

----- Original Message -----

Subject:Re: L1000343: VRB request re ceramic tumbling media

Date:Thu, 26 Aug 2010 09:23:27 -0700

From:John Worden <worden_j@ligo-wa.caltech.edu>

To:Peter Fritschel <pf@ligo.mit.edu>

CC:Riccardo DeSalvo <desalvo@ligo.caltech.edu>, Michael Zucker <zucker_m@ligo.mit.edu>, Michael Meyer <mmeyer@ligo-la.caltech.edu>, Rai Weiss <weiss@ligo.mit.edu>, Fred Raab <raab_f@ligo-wa.caltech.edu>, Dennis Coyne <coyne@ligo.caltech.edu>

This doc: L1000346

The VRB will accept tumbling of these parts provided that: the parts are clean prior to tumbling, a new or appropriately cleaned drum is used, and clean non organic bonded media is used. Otherwise hand deburring should be performed with clean files or deburring knives.

John

On 8/24/2010 8:53 AM, Riccardo DeSalvo wrote:

This is because many briquette abrasives are or at least were resin bonded,
R

On Aug 23, 2010, at 1:45 PM, Dennis Coyne wrote:

My memory is the same as yours Mike.

FWIW ...

a) The latest version of the SLAC document, SLAC-I-007-12004-001 R1 (2003 Apr 17), "Vacuum Department Guidelines for Vacuum Systems", does not explicitly prohibit tumbling, but does state the following:

4.2 Surface Preparation

No operation which might result in contaminants becoming embedded in the material shall be used. Grinding with resin bonded wheels, using rouge, emery cloth, crocus cloth or a similar abrasive is prohibited

(This document does not call for all surfaces to be cut BTW.)

b) The SLAC document, SLAC-FP-202-631-14-R5 (1995 Feb 13), "Technical Specification: Fabrication of U.H.V Components" states:

C.2. Grinding, Danding, Polishing and De-burring. The use of sanding discs, grinding wheels or abrasives is prohibited unless specifically called for. Acceptable techniques and materials for de-burring and polishing are given in SLAC Doc. No. SC-700-866-49.

c) The SLAC document SC-700-866-49 (1995 Dec 4), "Specification: Klystron & Vacuum Components Machining, Deburring, Polishing" states:

II.b. Deburring

Deburring shall be with a file, deburring knife or permitted abrasive. Deburring by abrasive vibrating or tumbling is not allowed without prior written permission from SLAC and then only if medium is silicon carbide in conjunction with fluids expressly permitted per SLAC spec. SC-700-866-47 at it's current revision. Deburring by any other unspecified technique is prohibited.

Document SC-700-866-47 lists acceptable cutting/machining fluids. BTW, SC-700-866-49 permits the use of 3M Scotch Brite. LIGO does not.

Dennis

Michael Zucker wrote:

I recall tumbling was indeed prohibited for the reason Ric says, but remember the worry was directed specifically at cleaning up raw stock; the inevitable mill contamination that gets rolled or extruded into surface pockets and inclusions is likely buried by the peening. So tumbling may make things look shiny but is not allowed as a substitute for removing the raw material "skin".

However we are specifying elsewhere that stock be machined on all sides to remove the skin and associated mill contamination anyway. (Presuming this applies here same as everywhere, is that correct?)

In this case there's no remnant landscape of crevasses, and no intrinsic source for contaminants except the tumbling mill, media and other parts that have been through it previously.

So I would guess if we can have them sign up (verifiably) to preclean the parts, use uncontaminated fresh media, and use a new or demonstrably clean machine, dedicated to our parts, there should be nothing around to bury.

However I agree this isn't what we wrote in T960022 so I would be very interested if other old-timers recall the same about the prohibition. Was it intended to preclude tumbling as a cheap way to "clean up" raw stock?

I am not sure if this was one of the recipes we inherited from the SLAC book but unfortunately I don't have it with me here.

On Aug 19, 2010, at 6:01 PM, John Worden wrote:

If the ceramic media, mounts, and tumbling drum are clean and the acid etch is deep enough, perhaps this would be acceptable?
Also, Liquinox is not an acid. Perhaps you were thinking of another product - perhaps Citranox?

John

Riccardo DeSalvo wrote:

The reason that tumbling is forbidden is because the tumbling hammers the dirt inside the material, and any other dirt from previous tumbling cycles, or even from verging brickettes, is imprinted into the material.

R

On Aug 18, 2010, at 8:13 AM, Peter Fritschel wrote:

VRB:

We have been working with Siskiyou, Inc. to develop vacuum-compatible kinematic mirror mounts for use in aLIGO, based on some customization of their standard designs (these would be replacements for the DLC mounts that some of you are familiar with). The two prototype mounts we have received look good, and we would like to proceed with production quantities (you can see pictures of the p'types on <http://ligoimages.mit.edu>, under ISC).

Siskiyou's standard processing of the aluminum parts of the mount includes a vibratory tumbling for deburring. However, E0900364-v3 specifically prohibits tumbling. Siskiyou would prefer to use tumbling because they do it in-house, and it is thus under their control (electro-polishing, e.g., would have to be sent out to be done, and they prefer to keep things under their control as much as possible).

Therefore this inquiry to the VRB regards the use of vibratory tumbling for these parts. Tumbling is often done with plastic media, which is perhaps the reason we prohibit it. However it can also be done with ceramic media, which would appear to pose less of a contamination risk for us. Siskiyou is willing to use ceramic media, so I'm specifically requesting the approval of tumbling with ceramic media in this case. I don't know exactly what kind they would use, but here is an example vendor of such media, in case it is useful:

<http://www.vibrafinish.com/vibratory-media-highdensity-ceramic-sp.html>

I expect we could specify the ceramic formulation, if desired, and we can specify that they use a fresh batch for our parts.

To put it in context, the processing steps that would follow the tumbling are:

- mild acid etch (Liquinox) in ultrasonic cleaner
- rinse in 180 deg DI water
- air bake all parts

Then vendor would assemble the mounts (w/ gloves, in a clean room/flow bench). At LIGO, we would partially disassemble the mounts (take the screw actuators out), and

perform the vacuum bake and
RGA screening.

thanks,
Peter

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John Worden
Observatory Manager
LIGO Hanford Observatory
P.O. Box 159
Richland, WA 99352

Office: (509) 372-8136
Fax: (509) 372-8137
worden_j@ligo-wa.caltech.edu
www.ligo-wa.caltech.edu

Shipping address:

LIGO Hanford Observatory
127124 N Rt 10
Richland, WA 99354

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John Worden
Observatory Manager
LIGO Hanford Observatory
P.O. Box 159
Richland, WA 99352

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