

Engineering Change Notification

Supplier Name: Heller Industries

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Original Date Presented: 6/6/2023

ECC Class: <input checked="" type="checkbox"/> A <input type="checkbox"/> B	Owner:	ECN #:	Rev #: INT
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(Basic guidelines: A=Form/Fit/Function / B=Manufacturability/Documentation)

Sec.1 – Change Description: (include HW/SW changes, supplier changes, site changes, cosmetic changes, procedure/process changes, etc.)

Reactor Catalyst Upgrade And Return Gas Into Flux Box

SEC.2 – Equipment Affected:

ALPHA 2043MK7 NGBA ALL OVEN

SEC.3– Change Outline

Change Item	Present Value	Proposed Value	Reason for Change
Reactor Catalyst	205019+2210186	4177290+4188290+4195751-xx	Improve and enhance flux collection efficiency to make the oven chamber cleaner
Return Gas Into Flux Box	205000 (Bottom Exhaust ,reactor)	4190980 (Update KIT)	Improve and enhance flux collection efficiency to make the oven chamber cleaner

SEC.4 – Description of Change:

a. Problem Statement:

Improve and enhance flux collection efficiency to make the oven chamber cleaner

b. Proposed solution:

1. Reactor Catalyst Upgrade
2. Reactor return Gas from bottom PLD change to Large Flux box .

SEC.5 – Concerns/Considerations (risks, what could go wrong?) – list not applicable N/A

Concern	Tested and Passed	Data Still Pending	Not Affected
Factory interface (AFE/FEI)	N/A	N/A	O
Link Integration	N/A	N/A	O
Defects / Contamination	N/A	N/A	O
Backside visible marks / discoloration / scratches	N/A	N/A	O
Backside contamination	N/A	N/A	O
Front-side visible marks / discoloration / scratches	N/A	N/A	O
Front-side Mechanical Particles	N/A	N/A	O
Front-side Particles From Process	N/A	N/A	O
Process Concerns	N/A	N/A	O
Uniformity	N/A	N/A	O
Defect	N/A	N/A	O
Film Contamination	N/A	N/A	O
Automation	N/A	N/A	O
Tool Communication/Automation	N/A	N/A	O
Link Communication/Automation	N/A	N/A	O
Tool Output Impacts	N/A	N/A	O
Repair Time	N/A	N/A	O
Units Between Interrupts	N/A	N/A	O
Run Rate	N/A	N/A	O
Procedure/s Validated	N/A	N/A	O
Associated Tools, File, etc. Validated	N/A	N/A	O

1. Has form/fit/function been validated? If so, explain:

Form/Fit/Function have been validated on test oven (CO#700357)

2. Test plan outlined? If so, explain:

- Remove old reactor catalyst from oven
- Add new reactor catalyst to oven
- Update reactor return Gas tube from bottom PLD to Large Flux box
- Heating oven for testing

SEC.6 – Side-by-Side Images

Original (POR)

JOOZEO

Molecular Sieve JZ-ZMS9

Description:

JZ-ZMS9 is Sodium aluminosilicate. It could absorb the molecular which diameter is not more than 9 angstroms.

Applications:

1. Purification of gas in air separation plant, removal of H₂O, CO₂ and hydrocarbons.
2. Dehydration and desulfurization (removal of H₂S and mercaptan, etc.) of natural gas, LNG, liquid alkanes (propane, butane, etc.).
3. Deep drying of general gases (e.g. compressed air, permanent gas).
4. Drying and purification of synthetic ammonia.
5. Desulfurization and denitrogenation of Aerosol.
6. CO₂ removal from pyrolysis gas.

Specification:

Properties	Unit	sphere		cylinder	
Diameter	mm	1.6-2.5	3-5	1/16"	1/8"
Static Water Adsorption	±%	26.5	26.5	26	26
CO ₂ Adsorption	±%	17.5	17.5	17.5	17.5
Bulk Density	±g/ml	0.54	0.62	0.62	0.62
Crushing Strength	±N/Pc	26	80	25	60
Attrition Rate	±%	0.2	0.2	0.2	0.2
Package Moisture	±%	1.5	1.5	1.5	1.5

Standard Package:

sphere: 140kg/steel drum; 25kg/paper drum; 25kg/ paper bag (A)
cylinder: 125kg/steel drum

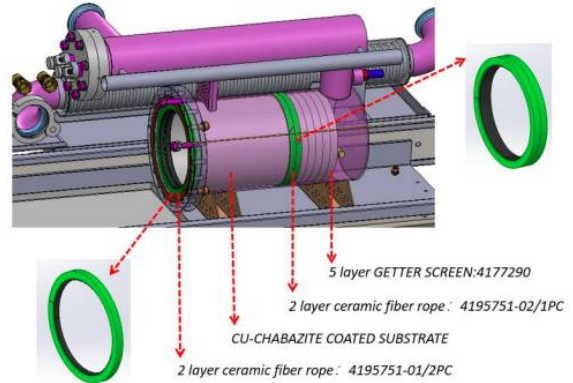
Attention:

The product as desiccant cannot be exposed in the open air and should be stored in dry condition with air-proof package

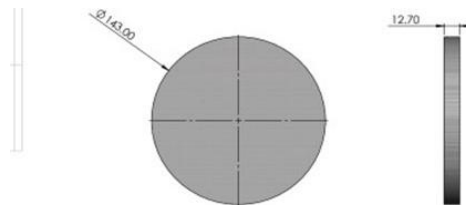


Proposed Change

New catalytic design shown



The GPF ceramic filter technology must first be wrapped with aluminum foil. 3-5 perimeter wrap layers is suggested. However, if more Aluminum wrap can be accommodated, that would help prevent by-pass. Please proceed.



- NOTES:
1. MATERIAL : DIN OC25A15
 2. WIRE DIAMETER : Ø0.35 ±0.02 MM
 3. DENSITY : 1.15 G/CM3
 4. WEIGHT : 234±2.5 G
 5. VOLUME : 203.3 CM3
 6. WASH KNITTED WIRE MESH IN NONIONIC CLEANER TO RID SURFACES OF FORMING OILS AND PHYSICAL DEBRIS
 7. THERMALLY OXIDIZE MESH SUPPORTS AT 920C/2HRS/AIR WITH A PASSIVE COOL DOWN PERIOD.

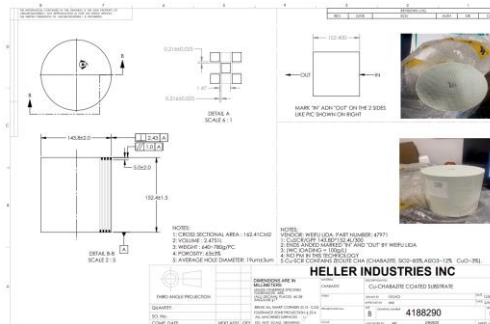
HELLER INDUSTRIES INC

THIRD ANGLE PROJECTION		DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SPECIFIED TO REMAIN AS SHOWN (2) DECIMAL PLACES (0.01) MINIMUM		DRAWING NO. 4177290	
QUANTITY:	QTY	DATE:	DATE	REVISED BY:	REVISED
SQ. NO.:	QTY	DATE:	DATE	REVISED BY:	REVISED
COMP. DATE:	QTY	DATE:	DATE	REVISED BY:	REVISED

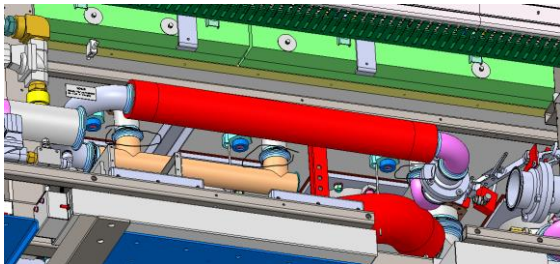
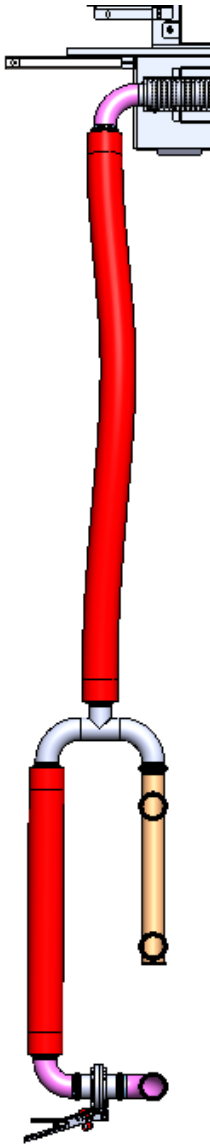
Original (POR)



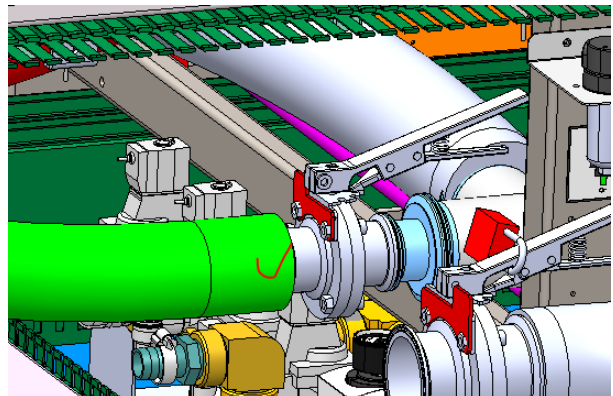
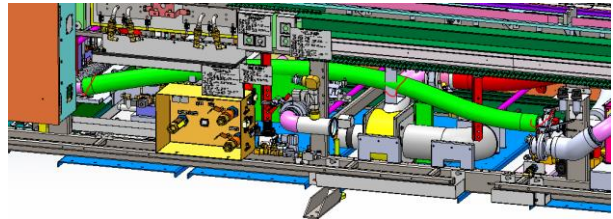
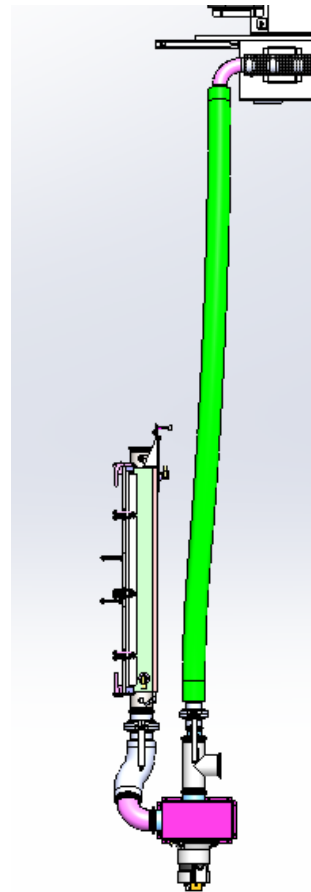
Proposed Change



Original (POR)



Proposed Change



SEC.7 – Supporting data

1. Specifications

N/A

2. Test Data Summary

10KG flux test on reactor catalyst :

--- Flux condition looks better, helpful for PM

--- PPM drops after the catalyst

Previous 10KG Flux Test Picture in 2020



This time 10KG Flux Test Picture in 2023



Previous 10KG Flux Test Picture in 2020



This time 10KG Flux Test Picture in 2023





Reactor Gas IN& OUT PPM Data				
	Gas IN		Gas OUT	
	Running Flux	No Flux	Running Flux	No Flux
O ₂ PPM	<0.5	13.80	<0.5	1.803

>> . After running the first 10kg Flux- 2692.5g

>> . After running the **Second** 10kg Flux- 2719g
>> . 26.5g heavier



Reactor Return Gas into Big Flux Box Test :

--- No impact on PPM

-- No impact on zone temperatures

Reference the PPT in the RFC.

3. Additional data gathered in support of proposed solutions

N/A

SEC.8 – Impacts

1. Safety/Health/Environmental Impacts: N/A

☐ 1.1. S2 compliance (will change effect compliance, is new compliance testing needed?):

☐ 1.2. Ergonomic impacts:

☐ 1.2.1. New or altered operator interface

☐ 1.2.2. New or altered coupling (grasping surface) for moving objects

☐ 1.2.3. New or altered distance from coupling to person performing lift

☐ 1.2.4. New or altered height of objects being lifted

☐ 1.2.5. New or altered existing parts weight

☐ 1.2.6. New or altered existing tasks with repetitive motion

☐ 1.2.7. New or altered stretching recommendation

☐ If answer is “yes” to any of the ergo questions above, contact the EHS owner to consult if a NIOSH lifting analysis is required.

NIOSH calculation done (Y/N, results):

1.3. New potential hazards N/A

☐ 1.3.1. Chemical (new chemicals or alter the way existing chemicals are stored)

☐ 1.3.2. Mechanical (new or altered existing mechanical components that create or alter existing mechanical hazards)

☐ 1.3.3. Thermal (new or altered existing potential exposure to >50C or <0C)

☐ 1.3.4. Radiation (new or altered existing potential exposure to RF, UV, lasers, ionizing sources, noise)

1.4. Electrical changes impacting load ratings N/A

☐ 1.4.1. Breaker change in size or number

☐ 1.4.1.1. Requires an updated cable matrix if a breaker in the main power cabinet is resized (must include ECC package)

☐ 1.4.1.2. Has the breaker load ratings been evaluated for impact to all upstream and downstream component/wiring rating by an electrical engineer?

☐ 1.4.2. Wire change in size or number

☐ 1.4.2.1. Requires an updated cable matrix if a breaker in the main power cabinet and module is resized and/or wires are added/subtracted (must include ECC package)

☐ 1.4.2.2. Has the new wiring been evaluated for current rating and voltage drop by an electrical engineer?

☐ 1.4.3. Transformer change in size or number

☐ 1.4.3.1. Requires an updated transformer matrix (must be included in ECC package).

☐ 1.4.3.2. Has the new transformer been evaluated for impact to all upstream and downstream component/wire ratings by an electrical engineer?

☐ 1.4.3.3. Has the transformer been evaluated for proper grounded (safety ground and ground reference) by an electrical engineer?

1.5. Personal Protective Equipment (describe changes). N/A

- ☐ 1.5.1. New or altered lifting devices
- ☐ 1.5.2. New or altered exclusion zones.
- ☐ 1.5.3. New PPE type of change when existing PPE is required.
- ☐ 1.5.4. New or altered exclusion zone size and or location.

1.6. Control Of Hazardous Energies (describe changes): **N/A**

- ☐ 1.6.1. New or altered existing CoHE LOTO points/devices
- ☐ 1.6.2. New or altered methods/location for energy dissipation
- ☐ 1.6.3. New or altered methods, location, and or test equipment for energy dissipation verification.

1.7. Tool hardware interlocks including EMO (describe changes): **N/A**

- ☐ 1.7.1. New or changes to existing hardware interlocks and or EMO circuits.
- ☐ 1.7.2. New or changes to that require any hardware interlocks to be defeated

- ☐ 1.8. Tool software interlocks (New or changes to existing software interlocks) (describe changes): **N/A**

- ☐ 1.9. Safety/hazard labeling (New or alerted existing labeling) (describe changes): **N/A**

- ☐ 1.10. Guards or protective devices (New or alerted existing devices) (describe changes) **N/A**

- ☐ 1.11. Changes needed to PM procedures (describe changes): **N/A**

- ☐ 1.12. Environmental Impact (describe changes): **N/A**

- ☐ 1.12.1. New or alteration to existing tool exhaust and or emissions
- ☐ 1.12.2. New or alteration to existing decontamination or waste disposal procedures

- ☒ 2. Cost? **there are no changes in cost to Intel related to this change.**

- ☐ 3. Output (Run rate, availability)? **N/A**

- ☐ 4. Environmental Impact (exhaust, emissions, tool compatibility) **N/A**

- ☐ 5. Automation impact (impact to station controller, automation compliance standards)? **N/A**

- ☐ 6. Impact to facilities connections (Install package)? **N/A**

- ☐ 7. Impact to equipment fingerprint document? **N/A**

- ☐ 8. Have all user adjustable software and or firmware values been documented. **N/A**

- ☐ 9. Has the set up and or location of all adjustable components been documented. **N/A**

- ☐ 10. Have all key process parameters expect performance been documented (example heat up time, pump down rate etc). **N/A**

- ☐ 11. Contamination issue (metal, foreign materials)? **N/A**
- ☐ 12. Other impacts **N/A**
- ☐ 13. 3rd party interface and/or coordination required? **N/A**
- ☐ 14. Parts Quality – Are there special testing needs or QA steps required? **No need.**
- ☐ 15. Quality – Has supplier quality checks/processes for this/these specific part(s) been verified and documented, beyond First Article? **N/A**
- ☐ 16. Impact to CSI Document? **N/A**
- ☐ 17. Is this change a PROTOTYPE? (see section 12) **N/A**
- ☐ 18. Material Construction: **N/A**
 - ☐ 18.1. Is this component used in the vacuum/reaction chamber?
 - ☐ 18.2. Is this component located in a gas stream that contacts the wafer? Does this component contact the wafer?

SEC.9 – Software Considerations **N/A**

- ☐ 1. SW needs to be installed before HW?
- ☐ 2. HW needs to be present (or jumpered) for SW to run?
 - 2.1. If so, indicate HW:
- ☐ 3. HW can be jumpered if HW is not present
 - 3.1. If so, indicate HW:
- ☐ 4. Firmware needed?

SEC.10 – Implementation considerations

- ☒ 1. Estimated downtime (per tool)? **24 hours**
- ☒ 2. Has retrofit procedure validated and released? **YES**
- ☒ 3. Who will be performing the upgrade? **Heller FSE**
- ☒ 4. Is on-site tool upgrade required? **YES**
- ☐ 5. Are maintenance procedures impacted? **NO**
- ☐ 6. Is training required? (If yes, what is the plan?) **NO**
 - ☐ 6.1. Is FSE training required? **NO**
 - ☐ 6.1.1. Will install expert provide training and certification to key individuals?
 - ☐ 6.1.2. Who will provide training and certification to remaining FSE's?
 - ☐ 6.1.3. Who will own and track training and certification?

- ☐ 6.2. Has "tribal knowledge" documented? **N/A**
- ☐ 6.3. How are learnings from install/vendor qual documented? **N/A**
- ☒ 7. Have all potential stack-up issues been adequately addresses? **YES**
- ☒ 8. As result of change, will the QC inspection criteria for the parts have to be modified? **YES**
- ☒ 9. Have all the drawings and parts specifications been considered/revised for inclusion in inspection criteria? **YES**
- ☐ 10. Are there any special tools or expertise required to install/setup at Intel? **N/A**

SEC.11 – Implementation Plan

- ☐ 1. Is this a documentation only change? **NO**
- ☐ 2. What is the impact to BOM/spares (include PN, stocking level and quantity recommendations)
 - ☐ 2.1. List recommended new spares for this ECN:
 - ☐ 2.2. List recommended adjustments to existing spares stocking levels for this ECN **N/A**
 - ☐ 2.3. List parts made obsolete by this ECN- **N/A**
- ☐ 3. Part exchange impact
 - ☒ 3.1. Is new part a direct replacement for the old part? **YES**
 - ☐ 3.2. Is new part NOT a direct replacement for old part?
 - ☒ 3.3. What is the new part availability/lead-time (estimate)? **Lead-time 2 week**
 - ☐ 3.4. Other: **N/A**
- ☐ 4. New tool disposition:
 - ☐ 4.1. Use up existing inventory and cut in when all parts stock has been depleted.
 - ☒ 4.2. Cut in immediately. If so, tool ID for first install. **Yes, cut in on new production tools.**
 - ☐ 4.3. Other
- ☐ 5. Existing tool disposition
 - ☐ 5.1. Replace old part with new part when old part fails?
 - ☐ 5.2. Replace old part with new part retrofit kit when old part fails?
 - ☒ 5.3. Retrofit part/kit to all tools in the field? **YES**
 - ☒ 5.4. Part availability/lead-time (estimate)? **no change to lead time/availability**
- ☐ 6. Spare parts disposition management.
 - ☐ 6.1. Use new parts and old parts interchangeably? **NO**
 - ☐ 6.2. Segregate old parts from new parts. Use up all parts before using new parts? **NO**
 - ☒ 6.3. Recall all old parts and replace with new parts. Old parts CANNOT be inspected and/or reworked to be like new. **YES**
 - ☐ 6.4. Recall all old parts. Inspect/rework old parts like new criteria and return as new parts. **NO**
 - ☒ 6.5. Parts availability/lead-time (estimate) **no change to lead time/availability**
 - ☐ 6.6. Other
- ☐ 7. Have the old parts been purged from supplier inventory to avoid mixing and prevent accidental shipment of obsolete parts? **NO**
- ☐ 8. Has a commercial agreement been reached? **N/A**

SEC.12 – Prototype Hardware (Fast Track) Minimum Criteria before Shipment **N/A**

- ☐ 1. Has an engineering draft procedure been reviewed with Intel engineering and supplier FSE?
- ☐ 2. Has the form/fit/function test defined by Intel and supplier's engineering owners?