# PRODUCT REALIZATION

**Document #: QM7**
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## PURPOSE

To establish policies and procedures for Product Realization activities using process and systems approaches.

## SCOPE

This document defines requirements of the QMS in planning, identifying customer requirements, purchasing, process control, product and service control and measuring devices.

## REFERENCES

Quality Manual (QM) procedures 4,5,6,8
ISO 9001 – Quality Management Systems – Requirements

## DEFINITIONS

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|---|---|
| Organization: | Georgia Gulf Sulfur Corporation, including Georgia Gulf Sulfur, Holly Industries, International Sulphur, Inc., and S.F.Sulfur |
| QMS: | Quality Management System |
| CSR: | Customer Service Representative |
| C of A: | Certificate of Analysis |
| Top Management: | CEO/Quality Manager and President/ISO Management Representative |
| Design Committee: | CEO/Quality Manager, President/ISO Management Representative and Vice President of Manufacturing/Plant Manager |
| Crude Sulfur: | General terminology for bulk molten sulfur or bulk solid sulfur Having a minimum purity of 99.5%, excluding up to 1% moisture that may be added to bulk solid sulfur to hold down Dust during transportation. |
| Recovered Sulfur: | General terminology used to identify molten sulfur that is a byproduct of natural gas processing or petroleum processing. This sulfur is derived from $H_2S$ that is naturally occurring in hydrocarbons. |
| Frasch Sulfur: | Refers to sulfur that is mined utilizing super-heated water injected into naturally occurring sulfur deposits. |

## RESPONSIBILITY

All responsibilities related to this element are found in the Procedure section of this document.

## PROCEDURE

# 7 Product Realization

## 7.1 Planning of Product Realization

Based upon customer requirements, the MRC has planned and developed the processes necessary to meet customer requirements. The processes and their interaction as a system are documented on the Process Flow Chart (Doc 1).

Planning is consistent with the quality policy, quality objectives, and product development and verification activities.

### 7.1.1 Product Quality Requirements

The Sales Representatives and Customer Service Representatives gather product quality requirements from the customers and communicate these requirements to the rest of the organization.

### 7.1.2 Quality Records

The ISO Management Representative identifies all required records necessary to demonstrate the effectiveness of the QMS. These records are listed in the Master Records List (Doc 4).

## 7.2 Customer Related Processes

### 7.2.1 Determination of Requirements Related to the Product

All orders are taken by referencing a coded specification. The Organization has an established policy to maintain a central file containing a copy of all customer and internal specifications.

The organization also abides by statutory and regulatory requirements of the sulfur industry and by all requirements applicable for the effective specified uses of the product.

### 7.2.2 Review of Requirements Related to the Product

The Customer Service Representative is authorized to communicate with the customer and will review the product requirements prior to committing to supplying a product to the customer. Prior to final acceptance of the order, the

CSR confirms product availability and transportation arrangements.

**7.2.2.1 Sales Order Entry**

CSR receives customer sales orders by telephone and enters order information onto the Order Form (Form 3). Orders are also received via email and fax and then all orders are entered into the computer system to generate a contract, Sales Order (Form 4) [Peachtree Accounting is used for all companies], which constitutes acceptance of the order.

**7.2.2.2 Review of Requirements**

The CSR evaluates the order for the ability to meet defined requirements. If unsure, they consult the National Sales Manager or the President for a decision.

**7.2.2.3 Long Term Contracts**

The President receives long-term contract requests from several customers. Customer requirements are documented by the customer on their own contract form in this case. Prior to final acceptance of the order, the President confirms product availability for the upcoming time period covered by the contract.

**7.2.2.4 Capability Demonstration**

Capability demonstration to fulfill the long-term contract, based on confirmed product availability, is confirmed by the date, initials or signature of the President on the long-term contract. These initials or this signature constitutes acceptance of the order.

**7.2.2.5 Order Changes**

Orders are changed using Change Control (Form 1), which is then attached to the face of the Sales Order. The original order, with change control attached, will be resubmitted to the manufacturing plant to execute the change. The plant manager is responsible for ensuring

that all relevant personnel are made aware of the changed requirements.

### 7.2.3 Customer Communication

The Organization effectively communicates with customers in the following ways:

- Product information is communicated to the customer through placing the product code on the sulfur bag.
- CSR's are authorized to handle customer changes and inquires.
- Positive customer feedback will be communicated throughout the Organization. The purity of sulfur received results in relative ease in meeting or exceeding customer specifications. As a result, returns are rare. Customer complaints are addressed as described in QWI-9. The MRC reviews all complaints for symptoms of recurrence. Any problems are evaluated and corrected.

## 7.3 Design and Development

### 7.3.1 Design and Development Planning

Top Management plans and controls the design and development of the product by planning:

- The design and development stages, as listed on the Design Control (Form 6)
- The review verification and validation that are appropriate to each stage of design and development
- All responsibilities and authorities for effective and organized design and development
- The interfaces between customers, laboratory and the design team are conducted in a way that ensures proper communication and indicates responsibility for various steps in the design process
- Planning output is continually updated throughout the design process

### 7.3.2 Design and Development Inputs

The President gathers the following input to development formulation and specifications:

- Customer requirements for function and performance

- All statutory and regulatory requirements that apply to the product being designed
- Statistics and results of previous similar designs
- Any other requirements necessary to produce a valid and effective design

All design inputs are initiated on Design Control (Form 6) and reviewed for adequacy. Valid requirements are complete, easily understandable and consistent.

**7.3.3 Design and Development Outputs**

Top management is responsible for the design of specifications and the Vice President of Manufacturing/Plant Manager is responsible for the preparation and manufacturing of samples.

Design and development outputs include:

- The specification sheet produced according to the Manufacturing/Batch Sheet (Doc 6 )
- The appropriate information for purchasing and production
- Product acceptance as indicated by the signature of a member of top management on the Design Control (Form 6)
- For all new customers, an MSDS is attached to the design output

**7.3.4 Design and Development Review**

The CEO and the President perform systematic reviews of design and development at the appropriate stages of the design in order to identify problems during the design process and to determine how well the results of design and development meet stated requirements, Design Control (Form 6).

**7.3.5 Design and Development Verification**

To obtain internal approval, the QC Technician runs a Certificate of Analysis (Form 35) (computer generated) (C of A) on the production sample for the Design Committee to review. The Design Committee approves the design if the Certificate of Analysis (Form 35) conforms to the specifications. The QC Technician or any Design Committee member's signature on the Certificate of Analysis (Form 35) constitutes internal approval.

To obtain customer approval, the production sample, C of A

(Form 35) and provisional specification will be shipped to the customer for evaluation and approval. Customers indicate approval by signing and returning the provisional specification.

### 7.3.6 Design and Development Validation

Design validation is impractical. Customers are encouraged to provide feedback based on usage of the first order under actual conditions. If the first order is acceptable, subsequent reorders of the same product constitute customer design validation.

### 7.3.7 Control of Design and Development Changes

Any design change related to specification/formulation is treated as a new design and this entire procedure is repeated.

Records of the results of the review of changes and any necessary actions are maintained in the Design Control (Form 6).

## 7.4 Purchasing

### 7.4.1 Purchasing Process

The CEO/Quality Manager or Purchasing Agent reviews for completeness and then releases the Purchase Order (Form 8) [Peachtree Accounting used for all companies]. Purchase orders (written or verbal) will reference product code, specification number, and product name, or other descriptive phrase, agreed to by supplier and indicated on product data sheet.

A copy of the purchase order is provided to the Plant Manager immediately upon completion, to inform that the material is on order, to give the approximate arrival date, and to allow preparing a space in the warehouse for storage. The purchase order will also be used to crosscheck incoming materials with both the specification sheet and the bill of lading.

The Organization evaluates and selects new suppliers based upon the following criteria:

- **Crude Sulfur –** The primary criteria to qualify a new supplier will be a review of that supplier's specification sheet to meet our minimum standards and the test results on a sample analyzed by our Q.C. Technician. If both criteria prove

acceptable, the supplier will be given up to five truckload orders to test delivery systems and actual quality.

- **Inert Ingredients –** Qualifying a new raw material supplier requires a review of that supplier's specification sheet and sample. If the supplier is able to meet or exceed the standard specification for that ingredient, a plant trial can be arranged to check performance in manufacturing. No new suppliers will be qualified unless that supplier offers significant cost savings without sacrificing quality or we are attempting to locate an alternate supplier.
- **Packaging Supplies –** Packaging materials for sulfur are standardized in the industry and generally conform to DOT Group III specifications. A new packaging supplier can be qualified by sending a sample shipment to the plant for packaging trial.
- **Other Goods and Services –** Suppliers of other goods and services not listed above are qualified based on meeting specifications for their particular product, whether actual or a service. Qualification will be determined based on ability to provide quality goods and services as requested by Georgia Gulf Sulfur.
- **Records –** Records of New Supplier qualification activities are recorded on the Supplier Evaluation (Form 5).

### 7.4.2 Purchasing Information

Raw Material specifications are as follows:

a. **Crude Sulfur –** Specifications are written and contained in *Raw Materials & Packaging Supplies.*
b. **Raw Materials –** Industrial, Agricultural, and Packaging Products – Specifications are written internally or accepted as supplied by the manufacturer and contained in *Raw Materials & Packaging Supplies.*

The Organization has not experienced repeated occurrences of Supplier non-conformance in the past 10 years, however, if one occurs, purchasing would notify Plant Manager / VP Manufacturing and a Nonconformance/Corrective Action (Form 12) would be initiated. In the event this occurs in the future, the CEO/Quality Manager will reevaluate by completing the Supplier Evaluation (Form 5).

### 7.4.3 Verification of Purchased Product

The Plant Manager, Warehouseman, or Q.C.Technician will:

- Visually inspect load for damaged material
- Verify shipment with purchase order information
- On purchases where a C of A is specified, compare the received C of A with the minimum raw material specification sheet for acceptance
- Pull samples for all items received not containing a C of A and test for compliance with the Organization's minimum specifications for acceptance
- Notify Production Manager of all accepted receiving
- All non-acceptable raw materials will be quarantined. Plant Manager/VP Manufacturing and purchasing will be notified. A Nonconformance/Corrective Action (Form 12) will be initiated and disposition determined.

## 7.5 Production Provision

### 7.5.1 Control of Production Provision

The Organization plans and implements production provision under controlled conditions, including:

- Product characteristics are found on the Manufacturing/Batch Sheets and used to direct the appropriate measurement and blending of raw materials
- Work Instructions QWI-1 through QWI-45 have been written for all production processes of the organization and are available at the appropriate workstations
- The MRC ensures that all suitable work equipment and tools are made available throughout the production system
- Appropriate monitoring and measuring devices are available at the appropriate testing areas
- The MRC ensures that the proper monitoring and measurement activities are undertaken
- The appropriate activities to ensure proper release and delivery are in place

### 7.5.2 Validation of Processes for Production Provision

Arrangements for these processes will include:

- On a daily basis, the Plant Manager, Mill Operator, or Q.C. Technician verify and approve equipment by comparing product conformance to specifications
- Use of specific methods and procedures (Work Instructions, QWI-1 through QWI-45)
- Requirements for records as specified in the Quality Manual and in the Work Instructions
- Revalidation, as necessary

### 7.5.3 Identification and Traceability

The Organization will identify product status with respect to monitoring the measuring requirements and will control and record the unique identification of the product in the following manner:

**Traceability of Pulverized Sulfur**

| SOURCE | RESPONSIBILITY | TRACEABILITY ID | DOCUMENTATION |
|---|---|---|---|
| Raw Material | Truck Driver<br>QC Technician | Date & Supplier<br>Bill of Lading # | Incoming Bill of Lading<br>Incoming Inspection Log Book |
| Flaking | Production Manager | Date & Bin # | Flaking Log |
| Milling & Packaging | Production Manager<br>Mill Operator | Bin #<br>Lot # | In-process Screen<br>Log Book |
| Shipping | Warehouseman | Lot # | Release Sheet (Form 28)<br>Outgoing Bill of Lading |

**Traceability of Homogenized Sulfur**

| SOURCE | RESPONSIBILITY | TRACEABILITY ID | DOCUMENTATION |
|---|---|---|---|
| Raw Material | Truck Driver<br>QC Technician | Date & Supplier<br>Bill of Lading # | Incoming Bill of Lading<br>Incoming Inspection Log Book |
| Homogenization | Fluid Plant Operator | Storage Tank # | In Process Log Book |
| Shipping | Fluid Plant Operator<br>QC Technician | Storage Tank #<br>Order # | Outgoing Log Book<br>Outgoing Bill of Lading |

**Lot Number Assignment**

Lots of materials are assigned numbers based on the Julian date and order of manufacture during the day. Example:

G4181001 = Sample Lot Number

G = plant (GGS) [SF, HI, ISI]
4 = year 1994
181 = Julian date, 181st day of year, June 30
001 = 1st pallet produced on indicated date

### 7.5.4 Customer Property

The Organization does not accept customer – supplied products.

### 7.5.5 Preservation of Product

Throughout the production process, up to and including delivery to the customer, the Organization preserves the conformity of the product including identification, handling, packaging, storage and protection in the following manner:

- **Handling –** Potential damage during handling consists of torn bags. Minor damages will be addressed by repairing the package on the spot. Major damages will be addressed by restacking the pallet and replacing the damaged bags or storing in a designated area.
- **Prevention –** Elements of damage prevention include trained forklift drivers, effective warehouse space utilization, and pallet stacking plans.
- **Storage –** Designated areas shall be used for storage of receiving, in-process, and finished products.
- **Deterioration –** Damage/Deterioration is assessed during monthly physical inventory and documented on the monthly inventory sheet.
- **Packaging –** Both paper bags and Super Sacks are used to package products. There are no requirements that would damage the product. Stretch wrapping is the only final packaging used.
- **Delivery –** The Organization is responsible for the condition of the product until the load is delivered to the customer's dock. The customer telephones us regarding damage concerns. The Customer Service Representative follows QWI – 9 using Form 12 to document problems.

- **Prevention –** The Warehouseman visually inspects the shipping container for flaws that could cause product damage prior to loading. The Warehouseman loads the container using the loading configuration corresponding to the container and load size to prevent damage.

## 7.6 Control of Monitoring and Measuring Equipment

### 7.6.1 Test Equipment

All test equipment affecting the ability to meet stated requirements is listed on the Critical Gauge List (Doc 2). Calibration is conducted at prescribed intervals as noted on this list. Both internal and external calibrations are traceable to NIST.

### 7.6.2 Internal Calibration

Internal calibration activities are performed as described in the Quality Work Instructions. A calibration sticker is attached showing date of calibration. An Internal Calibration Chart (Form 29) is kept to record results of internal calibrations and adjustments made for each piece of equipment.

### 7.6.3 External Calibration

External calibration technicians must provide their calibration procedures including the number of checks made and the results of calibration. Additionally, they must provide a certificate of calibration traceable to NIST.

### 7.6.4 Out of Calibration Control

When a gage is found to be out of calibration, all material produced during the period since last calibration, is retested to determine the date of gauge malfunction. Internal products found to be nonconforming during that time period will be tagged (Form 10) and a Nonconformance/Corrective Action (Form 12) would be generated. External nonconforming product found would generate a Nonconformance/Corrective Active (Form 12). The Vice President of Manufacturing/Plant Manager will ensure product recall and disposition.

## RECORDS

| | |
|---|---|
| **Form # 1** | Change Control will be retained by the CSR for a minimum of 1 year |
| **Form # 3** | Order Form will be retained by the CSR for a minimum of 1 year |
| **Form # 4** | Sales Order will be retained by the CSR for a minimum of 1 year |
| **Form # 5** | Supplier Evaluation records are retained in the Local Office by Purchasing indefinitely |
| **Form # 6** | Design Control (Form 6) is retained indefinitely by the ISO Coordinator |
| **Form # 8** | Purchase Orders are retained by CSR for a minimum of one year |
| **Form # 28** | Release Sheet will be retained by the Q.C.Technician / Transportation Coordinator for a minimum of 1 year |
| **Form # 29** | Internal Calibration Chart and External Calibration certificates are retained by each Plant Manager for a minimum of one year |
| **Form # 35** | Certificate of Analysis is retained by the CSR for a minimum of one year |