Gem-Trim a Proven and Tested *"Replicator"*

Replicators can prove a very useful alternative source to the original manufacturer (OEM) for customers looking for spare parts. However, care must be taken to ensure a replicator is selected who follows the proper controls and techniques.

Before discussing replication, it is interesting to look at what the term means. According to Webster (standard American English dictionary), replication is "…the action or process of reproducing …". Further, the EPRI (an American Research Institute) defines reverse engineering as " ...the process of developing technical information sufficient to duplicate an item by physically examining, measuring, or testing existing items; reviewing technical data; or performing engineering analysis."

Whatever the definition, replication is very much an accepted practice throughout many industries. When performed with the proper controls and techniques, it provides customers with a viable alternative for replacement products. Provided done properly, replication is not illegal, bogus, pirated, or counterfeit. This requires replication to be preformed in a controlled, proper manner, with full documentation and support.

Problems can occur on products from all manufacturers including the OEMs. This is the nature of mechanical products.

Benefits for the client can include: significant cost savings, better delivers, lower inventories, alternative suppliers, and quality equal or better than original. Because the OEM's parts prices are often extremely expensive with long deliveries, this can be an excellent alternative. Replication is a common practice amongst many industries including automotive, nuclear, electronics, software, industrial applications like pumps, compressors, turbines, etc. Even OEM's do it! To meet their needs, the nuclear power industry has issued a report, EPRITR-107372, "Guideline for Reverse Engineering at Nuclear Power Plants". On obsolete, or hard-to-find Parts, it is a real service and can provide significant cost savings without risking quality, safety, or lost production.

Caution should always be taken when using a replicator, as not all replicators are created equal! And a few poor replicators give the many good ones a bad name. Lowest price and fastest delivery should not be the only considerations in choosing a replicator. To ensure parts are properly and consistently replicated, the following controls are absolutely needed:

- Design controls: control of how critical characteristics are determined and parts are documented
- Manufacturing controls: controls during manufacturing cycle, to assure the proper materials, dimensions, quality, and conformance to the required specifications
- Quality controls: process controls, inspection controls, procedures, etc. Few replicators, if any have the necessary quality controls in place to assure total quality
- Customer service: support for contract review, quotes, expediting, repair, & field follow-up
- Warranty: must be able to stand behind its products & services.

Common myths and mistruths

OEMs sometimes offer reasons why replicators should not be used. These are valid points, but a reputable replicator will be able to meet them easily:

Tolerances: How can the replicator know what the proper tolerances/critical characteristic are? Answer: thorough, documented inspections of many parts, and experience over the years, tolerances can be developed, often tighter than most OEM's. Many such dimensions and tolerances are dictated by standard engineering practices used for thermal expansion of components, surface finishes for packing and sliding surfaces, etc.

Materials: How do they know what the proper material is? Answer: use of the OEM P/N along with a nuclear analyzer. If unclear, the replicator should further discuss with the customer or initiate testing by an independent laboratory.

Designs: What about different design or manufacturing methods? Answer: the design should be replicated as closely as possible without affecting the design integrity. This guarantees form, fit and function. The latest manufacturing technology should be used. If a reputable company cannot verify form, fit and function, it will not make the item.

Design changes: How are design changes handled by the OEM? Answer: if there is a significant design change (affects from, form, fit, function), then the OEM should notify the customer and obtain their approval, as this change may effect parts in service, which were originally specified for this application. Also, as a continuing part of the reverse engineering process, drawing on the OEM parts should be double checked, whenever received for refurbishing, to identify any design changes.

Warranty: Do they have a warranty? The OEM's warranty is no longer valid if replicator parts are used! Answer: Typical warranties expire after 12 months in service or 18 months from the shipping date. The replicator should have a warranty that equals or surpasses the OEM's, and the resources to support any problems. Be aware that the OEM warranty is typically not valid if there is a misapplication, if the valve is repaired by non-OEM authorized repair facility, as well as many other reasons. We all know, however, that many such valves are used daily without problems.

Liability (being legally obligated and responsible): You lose liability claims if there are problems and replicator parts used! Answer: Liability terms for most manufacturers are typically "limited". Read the fine print before you accept this argument, because it applies to the OEM as much as it does to the replicator. What ever replicator is used, it should have comparable terms, as well as the support services and technical expertise to resolve any such issues.

Old design: The OEM has obsoleted a valve for a newer, more efficient design. Answer: the current design may work just fine for the application. Replacement could be very expensive, both in the cost of the new valve, spare parts, and installation charges. The replicator can provide the obsolete parts and, in turn, significant savings. In general, most knowledgeable customers know that sliding stem control valves under most service conditions are usually fairly forgiving devices that allow some variations in the original design without affecting form, fit or function. Sometimes the original design even needs improvement. How many OEM stem failures have you seen? Where extreme service conditions exists, greater care must be taken to ensure proper operation. It is critical for the user to convey these conditions accurately to the replicator.

Field problems/discrepancies

Problems can occur on products from all manufacturers including the OEMs. This is the nature of mechanical products. What is important is that trends should be identified and the supplier should make an adequate response in a timely manner. Problems may be caused by misapplication, overload, handling damage, etc., all of which may often be out of the control of the supplier. But different suppliers handle problems differently. Customers should deal with replicators that have a solid history in the industry plus the resources to fully support their products and services. Therefore, find a replicator that fully supports its products and services, and works closely with customers to resolve problems to ensure total customer satisfaction. It is critical that customers know their suppliers well, work closely with them, and maintain clear, open and regular communications to solve problems together,

The Process

The typical replication process (for Gem-Trim at lease) is as follows:

1. Parts are typically purchased form an OEM, received from a customer, or obtained in the field during an on-site survey. These parts may be either used, but preferably new, and more than one part is also preferred to get a valid sampling. Depending on the wear or damage to the used part, it may or may not be suitable for reverse engineering. On arrival, parts are then typically cleaned and the OEM part number (P/N) is obtained. Material can often be referenced from the P/N.

2. Material verification is preformed using an in-house nuclear analyzer or outside laboratory.

3. Detailed inspections are preformed using calibrated gages and measuring equipment.

4. Detail manufacturing drawings are prepared with all the necessary specifications (material, heat treatments, coatings, surface finishes, dimensions, tolerances, etc.). OEM part numbers are used wherever possible.

5. All sketches and initial inspections are recorded and maintained for references.

6. The detailed drawings are then checked against the part by an independent checker. The drawings are then corrected and checked again by a Quality Inspector, following which they are then finalized and signed off by the preparer (designer), the checker, and an approver.

7. Drawings are then released to the shop for manufacture.

8. Once manufactured, the parts are inspected against the drawing and the work order for material, and dimensional compliance. All parts should be 100% inspected and etched with P/N and Work Order, replicator name, and store code number (if desired)

9. Parts are then packaged and delivered to the customer with documentation package.

10. Customer support is maintained at all times including post-delivery, if there are any problems, or special needs by the customer.