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AGI Production Part Approval Process (PPAP) Manual for Associated Gas Reformer Systems

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James Cristiano, Senior Vice President Supply Chain

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For further information concerning AGI's Quality or the content of this Manual, you may contact your AGI Quality Representative at: quality@agigreentech.com.

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1. INTRODUCTION.

1.1 Purpose. The purpose of this PPAP Manual is to define the qualification process and requirements for new and revised Goods that AGI has deemed are critical. This Manual will be updated by AGI, at its sole discretion from time to time. If AGI modifies or amends the Manual, AGI shall communicate to Supplier by placing a notification on the AGI Website and by sending written electronic notification within 14 days of updated Manual release.

The purpose of the Production Part Approval Process is to ensure that Supplier understands AGI's requirements and Supplier's manufacturing process is capable of producing product that consistently meets these requirements at the quoted production rate.

1.2 Scope. This document describes AGI's qualification requirements for Suppliers or Supplier's subcontractors who are required by AGI to submit a PPAP for Goods, including bulk materials, used in the manufacture and assembly of AGI products. AGI will only request PPAP submission for critical products being qualified for the first time for AGI products or for product previously approved per PPAP requirements outlined in this manual and going through an engineering change either requested by AGI or initiated by the supplier or its supply chain.

1.3 Applicable Documents. The following documents and reference materials listed in this section are applicable to the extent used, referenced or specified by AGI in any Contract between Supplier and AGI

1.3.1 AGI Documents. It is the Supplier's responsibility to use and comply with the most current, AGI approved version of the following documents, which are available to the Supplier via AGI's website: <http://www.agigreentech.com>. The latest copy of this Manual, other documents of interest to the Supplier and notifications will be available at the above referenced AGI website. Permission to use and access to the AGI Website may be revoked by AGI in its sole discretion with or without cause or notice to the Supplier.

- * AGI Engineering Specifications
- * GP-85039 AGI Supplier Quality Manual for Associated Gas Suppliers
- * FM-85011 Supplier Deviation Request Form
- * FM-85020 Supplier Specification Change Request Form
- * FM-85030 Master Supplier Assessment Form (not a form yet)
- * FM-85045 Part Submission Warrant (PSW) Form
- * FM-85046 Run @ Rate Form (as required)
- * FM-85048 Process Flow Diagram Template
- * FM-85050 Control Plan Template
- * FM-85051 Gage R&R Template
- * FM-85052 Dimensional Test Results Template
- * FM-85053 Material Test Results Template
- * FM-85054 Performance Test Results Template
- * FM-85055 Initial Process Studies Template (as required)
- * FM-85057 AGI Supplier PPAP Submission Checklist

1.3.2 Industry Documents. Suppliers are encouraged to utilize and comply with, as applicable under the circumstances, all of the following:

- **MIL-STD-1686** Electrostatic Discharge Control Program for Protection of Electrical and Electronic Parts
- **ISO 9001** Quality Management System Requirements – General
- **ASME B31.1** Power Piping Code
- **ASME B31.3** Process Piping Code

1.4 Terms, Definitions and Acronyms. The following terms, definitions and acronyms that apply to this Manual include all of the following:

- **AGI** – Advanced Green Innovations, LLC
- **AGI Electronic communication mediums means communication via:**
 - AGI Supply Chain Portal or email
 - AGI Website <http://www.agigreentech.com>
- **ASME** – American Society of Mechanical Engineers
- **CAR** – Corrective Action Report
- **CoC** – Certificate of Conformance. Document that confirms that product meets requirements. This form is included with every shipment.
- **Conformance Data** – Data for every requirement on AGI drawing, report must include result, pass/fail status, test standard used (if applicable), equipment used to measure each characteristic and bubbled print.
- **Contract(s)** – Means and includes: a) AGI's Production Purchase Order, b) supply agreement and/or c) any other contract or other commercial transaction requiring the Supplier to make, manufacture, assemble, ship and /or supply Goods or a service to AGI in accordance with the terms, conditions and specifications expressly set forth therein.
- **Control Plan** – Written descriptions of the systems for controlling parts and processes.
- **COTS** – Commercial off the shelf. Item that is sold to the general public and has been purchased/used by other customers already. Will be used "as is".
- **Cpk** – The capability index to measure process stability
- **Critical Characteristic** – Fit/Function Characteristic and/or Safety Characteristics identified in AGI drawings.
- **Customer** -- The organization or person that receives a product, as used in this Manual it means any person, business, entity, and/or company that AGI (or its affiliates, partners, suppliers, distributors and/or franchisees) renders services to or supplies products or Goods to in accordance with any contract including AGI (or its affiliates, partners, suppliers, distributors, franchisees) as a contracting party.
- **FAI** – First Article Inspection
- **Fit/Function Characteristic** – Product characteristic for which significant variation is likely to affect fit, function, mounting, appearance, or the ability to process or build the product (Goods), but is not related to safety or legal considerations. Identified on AGI drawings with ⊗^F symbol.
- **Goods** – means and includes any article, material, component, part, product, resource and/or substance that is made, manufactured, assembled, or refined in accordance with AGI Specifications and supplied to AGI pursuant to any executed Contract. The Goods (ex: materials, products, parts, services) identified on a Purchase Order and described in the Specifications. The term "Product" is synonymous and used interchangeably with the word "Goods".
- **GR&R** – Gage Repeatability and Reproducibility. Study that measures error from gage (Repeatability) and environment, method and operator (Reproducibility).
- **MSA - Measurement System Analysis.** A mathematical method of quantifying variation of the measurement system.

- **NDA** – non-disclosure agreement between the parties to a contract.
- **Pass Thru Characteristics** – Product Characteristics that are not controlled or functionally tested anywhere downstream in the supply chain and would have significant impact on customer requirements or satisfaction.
- **PPAP** – Production Part Approval Process. Automotive qualification process adopted by AGI to qualify critical items.
- **Process** – A set of interrelated or interacting activities, methods, equipment, materials, methods and environment which transforms inputs into outputs.
- **PQP** – Product Quality Planning – Process used to develop and launch a product.
- **PSW** – Part Submission Warrant
- **Purchase Order** – A written offer by AGI (referred to as the "Buyer" or "AGI") for the purchase of the goods (the "Goods") and/or for the rendering of services (referred to as "Services") from the seller or Supplier (referred to as the "Seller") that expressly states the types, quantities and agreed prices for products or services and other legally binding contractual terms and conditions.
- **REACH** – Registration, Evaluation, Authorization and Restriction of Chemicals. A European Union regulation that addresses the production and use of chemical substances, and their potential impacts on both human health and the environment.
- **RoHS** - Restriction of Hazardous Substances. EU Directive that restricts the use of certain hazardous substances found in electrical and electronic products.
- **Safety Characteristic** – Product characteristic for which significant variation is likely to affect the product's safety or the product's compliance with government regulations. Identified on drawings with Ⓢ symbol.
- **Shall** – means that compliance with a requirement, process, procedure, method, Specification or action related to the services, Goods, or supply of Goods is mandatory, not optional or discretionary.
- **Significant Characteristic** – Product or process characteristic identified by AGI or Supplier and that can affect safety or compliance with regulations, fit, function, performance, reliability or customer satisfaction.
- **SOW** – Statement of Work means a written statement, exhibit or attachment to an AGI Contract that outlines, describes, details and defines the specific services, Specifications, types, levels, standards, qualities, quantities, timelines, deadlines and other characteristics relating to the production, manufacture, assembly and delivery of Goods or services to AGI.
- **SPC** – Statistical Process Control
- **Specification** – specifications for the Goods and includes, but is not limited to, attributes, characteristics, features, components, dimensions, measurements, requirements, rates, appearance, apparatus, functions, materials, details and criteria provided by Buyer to Seller in connection with or relating to the Goods.
- **SQE** – Supplier Quality Engineer
- **Supplier** – as used in this manual, the term Supplier refers to a provider of Goods or services to AGI.
- **Tier I Make** – Products, assemblies made at Tier I. Tier I is the recipient of AGI's contract.
- **Tier II Make** – Products manufactured for Tier I to AGI print by an outside supplier.

2. GENERAL REQUIREMENTS.

2.1 When is a PPAP Required? Depending on the maturity and complexity of a manufacturing process, product or technology, AGI may decide that the PPAP process is the most adequate process to qualify a product in order to minimize the risk of product failure.

2.2 Supplier Requests for Engineering Approval

After full PPAP approval by AGI, PPAP re-approval will be required for changes per AGI's Supplier Quality Manual section 3.3, Change Notification and Approval. Approval requirements will vary depending on the magnitude of change.

3. PPAP SUBMISSION PROCESS.

3.1 PPAP Process Initial Qualification. Once AGI determines a part requires PPAP submission for production approval the following steps will take place.

3.1.1 AGI gets supplier involved in design and development process as early as possible.

3.1.2 AGI issues FM-85057 "Supplier PPAP Submission Checklist" with required submission level and submission due dates. AGI will determine how many samples will be used for PPAP.

3.1.2.1 Representative Production Run. Product for PPAP shall be taken from a significant production run. This run shall be from one hour to eight hours of production unless otherwise approved in writing by AGI. Product from PPAP shall be manufactured using production equipment, production gaging, production process, production materials and production operators. Parts from each manufacturing piece of equipment shall be used.

3.1.3 Supplier submits data by submission dates for AGI review. AGI either approves or rejects data; if rejected, supplier will resubmit data per agreed due date.

3.1.4 Supplier conducts Run@Rate, as required. Supplier submits Run@Rate Form to AGI for acceptance.

3.2 PPAP Status

3.2.1 Approved. Indicates that finished product meets all PPAP requirements. Supplier is authorized to ship production quantities of the product subject to customer purchase order and releases. PSW signed by AGI shows "Approved" status.

3.2.3 Rejected. PPAP submission does not meet AGI requirements. Submission data or process shall be corrected and data resubmitted to AGI. Supplier is not allowed to ship unless they possess a PSW showing Approved or Interim Approved.

3.3 PPAP resubmission due to change(s).

3.3.1 Per "Change Notification and Approval" section of Supplier Quality Manual, Supplier submits change notification to AGI Buyer via Supplier Specification Change Request Form FM-85020.

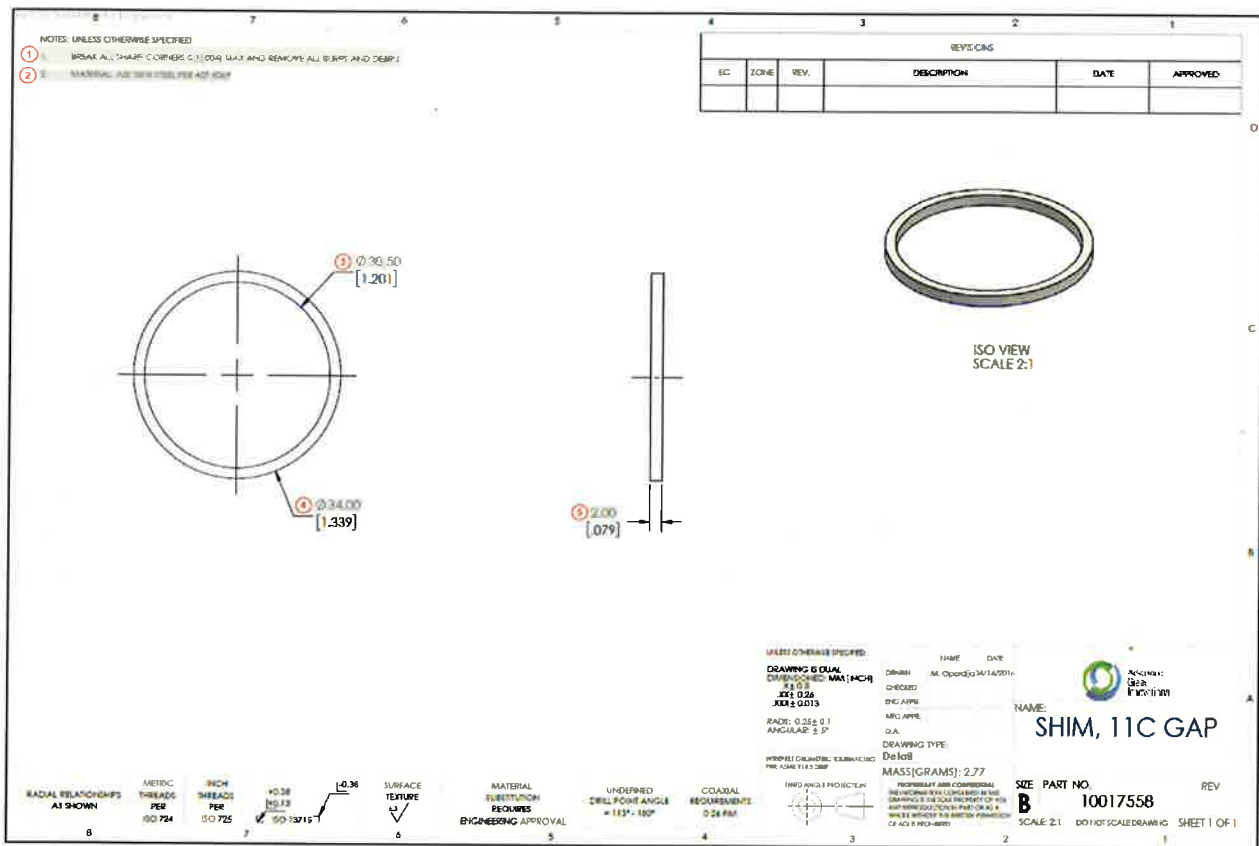
3.3.2 AGI reviews Change Request Form and replies in writing notifying Supplier which PPAP items must be resubmitted for approval.

3.3.3 AGI approves change by approving Change Request Form and PSW.

3.4 Submission Levels. AGI will determine and notify Supplier what part of the PPAP submission level is required for part approval. This will be identified in the PPAP Checklist (FM-85057)

4. PPAP ELEMENTS.

4.1 Design Records. Supplier shall submit a ballooned copy of the drawing and the numbers on the ballooned drawing shall correlate with the numbers referenced on dimensional, material, and performance results reports. The drawing shall be a copy of the AGI engineering released design record. Supplier shall meet all drawing requirements for PPAP approval.



4.2 Engineering Change Documents (If applicable). This applies only if AGI has approved any Deviations (FM-85011) that have not yet been incorporated into AGI drawings.

4.3 Customer Engineering Approval. AGI Engineering will grant approval via PSW.

4.4 Process Flow Diagram(s). The Supplier shall have a process flow diagram that clearly shows all steps of the process. The Process Flow Diagram is a living document that shall be updated if the process flow or assets used change.

The process flow Diagrams shall comply with the following:

- Illustrate the entire process from receiving through shipping, including staging, rework, inspections, outside processes and services.
- Describe how the product will move through the process, i.e., crane, conveyor, etc.
- Include all assets that are used in each step, i.e., MILL 1, MILL2, EOL 4.
- Correlate with steps, and checks identified in PFMEA and Control Plan.

4.5 Control Plan. The Supplier shall have a Control Plan that defines all methods used for process monitoring and control of the total system. The Control Plan covers three distinct phases: prototype, pre-launch, and production. A single Control Plan may apply to a group or family of products that are produced by the same process at the same source.

The Control Plan shall comply with the following:

- Prepared by a cross-functional team.
- Use the Process Flow Diagram, DFMEA, PFMEA and lessons learned to develop Control plan.
- Include all controls identified in PFMEA in Control Plan.
- Identify material specifications requiring inspections.
- Address all processes from receiving to packaging.
- Ensure gages required for test and inspection are included in Control Plan, available, calibrated and with a current and passing GR&R.
- Ensure inspection sample sizes are adequate.
- Include error proofing controls for Pass-Thru characteristics.
- Include a full dimensional layout study completed at least annually.
- FM-85050 (See Appendix A) or AIAG compliant format shall be used.

4.6 Measurement Systems Analysis Studies. (If applicable) The Supplier shall develop or obtain gages and standards to control their processes and to determine product conformance to specifications. The Supplier shall perform Measurement Systems Analysis (MSA) studies, e.g., GR&R, bias, linearity, stability, for all new or modified gages, measurement, and test equipment.

Acceptance criteria for GR&R results is as follows:

TABLE 4-1		
GR&R	Decision	Note
Under 10%	Acceptable	
10% to 30%	Acceptable only for non-significant characteristics	Acceptable only with AGI approval.
Above 30%	Unacceptable	MSA needs improvement by repairing gage, changing method, etc.

4.7 Dimensional Results. The Supplier shall provide evidence that dimensional verifications required by the AGI drawing and Control Plan have been completed and comply with specifications. Dimensional results form FM-85052 or similar shall be used.

The results report shall correlate with bubbled print and include AGI part number and revision and clearly show whether result is pass or fail. Use of gage pins, or go/no go gages can be supplemental but the main form of measurement should yield an actual numerical result. Go/no go gage use is acceptable as main form of inspection method only for thread gages.

4.8 Materials, Performance Test Results. The Supplier shall provide evidence that the material and performance verifications required by the design record and Control Plan have been completed and that results indicate compliance with specified requirements for all parts and product materials with chemical, physical, metallurgical, and functional performance requirements. Materials Test Results form FM-85053 and Performance Test Results form FM-85054 or similar shall be used.

4.9 Initial Process Studies (if applicable). The purpose of the Initial Process Capability Studies is to determine if the production process is likely to manufacture product that will meet AGI requirements.

Supplier shall provide Cpk data for Significant Characteristics based on AGI product once enough data is gathered to calculate Cpk.

Acceptance criteria for Cpk results is as follows:

TABLE 4-2		
Cpk	Decision	Note
At least 1.33	Required for Significant Characteristics	AGI requires 100% inspection of Significant Characteristics not meeting this Cpk.
At least 1.0	Acceptable only for non-significant characteristics	
Under 1.0	Unacceptable	Supplier shall notify AGI and stop production until process is corrected, or AGI grants Deviation Approval to proceed in writing.

Supplier can use AGI calculation forms, their own forms or any statistical software package to conduct calculations. Supplier should always provide to AGI data points along with capability results.

4.10 Qualified Laboratory Documentation (if applicable). If the Supplier uses a third-party laboratory to perform any testing called out on the AGI Drawing, Contract or Control Plan, the Supplier shall provide documentation showing laboratory is qualified and/or accredited to perform such tests. i.e., ISO-IEC 17025.

4.11 Records of Compliance with Customer-Specific Requirements. Evidence must be submitted for each of the items in section 5.

4.12 Part Submission Warrant (PSW). Supplier shall submit one filled out PSW form FM-85045 per part number. AGI will use the PSW to document PPAP approval, rejection or interim approval.

5. AGI SPECIFIC REQUIREMENTS

5.1 Run @ Rate (if applicable). The purpose of Run@Rate is to confirm and verify that the Supplier's manufacturing process is capable of producing products that meet AGI's quality requirements, at quoted CPV, for a specified finite period of time. Supplier shall fill out Run@Rate form FM-85046 or equivalent and submit completed form as part of the PPAP submission package.

At a minimum, a demonstration of production, over a continuous three (3) hour period of time, at the CPV production rate is required.

5.2 Packaging confirmation For service parts, AGI shall approve packaging and quantities.

5.3 Traceability Compliance Supplier shall sign statement certifying that it will comply with AGI required traceability requirements.

5.4 ASME Certification (If applicable). If applicable, Supplier shall provide a copy of ASME Certificate to certify that they comply with required ASME standard(s).

5.5 Supplier Assessment. AGI representative(s) or a third party authorized by AGI may conduct an assessment using Master Supplier Assessment Form FM-85030, Supplier is expected to close out all items before PSW can be approved.

5.6 AGI Supplier Requirements PPAP Submission Checklist. Supplier shall use PPAP checklist FM-85057 or similar to keep track and communicate PPAP elements submission status.

Supplier may use their own forms with AGI written approval, or the latest revision of AGI Forms.

This Manual may be amended or modified by AGI in its sole and unilateral discretion from time to time. Supplier shall complete review of modifications within (10) ten business days after receipt of the written notification from AGI and Supplier shall send AGI an implementation plan for compliance with the amendments or modifications.