65 - 5.95 (n=8)</td>
</tr>
<tr>
<td>Cooked</td>
<td>1 - 7.2 (n=5)</td>
</tr>
</tbody>
</table>

magnifies problems when initial load is high

Industry Size

Size of Industry in Indonesia*

- 16.9 millions are of micro-small scale
- 9 millions are food industries*

Large scale: 10.913
Medium scale: 70.225
Small scale: 640,000
Micro: 16.3 million

*http://lnweb18.worldbank.org/eap/wap.nsf/2c4ea74c4d42fe85f525566b0d0071b6842a8441a70a35229852556d790057f7388$FILE/SMEOverview.pdf

54% is food industry (National Statistics Bureau)
Classification of Enterprises

- **Micro**
  - IDR < 200 Million
  - 1-4 Employees

- **Small**
  - IDR 200 Millions – 1 Billion
  - 5-19 Employees

- **Medium**
  - IDR 1 – 5 Billion
  - 20-99 Employees

- **Big**
  - IDR > 5 Billion
  - > 100 Employees

Law No 9, 2005

Industry Size

Consequences of small industries
- Inadequate facility
- Inadequate equipment
- Lack of resources
- Lack of technical skills
- Lack of money

Indonesia “Food Star Program” (Piagam Bintang)*
- Star 1: 677 units (752 granted, 75 revoked) (2008)
- Star 2: 40 units (2009)
- Star 3: 7 units (2007)

NADFC, 2009. Directory of Food Safety*
### Financial Constraints

<table>
<thead>
<tr>
<th>Cost for GMP/HACCP in Turkey*</th>
<th>€</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building, ground and planning of the surrounding</td>
<td>12,176</td>
<td>42.17</td>
</tr>
<tr>
<td>Hygiene and sanitation</td>
<td>5,162</td>
<td>17.88</td>
</tr>
<tr>
<td>Insect control</td>
<td>3,400</td>
<td>11.78</td>
</tr>
<tr>
<td>Personal training</td>
<td>2,057</td>
<td>7.13</td>
</tr>
<tr>
<td>Calibration, maintenance and repairing</td>
<td>6,076</td>
<td>21.05</td>
</tr>
</tbody>
</table>

*Mutlu et al., 2005*
Language Barrier

Hazard = bahaya = kontaminan = cemaran?
emerging pathogen?
critical control points?
corrective actions?
risk?

*Merican, 2007; Suwanrangsi, 2000

Foods of Tradition

- Use of “now-known to be hazardous” materials in certain foods
  - borax in *gendar, lontong*
- Use of illegal colorant to replace plant extracts due to industrialization
  - certain types of kerupuk, tofu, snacks
- Known (toxic), illegal, but considered as specialty, local tradition


**Attitude/Behavior**

- Prevention is generally not internalized, not part of life style, perceived as costly: may not happen anyway! (i.e. bulb cover)
- GMP and HACCP will need time to be fully adopted in developing countries, just like any other preventive measures for safety

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**7 Problems and Confusions in Understanding GMP/HACCP**

1. GMP/HACCP is a preventive approach to produce safe foods, external pressures (importers, need for certification) should not be the only reason to implement the system*
2. HACCP sometimes conflicts standards and or inspectors demand on (end product) testing
3. GMP is a Prerequisite Program for HACCP. HACCP plan will not be effective without GMP

*Franco, 2009
7 Problems and Confusions in Understanding GMP/HACCP

4. GMP is a **generic** requirement for food industry not for a product:
   A GMP specific for a product can be made as a guideline, but it is not necessary

5. HACCP is **specific** for each product, factory, processing line:
   A generic HACCP plan is only good as a reference, not to be used directly

6. Several standards (SQF, ISO 22000:2005 etc) integrate HACCP while introducing more (confusing) terms

7. The new metrics FSO/PO are not a replacement of GMP/HACCP, they should be built on a sound GMP/HACCP
Problems in HACCP Development

- **Hazard Analysis**
  - Not all materials or ingredients are included
  - Insufficient knowledge of hazard, degree of severity, isolation frequency, risk or significance
  - Control measures do not address why hazards occur because source of hazard is not well defined

- **CCP determination**
  - CCP is only applied at steps in which a control can be done to eliminate/reduce hazard to an acceptable level
  - While a decision tree is helpful, CCP can be determined without it
  - No specific numbers for a product or food industry is present
  - “Too many CCPs” indicate poor compliance of PRP (GMP)
Problems in HACCP Development

• CL establishment

- CL should be easy to check/test for the specific product
- Do not use other’s (i.e importing countries) CL
- A microbiological limit for a CL is only applicable when rapid test is available
- CL should be justified and validated
- When new metrics of food safety management are available, FSO, PO, PC can be used to determine CL

Problems in HACCP Development

• Monitoring Procedures

- Monitoring shall be planned for all CCPs
- Monitoring does not comprise all the necessary components:
  what
  who
  how
  where
  when
Problems in HACCP Development

• Corrective actions

Corrective actions shall consist of
- preventive aspects (corrective action in ISO 22000:2005) and
- steps to correct the source of deviation (correction in ISO 22000:2005)

Problems in HACCP Development

• Verification

- Verification should be made to check whether all HACCP principles have been applied appropriately
- All critical limits have to be validated
- Audit has to be regularly carried out to check whether implementation has been done correctly
Problems in HACCP Development

**Documentation**
- Documentation shall be planned and maintained
- Documents are reviewed routinely for improvement
- Documentation should be used to pinpoint trends and problems in product processing

Case Study 1

*Development of a HACCP plan for Instant drink powder*, a popular schoolchildren beverage

- Scope of work: GMP review, HACCP plan development
- HACCP plan development found CCPs related to physical hazards
- Product has low aw, high sugar, low risk for microbiological hazard
- Physical hazards from grinding was the main concern

*EC-ASEAN, 2005 (not all info shown here was published)*
Development and Implementation of HACCP plan for Instant Powder Drink

- Hazard analysis suggested that physical hazards from grinding had to be controlled
- Best way was to install a metal detector post filling to assure absence of unwanted metal
- Suggestion was made to the management for a successful HACCP implementation
Case Study 2

*Development of a HACCP plan for nata de coco*, a popular RTE dessert, made from cellulose produced by *A. xylinum*

- Scope of work: GMP review, HACCP development and implementation
- HACCP plan development found CCPs related to physical and biological (quality) hazards
- Product has low pH, high sugar content, pasteurized: not likely to have surviving vegetative pathogens
- Spoilage and physical hazards (from employees) are the main concerns

*EC-ASEAN, 2005 (not all info shown here was published)*

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**Flow Diagram of Nata de Coco Production***

1. **Starter**
2. **Inoculation**
3. **Medium**
4. **Fermentation**
5. **Harvesting**
   - **Rinsing**
   - **Cutting**
   - **Boiling**
   - **Draining**
   - **Nata cubes**
6. **Filling**
7. **Sealing**
8. **Pasteurization**
9. **Cooling**
10. **Storage**
11. **1 kg-PET bags**
12. **Syrup**

*flow diagram shown is incomplete*
Development and Implementation of HACCP in nata de coco production

- September 2004 - June 2005
  Implementation of GMP/ HACCP decrease the amount of rejected products due to physical hazard (product loss) from 14,43% to 5,32% (9,11%), equal to US$ 43.000

http://ec.europa.eu/food/training/haccp_en.pdf

Case Study 3

- Evaluation of results of two independent studies in frozen shrimp production in industry A and B
- Evaluation was based on:
  (1) study on “profile of human pathogens in shrimp obtain from Java” – industry A (2001-2005)*
  (2) “application of technology and food safety management for frozen shrimp – industry B” (2006)**

*Dewanti-Hariyadi, et al., 2005
**Dewanti-Hariyadi, et al., 2006
### Case Study 3

#### Industry A | Industry B
---|---
GMP Implementation | | |
- facilities | yes | yes |
- equipment | yes | yes |
- workers | yes | yes |
- process control | control of raw material from middlemen not implemented | yes |
HACCP | | |
- plan | available | available |
- implementation | ND* | yes |
Salmonella findings | | |
- in raw materials | high** | low*** |
- in products | 20% reduction of raw materials | low*** |

ND = no observation made
** up to 5/5 samples taken
*** no analysis was made

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### Case Study 3: Import Refusal*

<table>
<thead>
<tr>
<th>No</th>
<th>Food Manufacturer</th>
<th>Number of cases</th>
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<tbody>
<tr>
<td>1</td>
<td>Industry A</td>
<td>20</td>
</tr>
<tr>
<td>2</td>
<td>PT. BPA</td>
<td>20</td>
</tr>
<tr>
<td>3</td>
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<tr>
<td>4</td>
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<td>18</td>
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<tr>
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<td>30</td>
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<td><strong>Total</strong></td>
<td><strong>164</strong></td>
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* Nov 2004 – April 2005

http://www.fda.gov/ora/oasis
Conclusions

• Several constraints for implementing GMP/HACCP can not be solved by industry only: lack of potable water-cold chain-finance
• Continuous food safety education to overcome personal/community/cultural problems
• Problems of GMP/HACCP needs to be addressed during HACCP plan development and disseminated to top management, operators and officials/inspectors

Thank You