SUCCESSFUL PRODUCTION LEAK TESTING

A Process For Selecting and Implementing The Optimum Leak Test Method
WHAT DEFINES SUCCESS?
SUCCESS = “GREAT WORK”

“Great Work Makes a Difference People Love.”

(O.C. Tanner Institute)
A CUSTOMER “LOVES” WHEN . . .

Supplier Meets Deadlines

Can Trust the System

System Meets Production Rates

Down Time Is Minimal

Support is Timely

Maintenance is Easy

Can Sleep At Night

Peace of Mind
A CUSTOMER IS NOT FEELING THE "LOVE"...

"The System Is Too Slow."

"Not What I Thought I Bought."

"I Don't Understand How It Works."

"Customer Support Sucks."

HOW DOES THIS THING WORK?

THAT'S NOT WHAT I ORDERED

LACOTECHNOLOGIES
A customer is not feeling the “love”...

“Is my tooling leaking?”

“Is it catching my leaky part?”

“The system is always down.”

Ummm, yeah...

I’m gonna need you to fix that ASAP.

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WHY THE FRUSTRATION?

Poor Communication Of Requirements And Expectations
Incomplete Application Information
Failure To Test Sample Parts
Inexperienced Supplier
Inferior Leak Testing Method
Poorly Designed Equipment
Ineffective Customer Training
SUCCESSFUL IMPLEMENTATION STARTS WITH . . .

Partnership Between Customer And Supplier

Effective Communication
A PROCESS TO HELP ENSURE SUCCESSFUL IMPLEMENTATION
**PROCESS OVERVIEW**

**DEFINE REQUIREMENTS & PART CHARACTERISTICS**
- Defined & Gathered by the Customer
- Assisted by the Prospective Supplier

**SELECT THE LEAK TEST METHOD**
- Assisted by the Prospective Supplier (Unless Already Defined)
- Approved by the Customer

**SUPPLIER SELECTION**
- Conducted by Customer

**DESIGN & IMPLEMENT THE LEAK TEST PROCESS**
- Designed and Built by the Supplier
- Reviewed and Accepted by the Customer
- Supported by the Supplier

**LEAK TEST METHOD ALREADY DEFINED**
STEP 1: DEFINE REQUIREMENTS AND PART CHARACTERISTICS

DEFINE REQUIREMENTS & PART CHARACTERISTICS

TEST REQUIREMENTS
- Leak Rate Limit
- Test Pressure
- Leak Flow Direction
- Leak Location

PRODUCTION REQUIREMENTS
- Production Rate
- Part Loading/Unloading
- Traceability
- Data Logging
- Part Marking

PART CHARACTERISTICS
- Interface/Design
- Size/Volume
- Materials of Construction
- Cleanliness

OTHER REQUIREMENTS
- Equipment Budget
- Equipment/Machine Specification
- Run-off / Gauge R&R
- Ongoing Process Validation
DEFINING LEAK TEST REQUIREMENTS – THE REJECT LIMIT

An Engineering Drawing Or Specification (Historical Requirement)
From Your Customer
Industry Standard Specifications Or Criteria
Engineering Calculations
Based On Knowledge Of Similar Products
Leak Rate Specifications Of A Competitor
Empirical Laboratory Testing
Data From Warranty Returns
Experience Of Leak Test Supplier
For more details download PDF here:
STEP 1: DEFINE REQUIREMENTS AND PART CHARACTERISTICS

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For PDF of RFP App Note
Click Here:
PROCESS OVERVIEW

1. **DEFINE REQUIREMENTS & PART CHARACTERISTICS**
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2. **SELECT THE LEAK TEST METHOD**
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3. **SUPPLIER SELECTION**
   - Conducted by Customer

4. **DESIGN & IMPLEMENT THE LEAK TEST PROCESS**
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**LEAK TEST METHOD ALREADY DEFINED**
STEP 2: SELECT THE LEAK TEST METHOD

DEFINE REQUIREMENTS & PART CHARACTERISTICS

REVIEW THE REQUIREMENTS
  Supplier Reviews and Clarifies Requirements

REVIEW AND TEST THE PART
  Supplier Reviews Part Drawings and Samples
  Supplier Performs Laboratory Testing on Sample Parts

PROVIDE RECOMMENDATIONS & OPTIONS
  Supplier and Customer Review Recommendations and Options
  Clarify “Implementation” of the Proposed Test Method

PROVIDE PROPOSED SOLUTION
  Formal Proposal is Submitted
EVALUATION AND TESTING OF SAMPLE PARTS

Preliminary testing can influence:
- Selection of the Test Method
- Ultimate Design of the Leak Test System

Example: Brake System Actuator
- Alignment issues
- Helium permeation issues
COMMON PRODUCTION LEAK TESTING METHODS

- HELIUM
- HYDROGEN
- REFRIGERANTS
- OTHERS

- AIR/NITROGEN
- VACUUM

Tracer Gas
- Sniffing
  - Manual
  - Automated
  - Robotic
  - Clamshell
- Hard Vacuum Chamber
  - Bombed
  - Prefilled
  - Apply Gas at Test
  - Gas Inside Part
  - Gas Outside Part
- Accumulation Chamber
  - Atmospheric
  - Vacuum

Air
- Visual Detection
  - Bubble Testing
  - Mass Flow
  - Mass Flow - Chamber
  - Vacuum/Pressure Decay
  - Vacuum/Pressure Decay - Chamber
- Direct Flow
- Pressure Change

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SELECT TEST METHOD BY REQUIREMENTS

Many of these requirements and characteristics have a direct impact on the available leak test method.
**METHOD SELECTION EXAMPLE:**

**BY TEST REQUIREMENTS**

<table>
<thead>
<tr>
<th>Method</th>
<th>Leak Rate Sensitivity (atmcc/sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&gt; 0.01</td>
</tr>
<tr>
<td>Helium Sniffing - Manual</td>
<td>B</td>
</tr>
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*A = Compatible*  
*B = Possibly Compatible, but not Ideal*  
*Blank = Not Compatible*
### Method Selection Example: By Test Requirements

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<thead>
<tr>
<th>Method</th>
<th>Outside-In Flow</th>
<th>Inside-Out Flow</th>
<th>Operator Independent Result</th>
<th>Calibrateable</th>
<th>Locate Leaks</th>
<th>Global Test</th>
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### METHOD SELECTION EXAMPLE: BY PRODUCTION REQUIREMENTS

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<tr>
<th>Method</th>
<th>Capable of High Rates</th>
<th>Robotic Part Handling</th>
<th>ID Tracking</th>
<th>Data Logging</th>
<th>Auto Part Marking</th>
<th>Multiple Part Config.</th>
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<th>Part Sealed</th>
<th>Part Open</th>
<th>Part Flexible</th>
<th>Large Volume</th>
<th>Internal Contamination</th>
<th>External Contamination</th>
<th>Non-Ambient Temp</th>
<th>Helium Perm. Materials</th>
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**METHOD SELECTION EXAMPLE: BY PART CHARACTERISTICS**

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SELECT TEST METHOD USING SELECTION APP
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STEP 3: SUPPLIER SELECTION

Experience
Range of test methods
Range of equipment options
References and reputation
Responsiveness, consulting, testing

Service and support network
Quality of key components
Quality system (ISO 9001)
Design methods (FMEA)
CAN YOUR PROSPECTIVE SUPPLIER MEET YOUR CHALLENGES?

“My product must last 15 years in the field. You have 10 seconds to leak test the product.”

“Many of the leaks the system will be exposed to will be thousands of times larger than the ultimate sensitivity.”

“There will be 20 different models tested on this system.”
CAN YOUR PROSPECTIVE SUPPLIER MEET YOUR CHALLENGES?

“I can’t guarantee the surface quality of the seal interface.”

“I need the system on the factory floor next month.”

“The product may have residual water in it when arriving at the leak test station.”
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LEAK TEST METHOD ALREADY DEFINED
STEP 4: SYSTEM DESIGN, ASSEMBLY & TESTING PHASE

- Review and approve design
- Support supplier with additional sample parts
- Factory Acceptance Testing (FAT) or “run-off”
STEP 4: SYSTEM DESIGN, ASSEMBLY & TESTING PHASE – AFTER THE SYSTEM SHIPS

Onsite successful “run-off” (SAT) Training
Support Strategy
Spare Parts & Consumables Strategy
Technical Support
Warranty and Non-Warranty Repairs
Ongoing system validation
Customer provided requirements, which we helped enhance.

- Tight leak rate limit
- High production rate

Hard vacuum helium leak test.

Sample parts are tested.

- Resolve part contamination issues
- Test high speed test concepts

Designed and built multi-chamber, robotic loaded system.
EXAMPLE: MOBILE A/C & HEATER COILS

Customer was unhappy with current bubble testing method.
   Had a leak rate specification from his customer
   Wanted to eliminate water and oven drying step
   Worked together to define all requirements

Customer supplied sample parts for testing.
   Concerns over cycle time and internal residual contamination
   Developed concepts for leak test connector solution

Determined helium hard vacuum method.

Designed and built innovative dual chamber system.
REVIEW OF KEY ELEMENTS OF SUCCESS
DEFINITE OVERVIEW

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LEAK TEST METHOD ALREADY DEFINED
KEY ELEMENTS OF SUCCESS

Start with a clear set of requirements. Use a prospective supplier to help, if needed. Clearly communicate requirements.

Work with prospective suppliers to evaluate sample parts and select the leak test method, if necessary.

Select an experienced and reputable leak testing equipment provider.

Stay involved in the design and build process.

Continue to insist on a thorough analysis and a systematic evaluation of your application, including testing of additional sample parts, if necessary.

Implement a clear and comprehensive system validation and run-off plan.

In partnership with your supplier, have a clear, long-term support plan.
LEAK TEST EQUIPMENT SUPPLIERS WANT TO DO "GREAT WORK"
WE WANT TO MAKE -

“A DIFFERENCE THAT PEOPLE LOVE”.