Mechanical Grinding and Polishing Procedure

Document Approvals

Responsibility	*Print Name*	*Signature*	*Date*
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NOTE: Signed and dated copies are kept on file.

SOP Revision History

VERSION	DATE	REASON FOR CHANGE DESCRIPTION	AUTHOR
1.0	05/02/2012	New Procedure supersedes SMI-SOP-009. Removed all references to grease in polishing and grinding applications.	Chris Olson
2.0	06/Nov/2014	Updated page 1 and 2. Updated Document approval names. Added SOP number into header. Inserted Sani-Matic format into header. Inserted readable phone numbers and page of page information into footer. Formatted entire document.	Tommy Holder
3.0	16-Mar-2016	Added 9 Customer Signoff	Tommy Holder
4.0	01/Jun/2018	Replaced SMI-SOP-009 with SOP-MA002, updated format, updated all sections, and added sections.	Tommy Holder

Table of Contents

1 Scope 3
2 Purpose 3
3 Responsibilities 3
4 Related Documents 3
5 Definitions 3
6 Safety Precautions 3
7 Procedure 4
7.1 Standard COP Grinding Process 4
7.2 Standard CIP Grinding Process 5
7.3 Component and or Sub-Weldments Grinding Process 6
8 Inspection 6
8.1 Non-Sanitary Applications Inspections 6
8.2 Sanitary Applications Inspections 6
9 Acceptance Criteria 7
a) Pits 7
b) Cluster of Pits 7
c) Dents 7
d) Finish Marks 7
e) Welds 7
f) Scratches 7
g) Surface Cracks 7
h) Surface inclusions 7
i) Surface Residuals 7
j) Porosity 7
10 Polishing and Grinding Materials 7
11 Customer Sign Off 8

1. SCOPE

This procedure applies to the method used for mechanical grinding and polishing of Sani Matic systems and components.

2. PURPOSE

This procedure will provide the best practices for final cleanup from grinding.

3. RESPONSIBILITIES

a. It is the responsibility of the Engineering Manager to:
- Verify all required engineers understand and are trained to this SOP.
- Release the drawing(s); solid model(s) and drill pattern(s) to Manufacturing in a timely manner.

b. It is the responsibility of Manufacturing to:
- Assure that the execution elements of this SOP are performed correctly.
- Assure all required data is entered on forms/logs/etc. based on the SOP/form/work instructions process rules.
- All personal who execute any element of fabrication are qualified and trained properly to this SOP.

c. The Quality department is responsible to:
- Provide updated forms/logs/etc. as required to operators.
- Verify, scan and maintain all types of material certifications as required.
- Update the procedure when necessary.
- Execute random part audits, capturing pass/fail data.

d. The Quality Manager is responsible to maintain training records and maintain all logs, designate may be assigned.

4. RELATED DOCUMENTS

Number	Type	Description
SMI-LOG-035	Excel – Prints in PDF	(*) - Product Checklists – "Job Router" (SMI-LOG-035E tab)
SOP-MA002	PDF Format	Mechanical Grinding and Polishing Procedure
SMI-LOG-003	Excel – Prints in PDF	(*) - SMI-LOG-003 Weld / Inspection Log (As required)
NA	PDF Format	(*) - Weld Map Drawing (per contract)
NA	Excel – Prints in PDF	(*) - SMI Welder Currency Log
BPE	PDF Format	(*) - ASME-BPE (Latest Standard)
NA	PDF Format	(*) - SMI Welder Procedure Qualification Record
NA	Excel – Prints in PDF	(*) - SMI Welder Welding Procedure Specification
NA	PDF Format	(*) - SMI Welder Performance Qualifications
SOP-QA002	PDF Format	(*) - Material Certification Procedure
SOP-W001	PDF Format	(*) - Welding-Stainless Steel Hygienic & Non-Hygienic Tubing – Non-BPE Applications
SOP-W004	PDF Format	(*) - 3-A Sprayball Manufacturing and Welding Procedure
SMI-LOG-080	Excel – Prints in PDF	(*) - Inspection Data Capture Form (SMI-LOG-080E tab)

Note: (*) signifies in table above that document is reference only if specified

5. DEFINITIONS

TERM/ACRONYM	DEFINITION
Progressive grinding	A series of steps using decreasing grit sizes in order to remedy an existing surface condition.
Color clean	To remove any discoloration produced in the welding procedure without removing any of the weld.
Blasting	Uniform finish produced by using blasting media (glass beads and aluminum oxide mixture) applied mechanically.
Surface Measurement	Measure finish across the lay of the grain per latest ASME BPE-2009

6. SAFETY PRECAUTIONS

All safety procedures are followed in the performance of this test to prevent personal injury or damage to the equipment.

a) Company PPE for shop environment as required
b) Safety is evaluated for each SOP, work instruction, and or process, implementation is based on its evaluation
c) Regulations for safety elements related to OSHA are part of the safety manager's responsibility
d) The safety element will be written in that specific document as it applies

7. PROCEDURE

a) The following are general procedures used in mechanically polishing vessel(s), framework(s), fitting(s), piping, spray ball(s), supply tube(s), strainer, and other accessories.

b) This procedure utilizes Progressive Grinding process steps taken through (320) grit, however; depending on the customer requirements, a lesser mechanical polish or varying process may be used.

c) It is frequently necessary to employ a series of steps using decreasing grit sizes in order to remedy an existing surface condition.

d) The initial grit size is selected on the basis of what coarseness of abrasive is needed to remove the major portion of the unwanted condition.

e) The operation is completed by using a graduated series of successively finer grit steps until the desired final finish is attained.

f) The bulk of the job is accomplished with the coarser grits; and the finishing is done with the finer grits.

7.1 Standard COP Grinding Process

The following process is being implemented to ensure our customers a quality, uniform product.
Use the tools and proper grit listed to grind the following:

a) INSIDE CORNER:
- 1.0” Cosmo Cylinder using 60 X.
- Smooth out and blend with Dyno-File with “scotch-bright” red belt.
- (may need to dolly corners in for better contour before grinding).

b) SUMP
- 1.0” Cosmo Cylinder using 60 X on weld.
- 120 merit wheel, (spindle buff) - (medium).
- Sump Face, (medium buff and hand “scotch-bright” to get circular grain around sump fitting).

c) TOP CORNER
- 5.0” Cosmo Wheel with 80 X on vertical welds.
- 1.0”, Cosmo Cylinder with 60 X on inside horizontal weld.
- 120 merit wheel, (may need to dolly corners for better contour).

d) JETS
- Tape 1.5” from Jet center to top and bottom to create a 3-Inch horizontal strip across tank.
- Disc jet welds with 80 X 0.5”, Cosmo Wheel with 120 X.
- 120 Flapper Wheel, (medium spindle buff .4.1.5 bottom).
- Sump End, (Tape line half way through Sump Ferrule).
- 5 weld Disc 80 grit, then 5.0” 80 X on weld.
- 120 merit wheel, on 80 X area.
- 120 Flapper wheel whole area(s) then medium spindle buff.
- Opposite End – Tape 5.0” in from bottom seam weld, repeat the grinding procedures as above.

e) INSIDE SEAM:
- Tape a line 1.5” in from side seam weld.
- 80 X disc then 5.0” wheel with 80 X belt.
- 120 merit wheel, (120-flapper wheel; medium spindle buff).

f) OUTSIDE SEAM
- Tape Line 1.5” in from side seam weld.
- Use spindle buff to color clean welds

g) FITTINGS
- Use correct template size if possible, (White wheel or square pad weld).
- 120 merit wheel, (Gray wheel fitting and template area).
- Red flexible “scotch-bright” wheel for final finish.

h) TOP RAIL

- Use correct template to give you a 2.0" depth tapeline on inside of tank.
- Dyno-File corner radius for uniform grain.
- Use Dyno-File or brown Scotch-Bright wheels on "straight-a-ways" and blend to corners.
- Use red flexible Scotch-Bright wheel for final finish.

i) TAPE FOR BLAST

- Tape top rails.
- Use correct template along bottom of tank to achieve an 8.0" tapeline from bottom of tank to above harnesses all around the tank.
- Tape above marker line all around the tank with black 2.0" blasting tape.
- Exterior corners – Tape 0.5" above horizontal weld(s).
- Vertical welds – Tape 0.5" on outer sides.
- Cover any exposed metal not to be blasted with duct tape or white plastic.

7.2 Standard CIP Grinding Process

The following process is being implemented to ensure our customers a quality, uniform product.
Please use the tools and proper grit listed to grind the following:

a) Important Notes:

- When putting on the masking tape for polishing or blasting put the tape to the outside of you "marker lines" so that the marker lines will be polished off or sandblasted off. (This saves a lot of clean-up time at final assembly).
- Also, do not use red markers. For some reason, red markers are much harder to clean than other colored markers.

b) SIDE SEAM:

- Tape with masking tape 3.0" wide or 1.5" from center of weld each side.
- If this weld has not been strip ground already or if the strip grinding is unacceptable, use an 80 X (for an unground weld only), then a 120 X "Cosmo" wheel (for both an unground weld and an unacceptable strip ground weld).
- Merit or "flap-wheel" with 120 X.
- Polish with a medium spindle buff.
- Remove masking tape and re-tape all exposed metal with white plastic.

c) BELT SEAM OR MIDDLE SEAM – (if tank has one):

- Tape with masking tape 3.0" wide or 1.5" from center of weld each side.
- Grind weld flat with a disc grinder and X disc.
- Use a Cosmo wheel with a 120 X grit belt.
- Merit or "flap-wheel" with 120 X.
- Polish with a medium spindle buff.
- Remove masking tape and re-tape all exposed metal with white plastic.

d) TOP HEAD SEAM:

- Use template with marker to obtain a line about 2-1/4" from top of head all the way around head.
- Tape with masking tape leaving marker line exposed.
- Grind weld flat with a disc grinder and an 80 X disc.
- Use a "Cosmo" wheel with a 120 X belt.
- Merit or "flap-wheel" with 120 X.
- Polish with a medium spindle buff.
- Remove masking tape and re-tape all exposed metal with white plastic.

e) HEAD FITTINGS:

- Tape or required template according to ferrule size.
- Grind outside weld of ferrules or fittings with a Hex pad or white wheel, then 80 grit merit(s).
- Polish all area of ferrule and up to template with a 2A medium gray wheel.
- Final polish all areas with a soft red Scotch-Bright wheel.
- Remove template.

f) OVERFLOW ROD – (if tank has one):

- Tape required template around colored area on top head.
- Polish entire area with a 2-inch red "roloc" disc, polishing from the middle to the edges.
- Final polish with a piece of red hand scotch bright.

g) SIDEWALL FITTINGS – (if tank has one):

- ***NOTE: Use same steps as head fittings unless the fittings are below the sand blast line near the bottom of tank, in that case, you do not need to do anything to the outside of them.***

h) COLOR CLEAN - INSIDE DIAMETER:

- Remove all color and weld blackness inside of all fittings on the tank (including inside diameter of top and bottom end of the overflow tube) by using a brown Scotch-Bright wheel mounted on an arbor used for cut-off wheels.
- Remove color on all other welds inside tank using multiple brown Scotch-Bright wheels sandwiched together on an angle grinder or “L” head.
- You may need to use the same wheel that you used for color cleaning the fittings mounted on a small angle grinder for tough to get at spots or maybe a wire brush.
- Color clean outside of sidewall (around anti-vortex plates) where anti-vortex plate is welded and blend in finish to match tank sidewall.
- Remove paper from inside of tank.

i) TAPE FOR BLASTING:

- First, clean area you will be taping.
- Using a template mark around bottom head between the tank legs about 4.25” from bottom of tank and tape with black sand blasting tape (with marker line exposed so that it will be sand blasted off) so that no bare metal is exposed above the tape line.
- Using the black sand blasting tape, tape around the hinges on the top head leaving a 1.0” gap between the hinges, and the black sand blasting tape.
- Using gray duct tape, tape the faces of all ferrules and openings shut to keep the sand out of the tank.
- In addition, either tape layers across the manway opening to use a round piece of cardboard and tape the edges to hold it in place.

7.3 Component and or Sub-Weldments Grinding Process

Note: Process requirement sections listed above that identify inside, outside, seam welds, corners, etc. will be applied to lower level Component and or Sub-Weldments as required.

8. INSPECTION

The following section will outline the minimum inspection requirements for sanitary and non-sanitary surface finish in sanitary and non-sanitary applications.

8.1 Non-Sanitary Applications Inspections

- A visual inspection of all assemblies will be the minimum requirement and may or may not be documented.
- Additional documentation may be generated through a customer requirement or a random inspection.
- All surfaces will be visual inspected for compliance with the surface finish specified in the assemblies drawing.
- Typical finish requirements of color cleaned, and bead blasted will be checked for uniformity.

8.2 Sanitary Applications Inspections

- All non-product contact surfaces will be visual inspected to assure compliance with the finish specified in the assembly drawing.
- The visual inspection of all assemblies will be the minimum requirement and may or may not be documented.
- When necessary, additional lighting and/or mirrors will be used to inspect inaccessible areas.
- When a finish of 35 Ra or finer is specified, a minimum of 2 areas of each assembly will be verified including areas which are difficult to visually inspect, using a “profileometer” and the inspection location and results will be noted on the shop assembly drawing.

9. ACCEPTANCE CRITERIA

The following acceptance criteria will be used for visual inspections.

a) **Pits** ---------- No pits greater than 0.020" is allowed.
b) **Cluster of Pits** ---------- No more than 4 pits in a 0.50" x 0.50" in window are allowed.
c) **Dents** ---------- None are allowed.
d) **Finish Marks** ---------- The Ra requirement must be met.
e) **Welds** ---------- If welds are finished, they must be smooth and blended.
f) **Scratches**:
- Tubing – cumulative length of scratches must be less than 12.0" per 20 foot of tubing.
- Fittings – Ra max must be met.
- Tanks – less than 0.05" per 4.0" x 4.0" inspection window.

g) **Surface Cracks** ---------- None are allowed.
h) **Surface Inclusions** ------- None are accepted.
i) **Surface Residuals** ------- None are acceptable.
j) **Porosity** ---------- None open to surface.

NOTE: for additional definitions refer to ASME BPE – (active year), section SF

10. POLISHING AND GRINDING MATERIALS

Interior Material		
Internal Material	Internal Vessel Seams	Internal Fitting Welds
120 grit Pad	80 grit Sleeve	120 grit Square Block
120 grit Sleeve	120 grit Pad	120 grit Cartridge Roll
180 grit Red Wheel	120 grit Sleeve	180 grit Wheel
180 grit Grey Blender	180 grit Wheel	180 grit Grey Blender
240 grit Flap Wheel	240 grit Flap Wheel	180 grit Scotch Bright
320 grit Grey Blender	320 grit Grey Blender	240 grit Flap Wheel
		320 grit Grey Blender

Exterior Material		
External Material	External Vessel Seams	External Fitting Welds
120 grit Pad	120 grit Pad	120 grit Square Block
120 grit Square Block	120 grit Sleeve	120 grit Cartridge Roll
180 grit Red Wheel	120 grit Flap Wheel	180 grit Wheel
180 grit Grey Blender	180 grit Red Wheel	180 grit Scotch Bright
180 grit Scotch Bright	180 grit Grey Blender	
	180 grit Scotch Bright	

SURFACE FINISH COMPARISON		
No.	Grit Size	Ra
3	120	43 - 48
4	150	30 - 35
4	180	23 - 28
7	240	15 - 20
8	320	9 – 13

11. CUSTOMER SIGNOFF

The following signoff table requires each customer representative involved in any part of a final product test (which uses this SOP to execute that test) to fill in the following information

NO.	NAME (PRINTED)	COMPANY / TITLE	SIGNATURE	INITIALS	DATE

END OF PROCEDURE