Case History #2: Eastman Chemical Company
Kingsport, TN

UNDESIRABLE EVENT: Customer Complaints

UNDESIRABLE EVENT SUMMARY: Five (5) similar customer complaints were received concerning green pellets mixed with clear pellets. Complaints were received from more than one customer, but not all rail cars of product received a complaint.

The silos (Figure 11.1) and conveying systems were checked prior to their initial use for the clear product. They were also cleaned and inspected after each customer complaint. Each time, one or more potential sources of green contamination was found and corrected.

After the fifth complaint, a team was put together to discover and eliminate the Root Cause of the contamination.

Figure 11.1: Product Silo with Blend Tubes
<table>
<thead>
<tr>
<th>Sub-System</th>
<th>Event</th>
<th>Mode</th>
<th>Frequency</th>
<th>Impact/ Occurrence*</th>
<th>Total Annual Loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer Service</td>
<td>Customer Complaints</td>
<td>Green Pellets Mixed with Clear Pellets</td>
<td>5 Railcars in 7 months (190,000 #/ Railcar)</td>
<td>$17,100</td>
<td>$85,500</td>
</tr>
</tbody>
</table>

**Table 11.1:** Line Item from Modified FMEA

**IDENTIFIED ROOT CAUSES:**

**Physical Roots -**
One of the silo blend tubes was damaged causing green pellets to be held in place and released intermittently.

**Figure 11.2:** Plugged Blend Tubes
Human Roots -  
Poor Repair Process was Used in the Past to Patch the Broken Blend Tube.  
Inadequate Cleaning  
Inadequate Inspection of Silo

Latent Roots -  
Blend Tube/Support Design Allowed Fatigue Failure  
Cleaning and Inspection Process Inadequate and Poorly Documented

IMPLEMENTED CORRECTIVE ACTIONS:

1. Damaged Blend Tube was Thoroughly Cleaned  
2. Cleaning/Inspection Procedures Developed and Documented  
3. Blend Tube Repair Procedure Developed and Documented  
4. Communicate New Procedures to Operations and Maintenance Personnel  
5. Conveying System/ Silo Product Changeover Check Sheet Developed and Deployed  
6. An Improved Blend Tube Design is Used in New Silos

EFFECT ON BOTTOM-LINE:

TRACKING METRICS:
Number of Customer Complaints Concerning Green Pellets

BOTTOM-LINE RESULTS
Have Experienced Zero Customer Complaints Since Root Cause was Found and Countermeasures Implemented.  

\[(5 \text{ Railcars}) \times (190,000 \text{ lbs./Railcar}) \times ($0.09/\text{lb.}) = $85,500\]

CORRECTIVE ACTION TIME FRAMES
From First Complaint to Correction was Seven (7) Months  
RCA Team Found and Corrected Root Causes in Seven (7) Days

RCA TEAM STATISTICS:

Start Date: July 14, 1998  
End Date: July 21, 1998  
Estimated Cost to Conduct RCA: $2,700  
Estimated Returns from RCA: $85,500  
Return on Investment: ~3200%
RCA TEAM ACKNOWLEDGEMENTS:

Principal Analyst: Kevin Bellamy  
Title: Reliability Engineer  
Company: Eastman Chemical Company  
Department: Reliability Technology  
Site: Kingsport, TN  
Core RCA Team Members:  
  Leslie White  Lee Norell  
  Keith Bennett  Michael Lambert

Event

CONTAMINATED SPECTAR POLYMER SHIPPED

INSPECTION DID NOT CATCH

CONTAMINATION LEVEL TOO SMALL

CONTAMINATION WAS INTERMITTENT

SILO 18 & SYSTEM T WERE USED W/ GREEN PRECURSOR

GREEN COMING FROM SILO 18

3 BLEND TUBES FULL OF GREEN

CONTAMINATED MATERIAL FROM SILO 18

Figure 12.6: Eastman Chemical Logic Tree

Figure 11.3: Eastman Chemical Logic Tree