Managing Electronic Component Obsolescence

Jan 2014
Asking Questions

- Ask questions during the webinar by using the Questions window
- Questions will be addressed at the end of the presentations
- Any question we do not get to will be answered individually by email
- The presentation will be sent to you after the webinar
- Please respond to the survey questions at the end of the webinar
Roya Ansari
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• SiliconExpert Introduction 5 minutes

• Dr. Peter Sandborn “Managing Electronic Component Obsolescence” 25 minutes

• Roya Ansari “SiliconExpert & Lifecycle Solutions” 25 minutes

• Questions & Answers 5 minutes
• Leading OEMs, Distributors, Suppliers & EMSs use SiliconExpert Daily

• Our Electronic Component Database of over 250 million components powers our:
  
  o Comprehensive software tools
  o Integrated solutions
  o Professional services
Reactive vs. Proactive Approaches to Obsolescence Management

- 250 Million+ Orderable Part Numbers
- Up to 42 Parametric values/product line
- Risk Analysis & Obsolescence Forecasting Algorithms developed with CALCE
- Regulation Data tracked: EU & China RoHS, REACH, Conflict Minerals, compliance & Material Declarations
- Parametrically-derived cross-references for millions of parts

Our Database
Today’s climate requires companies to be proactive.

Reacting to obsolescence, without plan = Costly

CALCE & SiliconExpert have developed algorithms to forecast obsolescence risk

Analytics seamlessly integrated into SiliconExpert’s solutions
Reactive vs. Proactive Approaches to Obsolescence Management

Today’s Expert Panelist

Dr. Peter Sandborn
Center for Advanced Life Cycle Engineering, University of Maryland
Managing Electronic Component Obsolescence

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http://www.enme.umd.edu/ESCML/obsolescence.htm

May 28, 2013
Obsolescence Definition

Obsolescence is defined as the loss or impending loss of original manufacturers of items or suppliers of items or raw materials.

… in particular, most folks are concerned with electronic part obsolescence.

The military community refers to this problem as: Diminishing Manufacturing Sources and Material Shortages (DMSMS)
Understanding the Problem

• Sustainment-dominated products – long-term sustainment (support) costs significant exceed procurement costs

• Example products: avionics, military, medical electronics, telecom infrastructure, large networks

• These types of products are manufactured and have to be supported for long periods of time (20+ years)

• These types of products are often subject to stringent qualification, certification and configuration control requirements making even the most minor design change prohibitively expensive

• DMSMS type obsolescence occurs because these products have no control over the supply chain for key components due to their low production volumes

• DMSMS is *involuntary* obsolescence – products are forced to change to remain manufacturable and supportable even though the manufacturer and customer do not want to change
Procurement life = length of time the part is available from its original manufacturer.
A Common Situation

Over 70% of the electronic parts are obsolete before the first system is installed!

Percent of COTS products out of production (un procurable) vs. first 10-year life cycle of a surface ship sonar system.

(System must be sustained until ??)

Year

% of Electronic Parts Unavailable

0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%


System Installation date
System Life Cycles are Increasing

- Boeing 737 - introduced in 1968
  - 7 system-wide redesigns to date

- Boeing 747 - introduced in 1969
  - 4 system-wide redesigns to date
  - The last major redesign involved addition of digital avionics controls, winglets, and a new flight deck

Center for Advanced Life Cycle Engineering

The Magnitude of the Obsolescence Problem

2010: 693,379
2011: 554,605
2012: 322,742
2013: 275,400 (through May 1)

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Obsolescence Management Strategies

- **Reactive**
  - Mitigations applied
  - Mitigation approach strategy and refresh plans

- **Proactive**
  - System health measurement

- **Strategic**
  - Refresh plans

Mitigations applied
Activities in Managing the DMSMS Obsolescence Problem

• Forecasting – predicting obsolescence risk or dates (frequency of obsolescence)

• Mitigation – minimizing the impact of the problem after it occurs using a set of reactive firefighting approaches

• Planning - planning design refreshes based on forecasted obsolescence dates and technology insertion roadmaps in order to minimize life cycle costs
“Part Chasing”

1) Accurately provide the current status of an item, i.e., have discontinuance or last-order notices been issued?
2) Identify alternative or substitute parts
3) Forecast the date of obsolescence
Obsolescence Forecasting

• Short-Term: Observe the supply chain for precursors to the part’s discontinuance including:
  • Reduction in the number of sources
  • Reduction in inventory levels
  • Part price increases
  • Announcements made by the part manufacturer that indicate either directly or indirectly that the part is being phased out
  • + other precursors

• Long-Term: Forecasting based on part attributes and/or data mining of the historical record performed prior to the appearance of any precursors to discontinuance

Strategy: Use long-term forecasting while continuously monitoring the supply chain for precursors. Abandon the long-term forecast when precursors appear.
Long-Term Obsolescence Forecasting Approaches

Two general methods for forecasting obsolescence exist:

1) Ordinal scale approaches – weighted accumulation of “scores” assigned to a set of predetermined part type, technology and supply-chain attributes.
   - Accuracy increases as you get closer to the obsolescence event
   - Historical basis for the forecast is subjective
   - Confidence levels and uncertainties are subjective if available at all

2) Data mining approaches – analyzing known part obsolescence dates to build vendor-specific (and vendor-independent) forecasting algorithms.
   - Based on the historical record – Can produce very accurate part-type and vendor-specific forecasts
   - Forecasts can include valid confidence levels and/or uncertainties
   - You have to have a large historical database to do this
Obsolescence Forecasting
(Linear Regulator Example)

Probabilistic analysis of the procurement life of a linear regulator over time. The graph shows the relationship between the introduction date and the procurement life. The probability density distribution, $f(t)$, indicates the likelihood of procurement life exceeding certain values. The worst-case scenario is highlighted with a red arrow.
Time-Dependent Mean Procurement Lifetimes
(Linear Regulator Example)

If I select a linear regulator introduced in 2004, its mean procurement lifetime is 6 years, which tells me that the part (if it follows the historical record for linear regulators) will be discontinued in 2010, it can even tell you what the uncertainty in that forecast is.

No parts introduced in 1993
Example: Vendor-Specific Linear Regulators
(National Semiconductor)

![Graph showing procurement life vs introduction date for linear regulators with regression lines and data points.]

- Linear Regulator
- Upper Bound
- Lower Bound
- Linear (Lower Bound)
- Linear (Upper Bound)

Equations:
- $y = -0.1014x + 206.77$
- $y = -1.0702x + 2149.1$

Example: Vendor-Specific Linear Regulators
(National Semiconductor)
Mitigation of Part Obsolescence

Mitigation = making the consequences of obsolescence less severe, mitigation does not stop obsolescence from taking place, it only manages it when it happens.

- Existing stock
- Negotiate with manufacturer
- Last time buy (Bridge buy)
- Lifetime buy (LOT - Life of type buy)
- Substitute part (inferior to original)
  - Uprate (usually thermal)
- Alternate part (equal or better than original)
- Buy from aftermarket sources
- Reclaim (salvage)
- Remanufacturing (retargeting)
- Emulate
- Redefine requirements
- Redesign
- Reverse engineer

![Pie chart showing mitigation strategies]

U.S. Navy Aging Aircraft IPT

275 Recommendations Made to 13 Platforms since 1/25/05

- Part substitution: 67%
- Lifetime buy: 20%
- Redesign: 12%
- Emulation: 1%

(Boeing)
Buying Shoes
**Lifetime Buy Cost**

\[
\text{Lifetime Buy Cost} = \text{Procurement Cost} + \text{Inventory Cost} + \text{Disposition Cost} + \text{Penalty Cost}
\]

**Financial Costs**
- **Procurement Cost**
  - LTB Purchase Cost
  - Quantity Purchased
  - Aftermarket Avail. and Cost
- **Inventory Cost**
  - Holding Cost
  - Available Stock
  - Stock on order or in route
  - Supplier/Distributor Committed Stock
- **Disposition Cost**
  - Disposal Cost
  - Excess Inventory
  - Degradation in Storage
  - Liability Cost
  - Other Programs
- **Penalty Cost**
  - Resale Revenue
  - System Unavailability
  - Inventory Shortage

**Quantity Purchased**
- Forecasted Demand
- New Order Forecasting
- Existing Commitments

**Forecasted Demand**
- New Order Forecasting

**Quantity Available**
- Mgmt/Budget/Contractual Constraints

**Inventory of Other Parts**
- Equal Run-Out

**Spares Forecasting**
- Forecasted Obs Date

**Forecasting New Order**
- Forecasting

**Forecasting Degradation**
- Degradation in Storage

**Forecasting Pilfering**
- Pilfering

**Forecasting Book Keeping Errors**
- Book Keeping Errors

**Forecasting Loss of parts in inventory**
- Other Programs

**Forecasting Liability Cost**
- Other Programs

**Forecasting Alternative Source Avail. & Cost**
- System Unavailability

**Forecasting Resale Revenue**
- System Unavailability

**Forecasting Supplier/Distributor Committed Stock**
- Committed Stock

**Forecasting Stock on hand**
- Stock on hand

**Forecasting Stock on order or in route**
- Stock on order or in route

**Forecasting Stock on order or in route**
- Stock on order or in route

**Forecasting Stock on hand**
- Stock on hand

**Forecasting Forecasted Obs Date**
- Forecasted Obs Date

**Forecasting Forecasted Date**
- Forecasted Obs Date

**Forecasting Supplier/Distributor Committed Stock**
- Committed Stock
Strategic Management

“If I knew I was going to live this long, I’d have taken better care of myself.”

Mickey Mantle
Famous U.S. Baseball Player
Cost Avoidance

Each data point represents a unique combination of refresh dates and content

“Cost Avoidance” = $33.1M

GTR8000 RF base station communications system
Uncertainties

Every input to the analysis on the previous slide was uncertain. So what does a cost avoidance of $33M really mean?

84% confidence that the difference will be greater than $30.17M
Ultimately, obsolescence (DMSMS) management comes down to two things:

1) Understanding the cost ramifications of the sustainment decisions you make:
   • What parts you pick
   • How you source the parts
   • Mix of reactive, proactive and strategic management

2) Understanding the state of management of your system
Total Ownership Cost

Let’s broaden our view a bit, what we would really like to know is the total ownership cost of the decisions we make …

Total Ownership Cost (for electronic parts) =

Purchase price
+ Part selection
+ Part approval and adoption costs (including supplier qual)
+ Part qualification (general and/or product specific)
+ Part- and product- specific NRE costs
+ Assembly, test and rework (manufacturing)
+ Cost of failure in the field
+ Obsolescence and other supply chain problem resolutions
SMT (Surface Mount) Capacitors
• SMT (surface mount) capacitor
• $0.015/part (-2%/year change)
• 5%/year fielded product retirement rate
• 10% after-tax discount rate
• Sustainment period = 20 years

Volume = 12,910 parts
Effective cost = $712/part

Volume = 12,910,500 parts
Effective cost = $0.225/part
How Well Are You Managing Your Electronic Parts Supply Chain?

Supply Chain Mgmt Index = \( \frac{(G+V_1)}{(G+V_1+V_2+R+B)} \)

- **G** = multiple qualified suppliers, no problems on the horizon
- **V_1** = single supplier and/or suspected problems - solution in place
- **V_2** = single supplier and/or suspected problems - no solution
- **R** = problem parts - no solution
- **B** = unmanaged parts

(Non-problems and problems with solutions)

(SD-22, September 2010)
Interpreting the Score

90-100 = Electronic parts supply chain management Best Practice program
80-89 = Solid management program
70-79 = Probably haven’t figured out how to research the blues (unmanaged parts) yet
55-69 = Starting to actively engage the available resources
40-54 = You know you have a problem
<40 = Learn to say: “would you like fries with that?”
Supplementary Information

Electronic Part Obsolescence:

Design Refresh Planning:


Human Skills Obsolescence:

Electronic Part Total Ownership Cost Modeling and Sourcing:


General Electronic Systems Cost Modeling:

All are available at: http://www.enme.umd.edu/ESCML
Human Skills Obsolescence

Age distribution of people capable of supporting a legacy control system for a major chemical company

Human skills obsolescence included (pool size based), 4% annual hiring rate

No human skills obsolescence
AVX Capacitors

- These are counterfeit parts!
- AVX - 1210 size capacitors with Class II (X5R) dielectric caused equipment failures after a few months in the field
- Capacitance changed from 22 µF to 18.1 µF over time
- Ceramic material was missing critical rare earth elements
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Risk Analysis Factors

- Lifecycle
- Multi-Sourcing
- Market Availability
- Environmental

SiliconExpert Risk Analysis & Obsolescence Forecast Algorithm
How many parts were obsoleted in 2013 alone? Over 350,000 parts.
Demo Portion
<table>
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<tr>
<th>Part Number</th>
<th>Manufacturer</th>
<th>Supplier Status</th>
<th>Description</th>
<th>DS</th>
<th>Lifecycle</th>
<th>Crosses &amp; Options</th>
<th>Budgetary Prices</th>
<th>Inventory</th>
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<td>Diode TVS Single Uni-Dir 20V 600W 2-Pin SMB</td>
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### Additional Details

- **Crosses**: 052, Cross(es)
- **Part Options**: 2-Lead Finish
- **Inventory**: 15, Seller(s)
- **PCN**:
- **Found in BOM(s)**: 12, BOM(s)
- **Cross By Parametric**:
- **Mask Part**: 1SMB24A%G
- **Introduction Date**: Aug 20, 1000
- **Enabling Energy Efficiency**: No
### Risk Analysis

- **Overall Risk:** 25%  
- **Lifecycle Risk:** Low
- **Part Status:** Active  
- **Part Lifecycle Stage:** Mature  
- **Estimated Years to EOL:** 3.5 Years  
- **Estimated EOL Date:** 2017

### MultiSourcing Risk

- **Crosses available within Part Category:** YES
- **Other Sources:** 20 Sources

### Inventory Risk

- **Market Availability:** 10 Distributor(s)  
- **Supplier Relationship:** 1 Source

### RoHS Risk

- **RoHS Compliant:** Yes  
- **Conflict Minerals:** DRC Conflict Free  
- **Rare Earth Element Information:** Rare Earth Free

### Supplier Mitigation

- **Supplier Relationship:** 1 Source

### Supplier Obsolescence Profile

- PDNs issued for obsolescence notices: YES
- PDNs made public: YES
- Obsolescence data listed on website: NO
- Obsolescence data extractable from PDFs: YES

For further information on the analysis of the SiliconExpert Risk Analysis & Obsolescence Forecast Algorithm developed in collaboration with the University of Maryland’s CALCE, please click [here](#).
Risk Analysis

25% Overall Risk

Lifecycle Risk
- Part Status
- Part Lifecycle
- Estimated Year
- Estimated End
- MultiSource
- Crosses Available
- Other Sources
- Inventory
- Market Availability
- Rare Earth
- RoHS Risk
- RoHS Compliance
- Conflict Minerals
- Rare Earth
- Risk Mitigation
- History
- Inventory / Pricing
- Comments

Supplier Relationship

Download Risk Report

Lifecycle Bell Curve

View Lifecycle Bell Curve

Analysis

Further information on the analysis of the ON Semiconductor Risk Analysis & Obsolescence Estimation Algorithm developed in collaboration with the University of Maryland’s CALCE, can be obtained by clicking here.

Supplier Obsolescence Profile
- Obsolescence date: 2013
- 15 years
- 4 years
- 2017

Obsolescence data listed on website
- Yes

Date of obsolescence listed on website
- No

Obsolescence data extractable from PDFs
- Yes

1 Source
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<td>Capacitor Ceramic Multilayer</td>
<td>Active</td>
<td>Cap Ceramic 0.1uF 10VDC X7R 10% SMD 0605 Paper T/R</td>
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<td>39</td>
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<td>RoHS 5/6</td>
<td>7</td>
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<td>RoHS 5/6</td>
<td>16</td>
<td>175 Cross(es) 3 Option(s)</td>
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<td>14</td>
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<td>IRF640S</td>
<td>Vishay</td>
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<td>7</td>
<td>175 Cross(es) 3 Option(s)</td>
<td>8 Seller(s)</td>
<td>Exact</td>
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</table>
### Mitigate Risk & Manage Obsolescence

- **Total**: 31 parts
- **Active**: 117 parts (58.79%)
- **NRND**: 3 parts (1.51%)
- **LTB**: 1 part (0.5%)
- **Obsolete**: 31 parts (15.56%)

<table>
<thead>
<tr>
<th>Row</th>
<th>Uploaded MPN</th>
<th>Uploaded Supplier</th>
<th>Uploaded CPN</th>
<th>Verified MPN</th>
<th>Verified Supplier</th>
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<th>Lifecycle</th>
<th>Description</th>
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<th>PCN</th>
<th>Crosses Options</th>
<th>Budgetary Prices</th>
<th>Inventory</th>
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<th>Match Status</th>
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<td>C1600X7R1H04K</td>
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<td>098</td>
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<td>29</td>
<td>MURA110T3</td>
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<td>Rectifier</td>
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<td>147</td>
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<td>128276</td>
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- **PCN**: 92 parts
- **Compliant**: 46.23%
- **Non Compliant**: 53.77%
- **RoHS (S&b)**: 3 parts (1.51%)
- **Not Required**: 0 parts (0%)
- **Unknown**: 40 parts (20.1%)

Viewing 1 - 25 of 31 parts
### Risk Analysis Report

#### Viewing 1 - 14 of 14 Parts

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<thead>
<tr>
<th>Row #</th>
<th>MPN</th>
<th>Manufacturer</th>
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<td>Fairchild Semiconductor</td>
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<td>AT28BV256-25T1</td>
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<td>8.8</td>
<td>High Risk</td>
</tr>
<tr>
<td>14</td>
<td>IRF640S</td>
<td>Vishay</td>
<td>7.3</td>
<td>High Risk</td>
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</table>
Create New Alert

*For parts in this BOM, alert users if the following changes occur:

☐ Include similar matched in the Alert
☐ Datasheet Change
☐ Supplier Acquisition Change
☐ Lifecycle EOL Change
☐ PCNs issued

*Delete Permission:
○ All Group Users
○ Me Only

And send the alerts to the following email addresses:

Create Alert

Existing Alerts

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<tr>
<th>Boolean</th>
<th>Text 1</th>
<th>Text 2</th>
<th>Text 3</th>
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<td></td>
<td><a href="mailto:robert.calaugh@siliconexpert.com">robert.calaugh@siliconexpert.com</a></td>
<td><a href="mailto:samantha.andretti@siliconexpert.com">samantha.andretti@siliconexpert.com</a></td>
<td>Datasheet change Supplier Acquisition change Lifecycle EOL change PCNs (click for details)</td>
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Alert History

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<th>Text 2</th>
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<tbody>
<tr>
<td>Mar 23rd, 2009</td>
<td>Alert sent on 3 Parts</td>
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</tr>
<tr>
<td>Mar 15th, 2009</td>
<td>Alert sent on 13 Parts</td>
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<tr>
<td>Feb 8th, 2009</td>
<td>Alert sent on 5 Parts</td>
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</table>
Q&A Session

Please fill out the survey at the end of the webinar.
Your feedback is greatly appreciated.

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Part Search &
BOM Manager tools

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