

PCR Quality Assurance and Testing Protocol (Draft Version)

Dr. Joseph Greene

CSU, Chico

June 24, 2004

Agenda

- Scope of Work
- Process of Developing Guidelines
- PCR Guidelines
- Benefits to the Industry
- Next Steps
- Questions and Comments

Scope of Work

- Objectives
 - Identify quality problems at PCR processors.
 - Identify quality assurance (QA) programs at PCR processors.
 - Recommend a QA program to improve the quality of PCR.
 - Evaluate, modify, and improve the QA program at PCR processors.
- Task 1- Detailed Work Plan
- Task 2- Survey of PCR Manufacturers
- Task 3- QA Guidelines
- Task 4- Testing Protocol for PCRs
- Task 5- Effectiveness of Guidelines and Testing Protocol
- Task 6- Final Report

Process of Developing Guidelines

- Purpose

- The purpose of the study is to propose a successful quality assurance program that can be used as a model by PCR manufacturers to improve quality.

- Basis

- Literature research in the U.S. and U.K.
 - Quality testing of raw materials, monitoring of melt index, statistical process control of the extrusion process, color analysis, and contamination control. Use of 2 mil test strip for HDPE.
 - Quality testing of raw materials for impurities and melt index, quality control on process parameters, and after-sales service on the recycled materials for PP.

Process of Developing Guidelines

- Basis

- Survey results from U.S. and U.K.

- U.K. survey (37 companies) found difference in quality programs between large companies who have QA procedures and small companies who do not due to financial burden.

- U.S. survey found similar results

- 8 companies from California and 1 from Illinois. Survey sent to 25 companies. Visited and reviewed operations at 2 facilities. 6 companies declined my request for a plant visit.
- Large companies reported
 - » QC/QA program and perform regular tests for quality and require documentation for quality during production of PCR.
- Small companies reported
 - » Not using a QC/QA program due to financial burden, but test products on an “As-Needed” basis and have limited documentation.

PCR Quality Protocol

- Philosophy
 - Different PCR customers have different quality requirements
 - Low quality plastic applications: low cost.
 - Plastic lumber: ease of flow and low cost.
 - Rigid Packaging: environmental stress crack resistance in some applications.
 - Trash bags: ease of flow, contamination, color, consistency.
 - Identity source of quality problems early in processing and remove source of problem.
 - Quality of PCR should be traceable to incoming materials and processing.
- Key Features
 - Quality Control Documentation
 - Incoming plastics
 - In-process
 - Outgoing PCR
 - Quality Assurance Testing
 - Incoming plastics
 - In-process
 - Outgoing PCR

PCR Quality Grades

PCR Grade Levels

- Grade 5: Current Standards (Low quality applications)
- Grade 4: Current standards plus testing for ESCR. (Rigid Packaging containers)
- Grade 3: Current standards plus process control and more testing (Trash Bags)
- Grade 2: Current standards plus more process control and additional testing (Trash Bags)
- Grade 1: Near Virgin resin quality using current standards plus high level of process control and testing (Trash Bags)

PCR Quality Documentation

- **Documentation and Testing**

- Grade 5: Current CIWMB standards.
 - Documentation: Incoming Material Spec 2, Outgoing PCR specification.
 - Testing: MI, Specific gravity, moisture, uniformity.
- Grade 4: Current standards plus ESCR testing.
 - Documentation: Incoming Material Spec 2, Outgoing PCR specification.
 - Testing: MI, Specific gravity, moisture, uniformity, plus ESCR
- Grade 3: Current standards plus more testing and PCR spec for gel count.
 - Documentation: Incoming Material Spec 1, Outgoing PCR specification, In-process quality sheets.
 - Testing: MI, Specific gravity, moisture, uniformity, color, odor, Extruded 1” strip for gel count.
- Grade 2: Same as 3 but with fewer gels in test strip.
- Grade 1: Same as 2 but with fewer gels in test strip.

Benefits to Industry

- Companies that are using and are satisfied with current standards can continue to use them.
- Quality of PCR for rigid packaging containers can be improved with the use of guidelines with improved environmental stress cracking resistance.
- Quality of PCR for trash bags can be improved with use of guidelines that should produce a more consistent PCR and require production of a test strip of PCR to check quality.
- Quality standards of PCR will be closer to standards for virgin resin.

Next Steps

- Release draft of guidelines - hard copy available on CIWMB web page.
- Comment period – June 24 to July 24, 2004
- Present changes to round table meeting in July.
- Prepared final guidelines.
- Request 3 volunteer companies to test guidelines at their facilities. Dr. Greene is available to lead the testing on-site.
- Test guidelines with 3 case studies demonstrating the use of the guidelines in July and August)
- Prepare final report in December of 2004.

Next Steps

- Release draft of guidelines - hard copy available on CIWMB web page.
- Comment period – June 24 to July 24, 2004
- Present changes to round table meeting in July.
- Prepared final guidelines.
- Request 3 volunteer companies to test guidelines at their facilities. Dr. Greene is available to lead the testing on-site.
- Test guidelines with 3 case studies demonstrating the use of the guidelines in July and August)
- Prepare final report in December of 2004.

Appendix

- **Quality Control Sheets for Incoming Plastic Material**
- **Post Consumer Pellet Specifications**
- **Inspection Sheet for Incoming Materials**
- **Inspection Sheet for Process Conditions**
- **Inspection Sheet for Outgoing PCR**