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# Design and deployment of a quality management system : a case study of RV Industries, Inc.

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**TITLE:**

**Design and Deployment of  
a Quality Management  
System: A Case Study  
of RV Industries, Inc.**

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Design and Deployment of a  
Quality Management System  
a Case Study of RV Industries, Inc.

by

Octavio C. Siochi

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Presented to the Graduate Research Committee

of Lehigh University

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## **Abstract**

Many small businesses are beginning to feel the demand for quality programs to meet customer expectations. There are many quality programs currently available, but most of these specifically address the concerns of large manufacturing companies. There is a need for more documented examples of quality management design and deployment specific to the circumstances surrounding small businesses.

This paper outlines the development and deployment of a quality management system for a small food processing company. Factors contributing to the success or failure of deployment are identified. Through case study methodology, this paper describes the degree to which each factor either aids or impedes successful deployment of a quality management system.

Some of the factors that greatly affect the deployment of a quality management systems are: Management Commitment, Leadership, and Perceived Complexity of the system.



## Introduction

While programs such as Total Quality Management and ISO9000 are extremely fashionable, small companies typically lack the necessary resource or skill to effectively design and/or deploy such quality management systems (Fisher, 50). Furthermore, the demands that TQM and ISO9000 impose on an organization are frequently excessive for small businesses (Avery, 50). Due to pressure from both consumers and industrial customers, small businesses are feeling the need to improve and formalize their existing quality systems. There is, however, a need for more documented examples of quality management design and deployment specific to the circumstances surrounding small businesses.

### *RV Industries, Inc.*

RV Industries, Inc. began operations on January 1, 1993, by acquiring the assets and business of Red V Coconut Products, Inc. RV Industries (RVI) imports desiccated coconut meat from its parent company, Fiesta Equities, Inc. RVI provides two main products. First, RVI re-sells desiccated coconut (DCN) that it imports. Second, a portion of the imported DCN is sweetened, packaged, and sold as sweetened coconut (SCN).

RVI is a small company by most standards. All its business is conducted out of a single 30,000 sq. ft. facility serving as factory, warehouse, and corporate office. In 1993, RVI employed an average of 10 production and warehouse personnel, and five person management team.

In its second year of operations, RV Industries is enjoying a 60% increase in sales volume, due partly to the acquisition of several major national accounts. Management also attributes the increased business to the use of quality as a competitive advantage. Specifically, RVI consistently delivers products whose characteristics meet or exceed both customer specifications and expectations.

Personal leadership has played a central role in RVI's ability to deliver quality products, despite the absence of a formal quality assurance program. For instance, the production supervisor personally trained all new hires. He would rotate new hires through each workstation in the process. Everything he did involved a maximum effort, and he encouraged those under him to do the same. Management is concerned however, that even with this level of commitment, RVI may not be able to maintain acceptable quality levels in the face of increased production.

In the third quarter of 1993, Management began to consider relocating RVI's facilities. The lease on the Avel facility would expire in November 1994, and renewing the lease appeared to be costly. After conducting

extensive studies, RVI decided to move its facilities to Doraville, Georgia. Moving to Doraville meant that overall shipping costs of coconut products would decrease. RVI management felt that the move also represented an opportunity to introduce a new quality management system. Management believed that resistance to a new quality system would be minimized in a greenfield situation.

In the first quarter of 1994, RVI agreed to work with the author in designing a quality system that would specifically address RVI's needs, and investigating the deployment process.

## **Methodology**

### *Literature review*

The word quality has come to possess many meanings. There appear to be four main schools of thought on the definition of quality.

The first set of definitions believe that quality can be described in terms of a product. Still somewhat unspecific, quality is viewed as "the amounts of unpriced attributes contained in the priced attributes" (Leffler, 956). A product's quality is also defined relative to other products. "Differences in quality amount to differences in the quantity of some desired ingredient or attribute" (Abbott, 126).

The second set of definitions believe quality to be defined in terms of the user. An article appearing in Quality Progress defined quality as consisting of "the capacity to satisfy wants" (Edwards, 37). Similarly, "the quality of a product depends on how well it fits patterns of consumer preferences" (Kuehn, 101). Juran describes quality as "fitness for use" (2-2). According to Juran, "Quality does not happen by accident, it must be planned."

The third set of definitions believe that the definition of quality lies in manufacturing. Another article appearing in Quality Progress defines quality as "the degree to which a specific product conforms to a design or specification" (Gilmore, 16). Philip Crosby simply defines quality as "conformance to specifications" (15). Crosby advocates zero defects, or doing things properly the first time. Crosby's view of quality is proactive, not reactive.

The last set of definitions are perhaps the most complex. Quality is defined in terms of value. For instance, "quality is the degree of excellence at an acceptable price and the control of variability at an acceptable cost" (Broh, 3). Armand Feigenbaum writes, "quality means best for certain customer conditions. These conditions are (a) the actual use and (b) the selling price of the product" (1). For Feigenbaum, quality stresses control, not prevention.

Instead of providing a definition, Garvin proposes analyzing quality in terms of eight dimensions: performance, features, reliability, conformance, durability, serviceability, aesthetics, and perceived quality (50).

Many factors can affect the success of a quality initiative. Ten factors affecting the adoption, implementation, and diffusion of innovation have been identified from the literature and may be applied to understanding the degree of success in the deployment of a quality initiative.

Successful deployment begins with a clear plan. It is essential to explicitly define the purpose of the project. One of the characteristics of a successful TQM deployment is "a clearly defined plan of where (the organization is) heading, how to get there, and what role they are to play in the process." (Grossman, 57).

A clear plan will also enumerate specific, visible benefits. The observability of these benefits affects the success of a deployment (Rogers, 232). A well defined set of benefits will serve as motivation and aid in the deployment process. Three Malcolm Baldrige winners, IBM, Federal Express, and Xerox, credit the success of their quality initiatives to a clear vision of where their companies will be *after* deploying their quality initiatives (Panchak, 6). Benefits must also be visible on a personal level. If users perceive no benefit to using a new system, they will have "little incentive to use it" (Barton, 108).

Specific benefits can only be achieved by guaranteeing a system's **Fitness for Use**. If the system being implemented directly addresses user's needs it is said to be fit for its intended use. Barton cites the "early identification and enhancement of the fit between a product and user needs" as a critical factor in deployment (103).

A well defined plan will also identify organizational factors. The plan must take into account the culture of the organization in which it is to be executed. If the designers and users of the system have overlapping cultural assumptions, the likelihood of management initiatives translating into the intended changes increases (DiBella, 315). This concept is similar to Roger's concept of **compatibility**. According to Rogers, the degree to which an innovation matches user's existing values, past experiences, and needs, directly affects its rate of adoption (223).

Utilizing deployment teams with individuals of varied experiences can help to alleviate problems arising from differences in cultural assumptions. Thus the **organizational integration** (the use of cross functional teams, for example) can affect the degree to which a project is successfully implemented. A paper examining the deployment of CAD/CAM systems identified the use of cross functional teams (for both steering and deployment) with the achievement of stated goals (Beatty, 53).

In the deployment of a program, some roles tend to lead to success. A *sponsor* must provide the project with the necessary resources. A *champion* must act as a "salesperson, diplomat and problem solver." A *project manager* must perform administrative duties. An *integrator* must then act as the focal point and mediate amongst the other roles. These distinct roles need not be played by distinct individuals (Barton, 107).

Hormel foods reports that its management initiated approach to TQM has "generated savings in the tens of millions" of dollars (Wagner, 18). Hormel's experience is indicative of a high level of **management commitment**. Deming, Juran, and Crosby all cite management commitment as an integral component of any successful quality program (Maginnis, 26). A recent study concluded that "impatience causes U.S. companies to fail at successfully adopting quality principles" (Miller, 5). In the same article, Stephen Grossman explained that many companies started TQM programs without really committing to it. When results did not come as quickly as anticipated, management was ready to move on to "the latest buzzwords."

Rogers suggests that the more "an innovation can be experimented with on a limited basis," the more likely the adoption of the innovation becomes. Rogers terms this relationship as **trialability** (231).

The user's perception of the **complexity**, or the ability to understand how and why a system works, can also affect its rate of adoption. A system perceived as less complex will be adopted at a quicker rate than one that is viewed as more complex (Rogers, 230).

Perceived complexity can be addressed by orientation and training programs. Training, or preparing users to operate the system, is another critical factor in a successful deployment. The magazine Institutional Distribution reports that basic literacy training at Kraft Food Service has helped in the effective deployment of its TQM program (80). Similarly, a Boston based accounting firm described the effect of company wide TQM training as "very beneficial" to its successful deployment (Levine, 74).

### *Hypotheses*

In this study, the success of an innovation's deployment is hypothesized to depend on the presence or absence of the ten aforementioned factors. Although not all the factors cited in the literature applied to quality initiatives, they are also applicable to the deployment of a quality management system. Table 1 summarizes the effect of each factor on the quality initiative deployment.

### *Research Methods*

The study was conducted in four phases: assessment, development, delivery, and evaluation.



The degree of ...	affects the success of deployment...	
	Directly	Inversely
1. clarity of plans	■	
2. observability	■	
3. fitness for use	■	
4. compatibility	■	
5. organizational integration	■	
6. activeness of roles	■	
7. management commitment	■	
8. trialability	■	
9. perceived complexity		■
10. training	■	

Table 1: Summary of factors affecting the success of deployment.

### Assessment

There are two sets of information that were defined before any other work can proceed. First, the nature of any existing form of quality management was established. Open ended interviews with employees and managers of RVI were conducted towards this end. A review of company records also provided additional information. An examination of customer documentation helped to clarify any existing perceptions of customer expectations. Direct observation of the manufacturing and office facilities provided information on the production process/practices, and the prevailing culture. Second, a theoretical basis for conceptualization and design of a quality management system was identified. The literature

review provided this information. The review also identified factors contributing to or detracting from successful deployment.

### **Development**

By applying the knowledge generated by the literature review in the context of the host company, a framework for the quality management system was assembled.

An analysis of data collected in the assessment stage identified specific quality issues that needed to be addressed. Strengths and weaknesses of the existing quality system were identified. The goal of the development stage was to: (1) pair existing strengths with the corresponding quality issues, and (2) where no strengths existed, develop proficiency in the appropriate quality function.

The host company reviewed drafts of the system and provided insight on an iterative basis.

### **Delivery**

The quality management system was delivered to the host company for installation at their new facility in Doraville, Georgia. Delivery included a brief presentation to the appropriate company representatives.

### **Evaluation of Deployment Success**

The evaluation process was conducted by participant-observation. The

goal of the evaluation stage was to identify the problems and solutions encountered by the host company in deploying the system. Having designed the quality system, the author was called upon to act as an advisor during initial deployment, but such involvement was minimal. Because of time constraints, the evaluation process only covered the initial phase of the actual deployment.

1994	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Literature Review	-----								
Design			-----						
Direct Observation	-----								
Conceptualization					-----				
Design							-----		
Delivery								◇	
Deployment Observation & Measurement									--
Case Writing									--
Submission									◇

Table 1: Schedule of research activities.

### *Operationalizing Factors*

As many of the factors affecting a successful deployment are intangible, operationalizing these factors can not result in precise quantitative measures. Nevertheless, the indicators that the author used to estimate a

measure of each of the independent variables shown in Table 1 on page 10 are discussed below.

The degree of clarity of plans can be gauged by comparing different people's understandings of the specifics of the plan. Differences may be indicative of a plan that is vague or not well defined. Any documentation outlining the plan that fails to identify specific steps in the plan may indicate a lack of clarity.

The observability of benefits can be gauged by first determining which benefits management hopes to achieve, and the timeframe within which it hopes to achieve those benefits. Management must also propose a method for identifying if the benefits have occurred, and to what extent. If management then articulates this information in its plan, the benefits are observable.

The systems fitness for use can be measured by identifying specific objections or concerns raised by users. When the concerns expressed deal with the inability of the proposed system to perform as the user requires, this factor can be said to have affected deployment.

Similarly, compatibility can be measured by identifying specific objections or concerns raised by users. When the concerns expressed deal with an

irrational unwillingness to utilize the proposed system, this factor is present.

Organizational integration can be measured by the degree to which individuals worked in cross functional teams. The factor is present if individuals with varied backgrounds are involved in deploying the initiative.

The presence or absence of roles may be determined by two methods. First, the operations can be observed to identify individuals exhibiting traits of any of the various roles. Alternatively, individuals may be asked to identify if they observed others exhibiting any of the traits. The traits to watch for are: salesmanship, diplomacy, exhortation, timeliness, and integration.

The presence of management commitment may be observed by evaluating the consistency of managements action over time. A lack of consistency could indicate a lack of management commitment.

Trialability can be measured by examining if the proposed quality initiative can be partially deployed and tested. Further evidence of trialability is the adoption of the system in stages.

The presence of complexity can be gauged by identifying the number and type of questions raised at the introduction and subsequent use of the system.

Training can be measured by identifying the number of formal and informal training programs that individuals undergo in relation to the proposed system.

### *Quality System Design*

Interviews with several RVI employees and managers provided a list of product characteristics upon which the basis for judging the relative level of quality had been used (either implicitly or explicitly) in the past. The results are summarized in Table 2. For a discussion of the production process see Appendix A.

<b>Color</b>	The product should appear to be white in color. Discoloration can result from aging, prolonged exposure to elevated temperatures, or improper proportions in the mixing process, in which case the color turns yellowish. Additionally, stains from the packaging material can occur if the product is not stored properly.
<b>Extraneous Matter</b>	The product should be free from any foreign matter that was not specifically part of the formulation in use. Extraneous matter can result from poor quality raw materials, or may be introduced during the manufacturing process.
<b>Flake Size</b>	The flake size is governed by the style of cut a particular customer orders. Incorrect flake size may result from using the wrong style of cut for raw materials, or from damage incurred during the manufacturing process.
<b>Flavor</b>	The product should possess a natural coconut flavor. Off-taste may result from poor quality raw materials, improper proportion of ingredients, or insufficient mixing time.
<b>Moisture Content</b>	The moisture content should fall within tolerances prescribed by the customer. Improper moisture content may result from improper storage, incorrect proportion of ingredients, or poor quality raw materials.

Table 2: Product Characteristics

<b>Odor</b>	The product should give off a pleasant aroma. Old raw materials typically have a distinct smell of decaying matter. Additionally, if coconut is exposed to items with particularly strong odors, it may pick up the odor of the item it is exposed to.
<b>Packaged Weight</b>	The US government enforces guidelines on the acceptability of variation in packaged weights. Differences in the weight of final product packages may result from operator error or natural variation inherent to the production equipment.
<b>SO<sub>2</sub> Content</b>	Customers can specify if SO <sub>2</sub> is to be used as a preservative. Excessive levels of SO <sub>2</sub> can occur if the incorrect raw materials are used.
<b>Package Graphics</b>	Final products are typically packaged in polyethylene bags. The appearance of the package may differ from specification. For example, colors may appear washed out, or the print registration may be misaligned. Defective raw materials may affect the appearance of the finished product.
<b>Package Seal Integrity</b>	Polyethylene package bags are heat sealed. The seal may fail if the heat is improperly applied, or if the raw materials are defective.
<b>Carton Appearance</b>	The polyethylene bags containing the final product are typically shipped in cartons. The appearance of the carton can be affected by the quality of raw materials used.
<b>Carton Coding</b>	Each carton is coded for production information. Improper coding can occur with operator error or poor record keeping.
<b>Carton Count</b>	Each carton is supposed to contain a pre-determined number of bags. The incorrect number of bags may be placed in the carton if operator error occurs.
<b>Carton Graphics</b>	Each carton has a printed label affixed to it. The appearance of the carton/label may differ from specification. For example, colors may appear washed out, or the print registration may be misaligned. Defective raw materials may affect the appearance of the finished product.
<b>Carton Seal</b>	Each carton is sealed for shipping. The failure of the seal may result from improper application, or poor raw materials.

Table 2: Product Characteristics (Continued)

<b>Microbiological Contamination</b>	Specific organisms are deemed undesirable for human consumption. These include E.Coli, Salmonella, and Staphylococcus. Contamination may occur with poor raw materials, or unsanitary shop practices.
<b>Inert Material Contamination</b>	Various inert materials are unsuitable for human consumption in specific quantities. Inert materials may be introduced by poor raw materials, or from production equipment.

Table 2: Product Characteristics (Continued)

Under RVI's informal system, all of the above characteristics were informally combined to produce an assessment of the level of quality. However, it is not necessary to exploit all the dimensions of quality in order to use quality as a competitive weapon.

### Dimensions of Quality

According to Garvin, "companies wishing to compete on quality will be more successful if they pursue segmentation strategies, singling out a few dimensions of quality as their focus instead of striving to be number one in all categories" (61). Additionally, he identifies eight distinct dimensions of quality: Performance, Features, Reliability, Conformance, Durability, Serviceability, Aesthetics, and Perceived Quality (49). These dimensions provided a framework for assessing the quality issues facing RVI, as illustrated by Table 1

Performance characteristics are the primary operating characteristics of the product. For a food product such as SCN, taste, color and odor are the primary operating characteristics. These characteristics also belong to the



Product Characteristics	Performance	Features	Reliability	Conformance	Durability	Serviceability	Aesthetics	Perceived	Regulated
Color	●						●		
Extraneous Matter		●							●
Flake Size		●							
Flavor	●						●		
Moisture Content				●					
Odor	●						●		
Packaged Weight				●					●
SO <sub>2</sub> Content		●							
Package Graphics							●		
Package Seal Integrity				●					
Carton Appearance							●		
Carton Coding		●							
Carton Count				●					●
Carton Graphics							●		
Carton Seal				●					
Microbiological Contamination				●					●
Inert Material Contamination				●					●
Reputation								●	
Shelf Life			●						
Customer Support						●			

Table 1: Characteristics vs. Dimensions of Quality

aesthetic dimension of quality. The aesthetic dimension includes the appearance and texture of a product. Thus the appearance of the

polyethylene bags and shipping cartons are also considered as part of the aesthetic dimension.

Secondary operating characteristics comprise the Features dimension of quality. Absence of extraneous matter, variety of flake size, specialty formulas such as SO<sub>2</sub> free SCN, and customer coding schemes are examples of secondary operating characteristics.

The conformance dimension is concerned with the degree to which a product's operating characteristics adhere to a pre-established standard. Maximum contaminant levels, quantity of product in a package, and seal integrity all belong to the conformance dimension.

The Durability dimension of quality refers to the amount of use one can get out of a product before it fails. As SCN is a consumable item, once purchased by the consumer, there is no application for Durability.

Serviceability deals with the speed, courtesy, and competence of the service process. Coconuts are by nature non-serviceable products, that is they can not be repaired. However, service can be provided through customer support to promptly assist the customer by replacing the unsatisfactory coconut product with satisfactory ones, and sharing with the customer the steps being taken to prevent similar occurrences.

One important characteristic that did not emerge from initial interviews was the company's reputation for producing high quality goods and being able to deliver those goods in a timely manner. This is one of the more significant assets RV Industries acquired from Red V Coconut Products. This characteristic belongs to the Perceived Quality dimension.

Another characteristic that was not mentioned in the first round of interviews was shelf life. Shelf life is a measure of the maximum time between production and consumption of a perishable good. It is analogous to mean time to first failure (MTFF), which belongs to the Reliability dimension of quality.

The last column in Table 1 indicates which characteristics are regulated, either by an administrative or judicial body. Limits on microbiological or inert material contaminants are enforced by the Food and Drug Administration, while package weight and unit count violations are addressed by the National Bureau of Standards.

Characteristics that fall under the regulated column are not optional. RV Industries should deploy controls for each of these characteristics as they are mandated by law or administrative order.

From among the remaining characteristics, however, a unique set must be selected that utilizes RVI's relative strengths vis-a-vis the competition.

## Relative Strengths of RV Industries

A reliable source of raw materials translates into high quality product availability. Over a period of time, availability of high quality raw materials reinforces the consumers perception of high product quality. Raw material availability is a sustainable source of competitive advantage because of the high entry barriers to backward integration. In order to provide the same degree of availability, competitors would have to either set up a new coconut mill or acquire an existing mill. Thus, the perception of quality dimension, specifically high quality product availability, must be pursued.

In conjunction with product availability, customer support, or the Serviceability dimension of quality, is also important to pursue. Customer support enhances availability because, in the mind of the customer, not only is the desired product available, it is also easy to purchase. And in the unfortunate event that something goes wrong with the product, the vendor is willing to work out reasonable immediate and long term solutions.

In the food industry, consumers associate "rich full flavor, natural and fresh taste, good aroma, and appetizing appearance" with high quality. Food products possessing these characteristics are "likely to gain market share as consumers continue to demand quality in what they eat" (Jacoby

78). Thus, the aesthetic dimension of quality must be continuously pursued.

Summarizing, RVI should pursue:

- Regulated Characteristics - as required by law
- Perceived Quality Dimension - to utilize product availability, an existing strength
- Serviceability Dimension of Quality - to utilize Customer Support, an existing strength
- Aesthetic Dimension of Quality - Addresses end users demands

These items were incorporated into the RVI quality management system. Appendix B. presents the RVI Quality Manual, which describes RVI's mission and quality statements.

### **Documentation**

The quality management system designed for RVI is documented in three levels. The first level enumerates RVI's strategic management and quality objectives. This document is called the RVI Quality Manual. The second level describes tactical policies for achieving strategic objectives. This manual is called the RVI Policy Manual. Appendix C contains the RVI policy Manual.

The third level provides the resulting operating procedures. There are three documents at this level. The RVI Procedure Manual enumerates the specific steps to be taken under the quality management system. The two

other documents, a compilation of product specifications and RVI forms, provide reference information for the Procedure Manual. A sample procedure is provided in Appendix D.

The RVI Quality Manual establishes RVI's long term management and quality goals. The document unequivocally proclaims RVI's commitment to using quality as a competitive weapon. It also recognizes RVI's social obligations and specifies the role quality plays in fulfilling these obligations.

The authority and responsibility for propagating the quality initiative are also enumerated in this document. RVI has adopted the view that quality is the responsibility of each and every member of its organization. Authority to correct or improve one's own work belongs to the individual. A management representative must be designated to assure that the quality initiatives happen, and to act as a focal point for all of RVI's quality efforts.

---

#### RVI Mission Statement

RV Industries seeks to become the recognized provider of choice for coconut based food products in North and South America.

Towards this end, RVI shall endeavor to establish and maintain a leadership position in providing quality products and services.

---

**Figure 1: RVI-Vision Statement:**

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RVI's competitive strategy is to leverage its reputation as a reliable quality producer to attract new national and continental accounts. Perhaps a little more radical is the acknowledgment that although RVI produces coconut products, it must consider itself as more than a manufacturer, but a provider of high quality coconut products and services.

Another notable feature of the system is its compatibility with ISO9002. Compatibility means that the general concepts and formats used in the RVI quality management system can readily be upgraded to ISO9002 or ANSI/ASQC Q9002 standards, without any major rework of the system. Specifically, the Procedure manual contains provisions for all the ISO9002 section, such as:

- Quality System
- Contract Review
- Document Control
- Purchasing
- Control of Customer Supplied Product
- Product Identification & Traceability
- Process Control
- Inspection & Testing
- Control of Inspection & Test Equipment
- Inspection & Test Status
- Control of Non-Conforming Product

- Corrective & Preventive Action
- Handling, Storage & Packaging
- Control of Quality Records
- Internal Quality Audits
- Training
- Statistical Techniques

Under some sections, however, no procedures were initially specified, as the procedures were beyond the scope of the agreement between RVI and the author. These procedures typically dealt with costs of quality.

In addition to the quality manuals, several other materials were prepared for the quality management system. A brochure explaining RVI's quality goals was developed to serve as both a public relations/ education tool and an orientation for prospective and new employees. A training video was also prepared. The video emphasized RVI's responsibility to its customers. It also traced the production process and pinpointed quality related issues at each step in the process.

Central to the quality management system is the fostering and maintenance of an environment conducive to quality.

### *Data Collection*

Doraville, Georgia is a small district 45 minutes north of Atlanta. The RVI facility is located in a relatively new industrial park. The single story high-



bay facility houses production, warehousing and office spaces from which RVI conduct all of its operations. The grounds surrounding the plant are well maintained and conform with established food manufacturing and warehousing practice. The attention to cleanliness extends to the interior of the facilities as well.



---

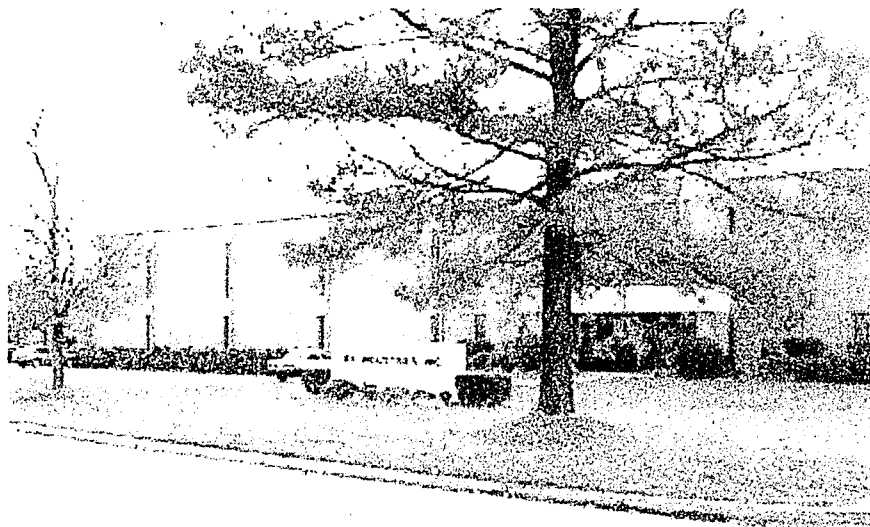
Figure 2: The RVI Facilities in Doraville, Georgia.

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### **Gauging the Success of deployment**

As of this writing, RVI was in the final stages of transferring facilities and starting up production at Doraville. The blending operation was still being performed in Avel, but packaging and warehousing were already running in Doraville. Most of management's attention was focused on starting-up plant operations, and unpacking into their new offices.

bay facility houses production, warehousing and office spaces from which RVI conduct all of its operations. The grounds surrounding the plant are well maintained and conform with established food manufacturing and warehousing practice. The attention to cleanliness extends to the interior of the facilities as well.



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Figure 2: The RVI Facilities in Doraville, Georgia.

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### **Gauging the Success of deployment**

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Under such circumstances one might not expect to find any form of deployment, but amidst the many difficulties encountered in moving a facility hundreds of miles without stopping production, significant steps towards deployment had been taken.

**Establishing an Environment.** Cleanliness, order, and discipline were the first impressions of the facility. Unlike Avanel, many of the production machinery were continually being cleaned throughout the workday. Another difference was the absence of loud music. In Avanel, employees were permitted to operate radios and boomboxes on the line. Not so in Doraville. There were no such distractions. While workers in Avanel were required to wear hairnets, Doraville went a step further. All personnel that ventured onto the production floor were required to wear lab hairnets and lab gowns.

The ritual of removing exposed jewelry and donning sanitary garments before entering the production facility served to impress both workers and visitors alike with the seriousness with which RVI takes its quality policies. Applicants for positions at RVI were given a plant tour in addition to the standard complement of interviews. During the interview, RVI managers would probe the applicant for their views on the importance of quality in the food industry. The plant tour reinforced the importance of quality in the mind of the applicant.

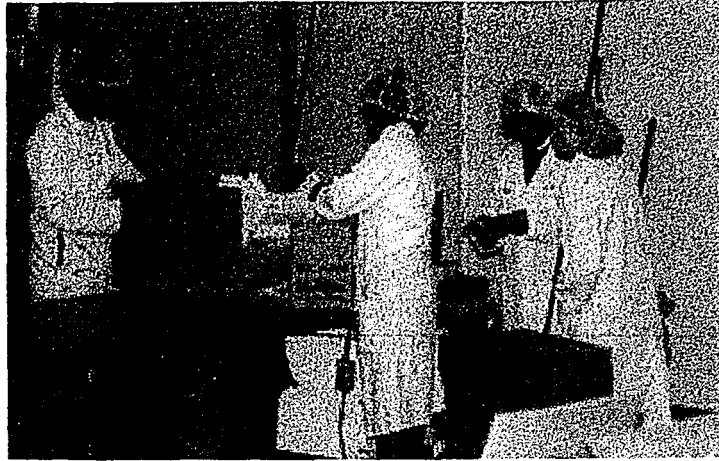


Figure 3: General Sales Manager Benny DeVilla gives a prospective employee a tour of the production facility. Applicants learn the process by which coconut is sweetened and packaged, as well as the quality issues faced in production.

Conversations with production personnel revealed what appeared to be a genuine concern for manufacturing products that conform to performance and safety specifications. The workers seemed to be able to easily identify the consequences of producing and shipping non-conforming product.

Given the overall attitude of employees and the atmosphere in the facility, RVI appears to have been successful in establishing an environment of quality consciousness.

Other aspects of the quality management system were only partially implemented.

**Training.** Although new hires were interviewed and given plant tours in accordance with the prescribed procedures, the training for new hires largely followed RVI's traditional on the job training methods. Although

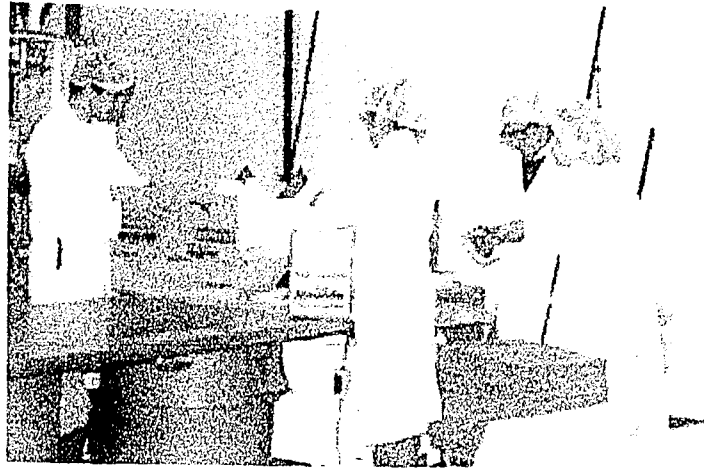


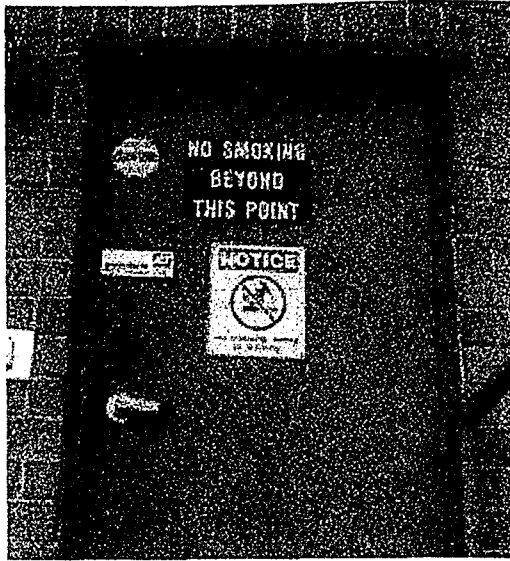
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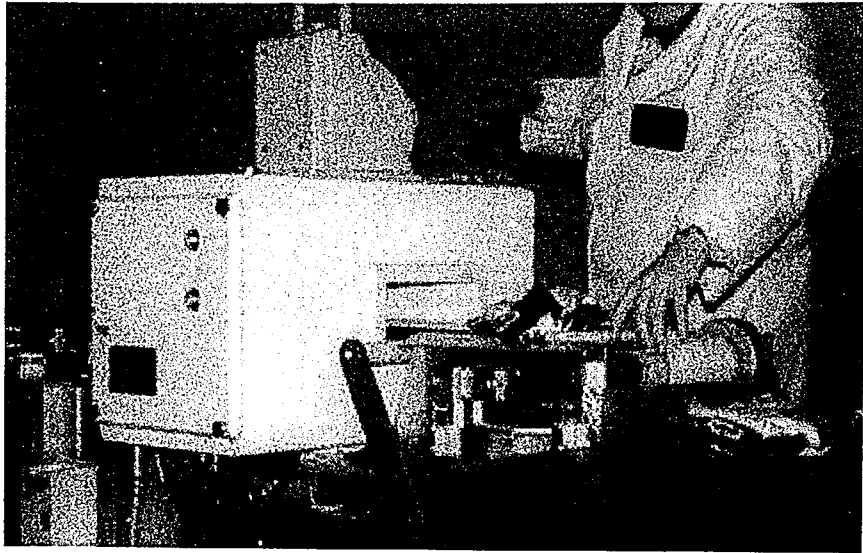


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**Inspection and Testing.** Surprisingly, some confusion arose over the exact specifications for incoming DCN. All RVI documentation prior to and including the quality management system had specified white desiccated coconut, free from blemishes or discoloration. The plant & traffic manager argued, however, that it was impossible to obtain DCN that was truly free from all blemishes.



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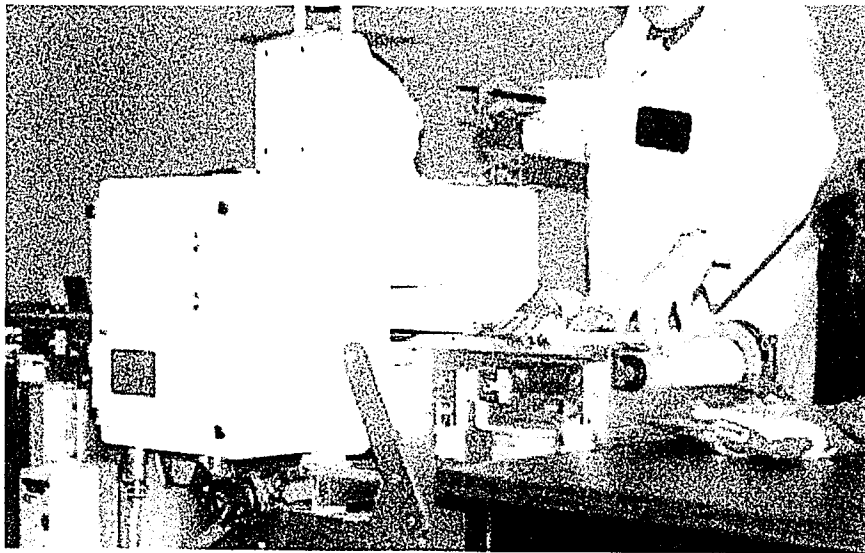
Figure 6: Periodic Calibration of metal detectors. Metal particles of know size and mass encased in plastic tubes are fed through a metal detector. The device must continually detect particles 2.5mm in diameter.

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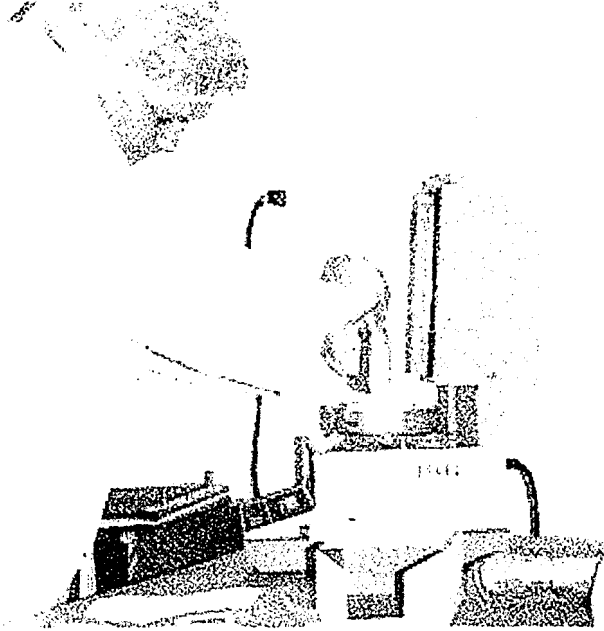
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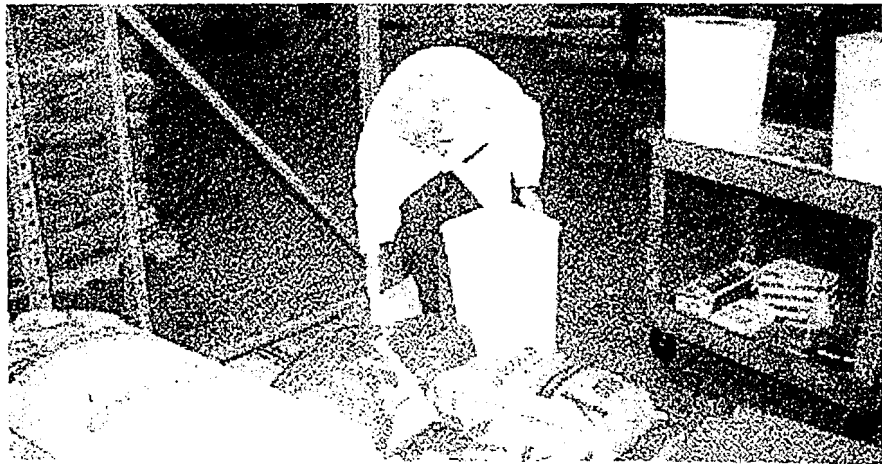
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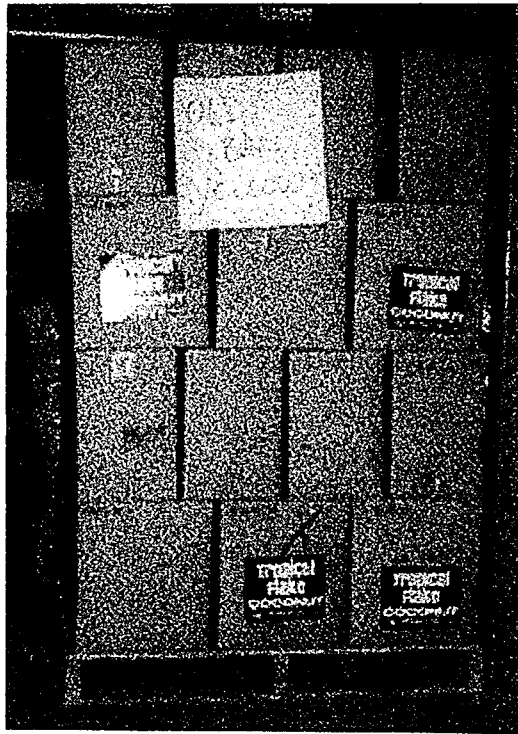
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Figure 8: Receiving Inspection for DCN. Samples are drawn from each container van.

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**Receiving Inspection.** Acceptance sampling is applied to incoming DCN in accordance with procedures. The procedures are, however, not followed strictly.

**Control of Non-Conforming Product.** Non-conforming products are being segregated and identified in accordance with procedure. While the methods are very simple, they are an improvement over previous methods.



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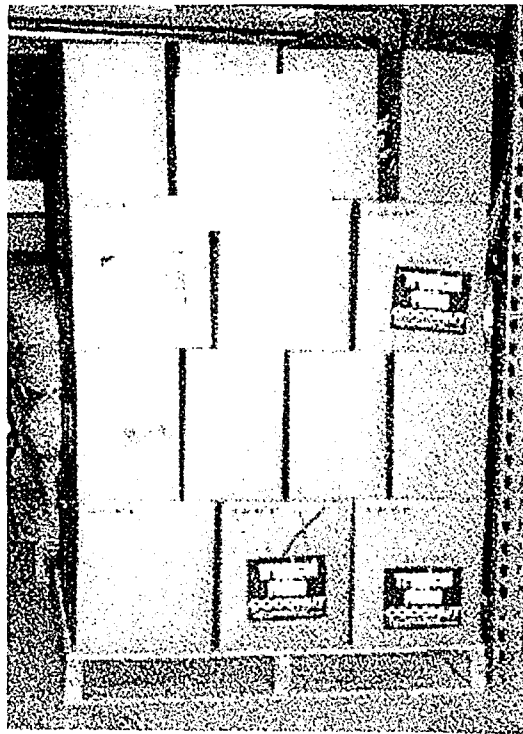
Figure 9: Non-conforming products are set aside and labeled.

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highly visible in the new facility. Both major pieces of production equipment, the blender and the weighing/packaging machine, were brand new pieces geared towards high reliability and performance. This was a particularly successful deployment item.

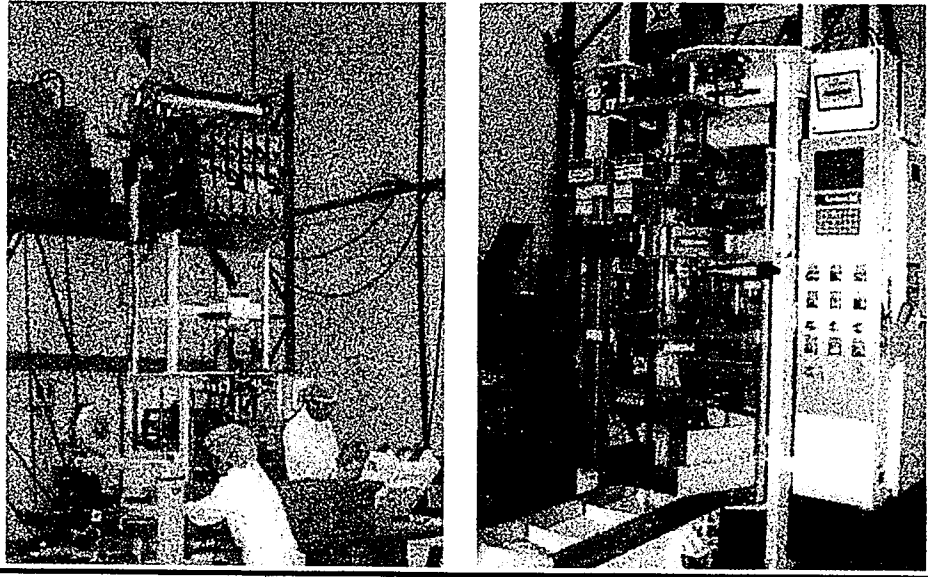


Figure 10: An automatic weighing and packaging machine used at RVI. Through an ingenious method of multiple computer controlled buckets, the machine is capable of holding very tight process capability, and guarantees no underfills.

## Results

RVI did not have a clear plan for deploying the quality management system. In fact, the management team had no official plans for deployment. Management was merely prepared to accept the deliverables. They did, however, express a genuine desire to deploy the system.

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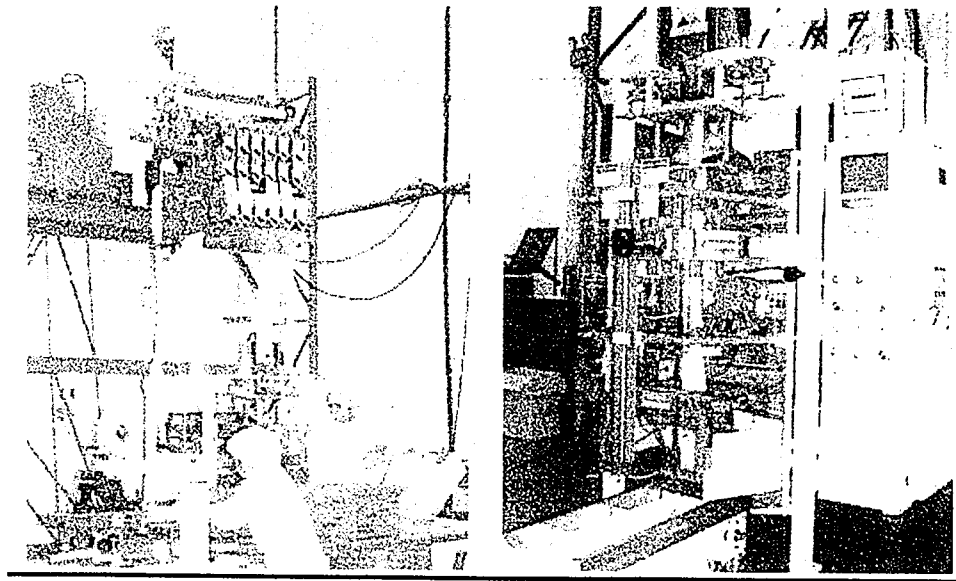
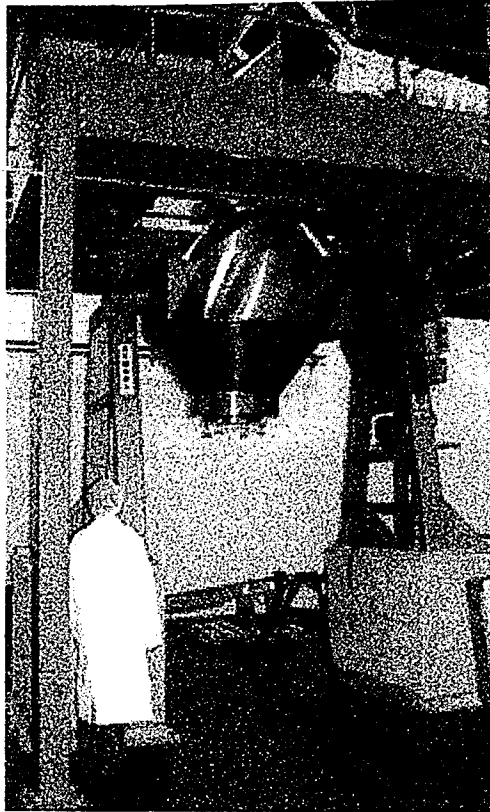


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Figure 11: A off axis dual cone blender provides a more thorough blending than conventional blenders.

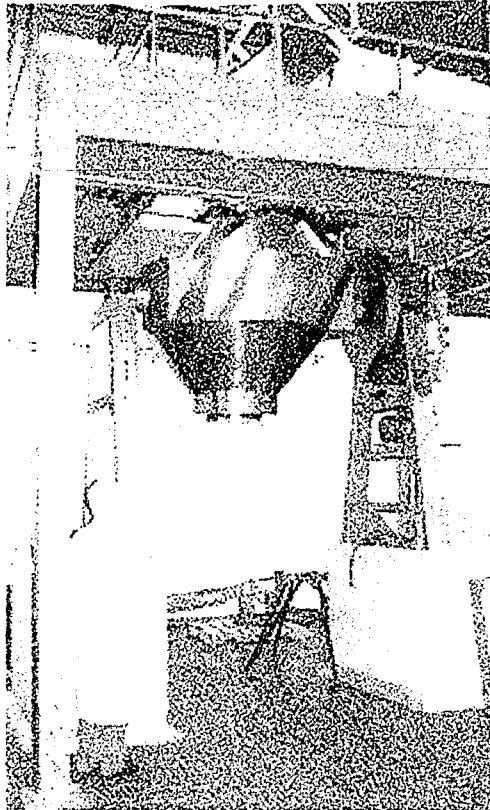
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Managers as well as production personnel cited the importance of quality to sales.

The system's fitness for use was brought into question by comments the plant and traffic manager made, such as the over emphasis of magnets in the production process. Apparently, he desired detection over prevention.

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Organizational integration was definitely present. On one occasion, the line shut down because the packaging machine clogged up. Spontaneously, workers from different parts of the line gathered around the problem machinery and began discussing the problem. Alternatives were proposed, one was selected and implemented that brought the line back up and workers returned to their workstations.

Various people were credited with performing many of the roles discussed in the literature search. For example, the company president was largely credited with championing the cause. It was he who introduced the quality initiatives to the rest of the management team, and secured the necessary resources for the initiative to proceed.

Again, due to time constraints, the presence or absence of management commitment was difficult to determine. It would appear however, from the interest and enthusiasm with which the quality management system was received, that management believes it is doing the right thing by pursuing the quality initiative. Another strong incentive comes from the newly acquired national customer accounts that demand strict, formal quality programs as a condition of doing business.

The system did exhibit trialability as evidenced by the fact that several portions of the system were implemented independently. The apparent

success, although it is still too early to tell, appears to be a motivating factor for deploying the remaining portions of the system.

Complexity was a factor that was readily apparent. The plant manager voiced concern over the wording of the system. He described the system as "unnecessarily wordy and sometimes complicated". His specific complaints were, however, directed towards the wording and structure that provided the system with ISO9002 compatibility.

Training was another factor that was obviously present. Although not all of the proposed training programs were implemented, many of the initial features, such as the brochures and the traditional OJT were carried out successfully. Additional plans for training were being formulated.

## **Interpretation**

Overall, the deployment of the quality management system at RVI can be described as both a success and a failure. In terms of the absolute number of policies and procedures implemented, the deployment was a failure. In terms of the effectiveness of the policies and procedures that had been implemented, the system had begun to show signs of achieving its intended purpose.

It is important to consider the environment RVI was in at the time of the study. Given that management had multiple pressing concerns dealing

with the logistics of moving, and that the move itself was not complete when the study was conducted, it is not surprising that only a few policies and procedures were implemented. That these policies and procedures were implemented at all is noteworthy in and of itself. Therefore, a fair assessment of the deployment would be that of a partial success.

Some of the factors that hindered successful deployment were:

**Lack of a clearly defined plan.** Part of the reason why so few policies and procedures were implemented is the lack of a clearly defined plan. RVI had defined where it wanted to be after deploying the system, however, it failed to actually plan on deploying the system.

**Complexity.** Perhaps the ISO9002 compatibility was too abrupt a change for RVI. Much of the wording seemed to intimidate the uninitiated users. After all, prior to this quality management system, RVI had no formal quality assurance program. Proper and timely training may serve to alleviate this problem

**Fitness for Use.** Perhaps the designer of the system failed to fully grasp the needs or expectations of users. There is, understandably, very little incentive to use a system that doesn't do what you need it to do.

The factors that aided in the deployment of the quality management system were:

**Observable Benefits.** Although RVI selected a highly observable benefit, specifically reduction in customer complaints, there was simply not enough time to monitor this statistic. However, having been to both the old and new facilities, RVI has another highly observable benefit. The facility in Doraville is remarkably clean, and the atmosphere in the plant is one that encourages quality consciousness. This benefit is self perpetuating. For instance, the facility is very clean, so when someone makes a mess, it stands out and the person promptly cleans up. The environment, most especially the donning of sanitary garments, served as a constant reminder of the seriousness with which RVI desires to deploy quality.

**Roles.** Without the assumption of roles, it is doubtful that this thesis would even have been written. A champion was instrumental in conveying the importance of developing and deploying this system to the rest of the RVI management team.

**Trialability.** By deploying small independent portions of the system, RVI was able to gauge the response from its employees and managers. This flexibility helps to win support for the program, if initial trials are positive. Conversely, if initial trials had turned out negative, it might have proven detrimental to the deployment of subsequent sections.

Some factors were not detected during the study of the deployment. As previously explained, these factors were: compatibility and management commitment.

Yet other factors, though detected, could not be said to either enhance or hinder deployment. These factors were:

**Training.** RVI had begun to implement training programs for both the quality culture and production process. No training was conducted on deploying the system or using it. The lack of formalized training did not seem to hinder the few policies and procedures that were implemented. However, these policies and procedures were among the simpler to adopt, thus reducing the need for formal training. The results of this factor are inconclusive.

**Organizational Integration.** As was the case with training, examples of organizational integration were identified during the study. These examples, however, were not concerned with the deployment of the system, but with the operation of the system. Due to the lack of any further information on this factor, its effect remains inconclusive.

This study was also limited by the assumption that factors affected only the deployment and not other factors. In reality, many of the factors had the potential for interaction effects.

For example, the complexity of a system can affect the deployment, but the degree to which complexity affects deployment is subject to the amount of training the users receive in preparation for the deployment. The extent of management commitment could be enhanced by the emergence of roles such as a champion, especially if the role is enacted by a influential member of management. Similarly, the broad ranging social and experiential backgrounds resulting from organizational integration can also reduce the apparent effect of differences in cultural assumptions between the users and designers of systems.

## **Conclusion**

The study examined the quality management needs and requirements of a small business. Based on the findings, a quality strategy was formulated. Policies and procedures were defined to support the quality strategy. The quality strategy, policy, and procedures were documented with ISO9002 compatibility in mind.

Factors affecting the successfulness of an deployment were identified and operationalized. It was the hypothesis of this study that the identified factors would indeed affect the deployment of a quality management system.

Much of the study relied on qualitative information, justifying the use of a case study methodology. This technique was used to analyze the

deployment of the quality management system and to test the hypothesis. The study, although hampered by time and scheduling constraints, was completed.

The study found that the lack of a clear plan, a low degree of fitness for use, and a high degree of complexity hindered the deployment of the quality system. Observable benefits, the presence of roles, and trialability enhanced the deployment of the system. The effects of training and organizational integration on successful deployment were inconclusive.



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## **Appendix A. RVI Production Process**

RVI was granted an exclusive contract to produce coconut for a well established national food company. The contract followed months of intensive scrutiny by the customers quality assurance department. The contract was granted only after RVI demonstrated the ability to consistently deliver products that met the customers stringent specifications. RVI was able to accomplish all this at the Avel facility, without a formalized quality program. This is an indication that RVI has been doing something right. This unidentified factor(s) could contribute to attaining competitive advantage. It is therefore important to identify the factor(s).

### *Production Process*

The search for the unidentified factors affecting quality begins with an analysis of the existing production process consists primarily of two phases: blending and packaging. The process is documented in Table 3 and Figure 12 according to ANSI Z94<sup>1</sup>.

The process begins with the receipt of the primary raw material, desiccated coconut (DCN). DCN arrives on board a container van. The product itself is packaged in 100 lb. polyethylene and Kraft paper bags. The bags which

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1. Due to the lack of an appropriate typeface, the symbols appearing here differ slightly from those prescribed by the standard, in that they are solid instead of outlined.

are stacked in the container van without the use of pallets or slip sheets, are manually unloaded and palletized. Temporary workers are usually utilized in the palletizing operation. Warehouse lot numbers are issued per pallet. The warehouse lot numbers are used internally to RVI for tracking purposes. The DCN is stored in the warehouse until requisitioned by the production department.

Step	Symbol	Description
1.	●	Rec'v / Unload DCN bag from CV
2.	●	Palletize and assign warehouse lot no.
3.	▼	Store pallet (DCN) in warehouse
4.	●	Requisition DCN
5.	→	Deliver DCN
6.	●	Note DCN Bag nos. Per batch
7.	●■	Strip paper liner on DCN bag exposing poly
8.	●	Load DCN bag on conveyor
9.	→	Transport DCN bags to blender loading station
10.	●■	Slit DCN poly bag and dump contents into blender
11.	●■	Add Salt into blender
12.	●	Cycle blender (First cycle)
13.	●	Add PG solution (automatic)
14.	●	Load ●●●● on conveyor
15.	●	Load ●●●● on conveyor
16.	●	Load ●●●● on conveyor
17.	→	Transport ●●●●, ●●●●, and ●●●● to blender loading station
18.	●■	Open ●●●● and dump into blender

Table 3: Flow process chart for existing process.

Step	Symbol	Description
19.	●■	Open ●●●● bag and dump into blender
20.	●■	Open ●●●● bag and dump into blender
21.	●	Cycle blender (Second cycle)
22.	●	Release SCN to sweetened bin
23.	→	Move SCN from bin to bucket conveyor
24.	●	Sift SCN
25.	→	Move Sifted SCN to chute
26.	→■	Drop SCN to bagging/weighing station
27.	●	Weigh and bag SCN for storage (in process stock) or use by subsequent operation
28.	→	Move bagged SCN to Wright machine for retail packaging
29.	●	Empty bag of SCN into Wright machine
30.	●	Bag and seal SCN in retail packaging
31.	→■	Move retail SCN pack to inspection station
32.	■	Inspect for weight and metal particles
33.	■	Inspect for Bag seal and visual appearance
34.	→	Move retail package to packing station
35.	●	Load retail packs into cartons
36.	●	Seal carton
37.	●	Palletize cartons
38.	●	Assign tracking no. To pallet
39.	▼	Deliver pallet (carton) to warehouse
40.	●	Load pallet (carton) to container van

Table 3: Flow process chart for existing process. (Continued)

The production department requisitions specific cuts of DCN for production. The DCN is drawn from the warehouse on a first-in-first-out basis (FIFO). This helps to prevent the DCN from unnecessarily aging.

Individual pallets of DCN are delivered to the production floor on a forklift. Each bag of DCN has a production lot number (DCN bag no.) issued by the supplier. The DCN bag numbers are noted before the DCN is used in production.

The paper liners of the DCN bags are then stripped. The coconut is still sealed inside the polyethylene layer of the bag. However, as the polyethylene is see-through, obvious non-conformities such as water marks, yellow flakes, or stains are readily visible. Should a non-conformity be discovered, the production worker performing this task calls the attention of the production supervisor. For each batch, six bags of DCN are loaded onto the conveyor and transported to the blending station.

The blender station is an elevated platform that provides access to the mouth of the blender. The worker at this station places bags onto a stripping plate, strips the plastic liners, and dumps the contents onto the chute. The worker inspects the bulk DCN for visual, olfactory, and occasionally for flavor conformance. If the conformance of the DCN is questionable, the worker at the blender station calls the attention of the production supervisor. If the DCN appears to be free of non-conformity, it is pushed into the blender. A measured amount of salt is added to the contents of the blender, and the worker activates the first blender cycle through a switch on a relay panel. During the first cycle, PG solution (a

mixture of water and propylene glycol) is added to the contents of the blender. The first blending cycle lasts an average of 12 minutes, but varies according to ambient conditions.

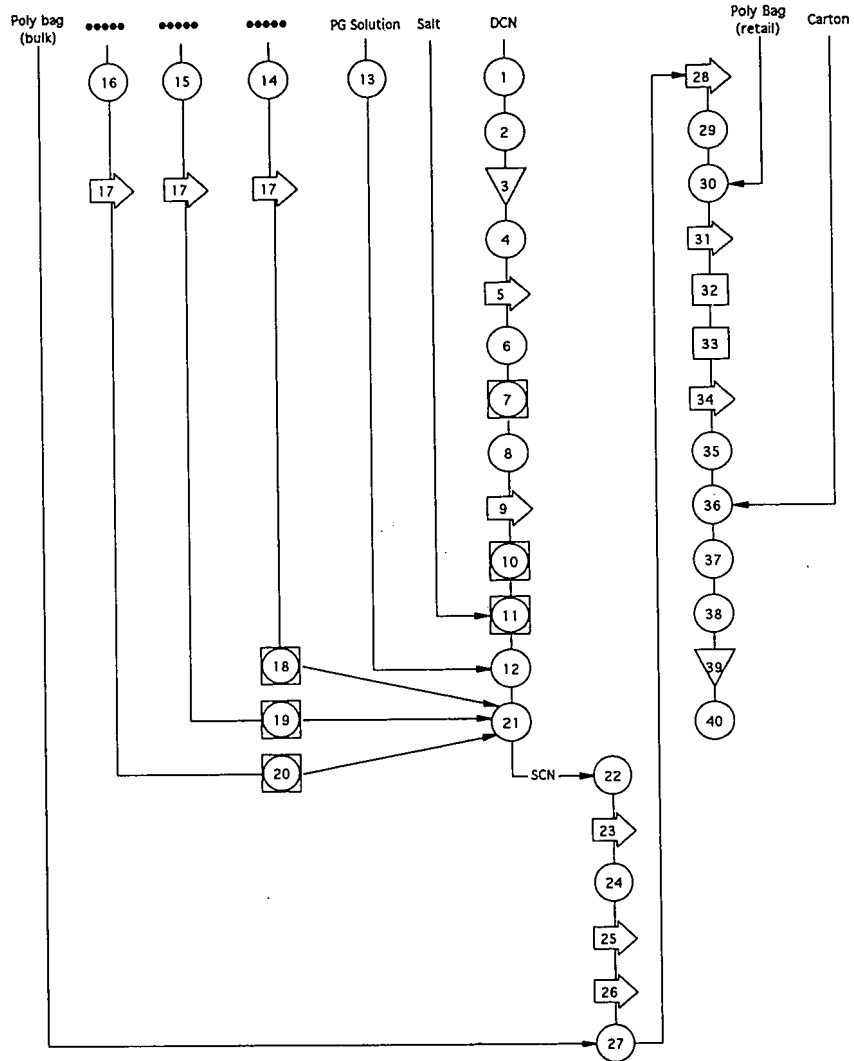


Figure 12: Operation Process Chart, Avandol NJ.

While the blender goes through the first cycle, production workers prepare the next set of materials to be added to the blender.



Bags containing the ingredients to a proprietary sweetener are loaded on the conveyor. The ingredients are then transported to the blender station where the bags are opened, inspected, and dumped into the blender. As with the DCN, workers will call the attention of the production supervisor if there are any doubts of product conformity.

Once all the ingredients of the proprietary sugar mixture are added to the blender, the worker activates the second blender cycle. The second cycle lasts an average of 6 minutes.

Upon completion of the second cycle, the blender releases its contents into a bin. This bin is made of stainless steel, and is modified with multiple screw conveyors that transport sweetened coconut (SCN) onto a bucket conveyor which transports the SCN to a sifting machine. The machine is equipped with interchangeable sieves, and an appropriate sieve is used based on the cut of coconut being processed. After sifting, the SCN falls onto a short belt conveyor that transports the SCN to a chute equipped with earth magnets. The earth magnets remove any ferrous materials that may have been present in the SCN.

At the bottom of the chute lies a scale. This area comprises the weighing/bagging station. Here the SCN is packaged into 50 lb bags for use as a buffer stock, or into 50, 25, or 10 lb. bags for bulk sale. Considerably more attention is paid to the weight of SCN being packaged for sale as opposed

to SCN being packaged for storage. Unfortunately, the buffer stock is necessary because of a large disparity in cycle times of the blending and packaging line.

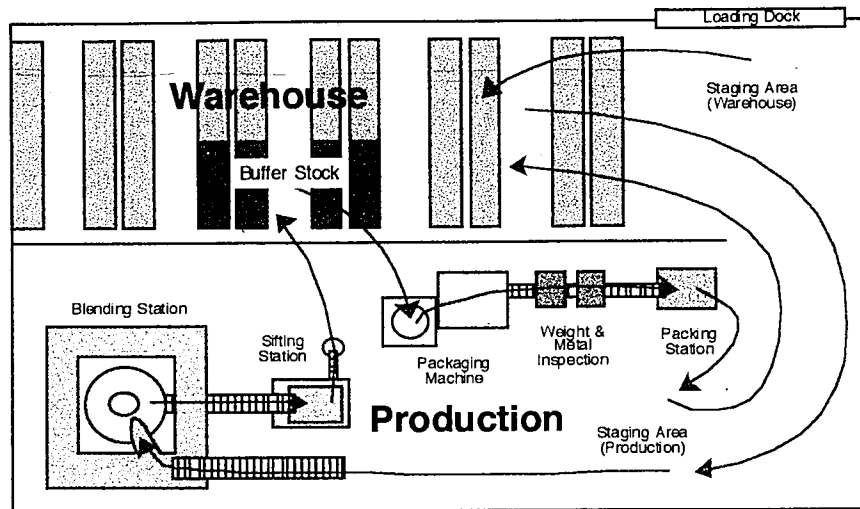


Figure 13: Plant Layout showing production flow. Blue flow lines represent DCN, green lines represent SCN

SCN is drawn from the buffer stock on a FIFO basis and loaded into the packaging machine. The machine dispenses a pre-set amount of SCN into polyethylene bags which are then heat sealed.

As the bags come out of the packaging machine, they drop onto a conveyor for transport to the inspection station. While on the conveyor the bags are subject to the scrutiny of production workers on this line. Very frequently, a bag will be picked off the conveyor, squeezed, shaken and returned to the conveyor. The workers are very adept at spotting possible non-conformities. The conveyor passes through a weight inspection station that

measures the weight of each bag, and blows non-conforming product off the conveyor and into a rework bin. The conveyor then passes through a metal detector, and non-conforming items are similarly removed from the line.

At the end of the conveyor lies the packing station. Workers at this station hand pack individual bags into cartons. As the bags are packed they are tested for seal integrity and aesthetics. When appropriately filled, the cartons are sealed, palletized, and delivered to the warehouse to await shipping.

#### *Quality Characteristics vs. Production Process*

The production steps and their effect on quality are illustrated by plotting a matrix. Along one axis, the quality characteristics are listed. The other axis lists production steps. At each intersection, the given production step either affects or does not affect the given quality characteristic. Additionally, inspection operations can be identified for any given quality characteristic, and related to a specific production step where the inspection occurs. The inspection can take one of two forms:

- Explicit Inspection - A formalized procedure for evaluating product conformance.
- Implicit Inspection - An informal method for checking product conformance.

The matrix is presented in Table 4. It shows that RVI's quality level is

highly dependent on the quality of incoming materials, primarily DCN. The quality characteristics of extraneous matter, flake size, flavor, and microbiological contamination are more dependent on the process, in that the level of quality can be affected by more process steps in comparison with the remaining quality characteristics. In addition, production steps 7, 10, 33, and 36 are important inspection point where a variety of characteristics can be monitored.

Step	Color	Extraneous Matter	Flake Size	Flavor	Moisture Content	Odor	Packaged Weight	SO <sub>2</sub> Content	Package Graphics	Package Seal Integrity	Carton Appearance	Carton Coding	Carton Count	Carton Graphics	Carton Seal	Microbiological Contamination	Inert Material Contamination
1.	✓	✓	✓	✓	✓	✓		✓								✓	✓
2.			✓														
3.	✓				✓												
4.			✓					✓									
5.			✓														
6.																	
7.		✓															
8.																	
9.																	
10.		✓		✓												✓	
11.		✓		✓												✓	
12.		✓	✓	✓													
13.		✓		✓	✓											✓	✓

Table 4: Quality vs.Process Matrix. Heavily shaded squares indicate Explicit Inspection, lightly shaded squares indicate implicit inspection.

Step	Color	Extraneous Matter	Flake Size	Flavor	Moisture Content	Odor	Packaged Weight	SO <sub>2</sub> Content	Package Graphics	Package Seal Integrity	Carton Appearance	Carton Coding	Carton Count	Carton Graphics	Carton Seal	Microbiological Contamination	Inert Material Contamination
14.																	
15.																	
16.																	
17.																	
18.		✓	✓														✓
19.		✓	✓														✓
20.		✓	✓														✓
21.		✓	✓	✓													
22.		✓															✓
23.		✓															✓
24.		✓															✓
25.		✓															✓
26.		✓															✓
27.		✓					✓										✓
28.	✓																
29.		✓					✓										✓
30.							✓			✓							
31.																	
32.																	
33.																	
34.																	
35.													✓				
36.																	

Table 4: Quality vs.Process Matrix. Heavily shaded squares indicate Explicit Inspection, lightly shaded squares indicate implicit inspection. (Continued)

Step	Color	Extraneous Matter	Flake Size	Flavor	Moisture Content	Odor	Packaged Weight	SO <sub>2</sub> Content	Package Graphics	Package Seal Integrity	Carton Appearance	Carton Coding	Carton Count	Carton Graphics	Carton Seal	Microbiological Contamination	Inert Material Contamination
37.																	
38.											✓						
39.																	
40.																	

Table 4: Quality vs.Process Matrix. Heavily shaded squares indicate Explicit Inspection, lightly shaded squares indicate implicit inspection. (Continued)

Discoloration in the SCN can result from aging of either the DCN used as a raw material, or the SCN stored in excess of its shelf life. Exposure to elevated temperatures will also cause the DCN to yellow. It is also possible that the DCN used as a raw material was already discolored at the time of receipt at the warehouse. Anytime the DCN is actually visible to an operator, it often undergoes inspection, even without the worker consciously looking for non-conformities. If the worker happens to notice that the product is discolored, the attention of the production supervisor is called. If, however, the worker is unable to differentiate between conforming and non conforming product, whether by lack of training or physical handicap, the inspection is useless.

## **Appendix B. RVI Quality Manual**

## 1.1 Vision Statement

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- 1.1.1 RV Industries seeks to become the recognized provider of choice for coconut based food products in North and South America. Towards this end, RVI shall endeavor to establish and maintain a leadership position in providing quality products and services.

## 1.2 Mission Statement

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- 1.2.1 RVI will expand its customer base for both desiccated coconut (DCN) and sweetened coconut (SCN) by focusing on the acquisition of national accounts.
- 1.2.2 RVI will explore new market opportunities by developing or introducing new coconut based products.
- 1.2.3 RVI will endeavor to acquire and operate the most effective manufacturing technology, while concurrently increasing labor efficiency.

## 1.3 Quality Policy

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- 1.3.1 Quality shall refer to the degree to which a product fulfills a customer's needs.
- 1.3.2 RVI recognizes that as a producer of food products, it has a responsibility to its customers, and the public in general, to provide a product fit for human consumption. Consequently, RVI will only deliver or accept products that meet or exceed bacteriological and foreign particle specifications.
- 1.3.3 RVI recognizes its obligation to observe existing federal and state regulations concerning the production of food products. Consequently, RVI will only deliver or accept products that meet or exceed packaged weight and packing count standards and specifications.
- 1.3.4 RVI recognizes the inconvenience to customers and possible loss of business resulting from the delivery of product not suitable for the customers' intended use. Therefore, RVI will only deliver or accept products that meet or exceed any and all internal or customer generated specifications.
- 1.3.5 RVI will emphasize the production of conforming product, as opposed to the removal of nonconforming product prior to shipping. In the event any unsatisfactory product is shipped to a customer, RVI shall take all necessary steps, regardless of cost, to quickly rectify the inadvertence.



- 1.3.6 RVI recognizes the importance of good quality raw materials to the continued success of its operations. It will, therefore, seek to build mutually beneficial long term relationships with its suppliers.
- 1.3.7 RVI recognizes the benefits of providing good customer service. It will provide accurate and timely information to customers regarding the status of orders or inquiries.

## **1.4 Responsibility and Authority**

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- 1.4.1 Management shall designate a representative with executive responsibility, who irrespective of other duties, shall bear the responsibility for ensuring that the quality system is established and implemented, and for maintaining its effectiveness.
- 1.4.2 Management shall seek to establish and maintain an environment conducive to the propagation of quality consciousness.
- 1.4.3 All RVI personnel are responsible for maintaining the current level of quality, and exploring opportunities to increase the level of quality.
- 1.4.4 All RVI personnel are responsible for initiating actions to prevent the occurrence of any nonconformities relating to product or process.
- 1.4.5 All RVI personnel are responsible for identifying any problems relating to the product or process.
- 1.4.6 All RVI personnel are responsible for initiating, recommending, or providing solutions to such problems. Furthermore, all personnel are responsible for verifying solutions.
- 1.4.7 All production personnel are responsible for stopping the further processing and/or delivery of nonconforming product until the deficiency or unsatisfactory condition has been rectified.

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## **Appendix C. RVI Policy Manual**

## 2.1 Quality System

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### 2.1.1 General

- a) RVI will establish, document, and maintain a quality system as a means of ensuring that its products meet or exceed standards and specifications.
- b) The quality manual will be compatible with ANSI/ASQC Q9002.
- c) RVI will effectively implement the quality system and its documented procedures.
- d) RVI will define and document methods for maintaining the desired level of quality. RVI will perform the following activities:
  - Clarification of standards of acceptability for all materials and products, including those for subjective characteristics.
  - Identification and acquisition of any controls process, equipment, resources and skills necessary to maintain the required level of quality.

## 2.2 Contract Review

---

### 2.2.1 Review

- a) Before accepting contracts and/or orders, RVI will review contract/order proposals to ensure that:
  - Customer requirements or specifications are sufficiently defined and documented, especially in the case of those received verbally; and
  - RVI has the capability to meet the contract or accepted order requirements.

## 2.3 Document Control

---

### 2.3.1 Document Release

- a) Before a document is released, it must be reviewed and approved by the end user. The end user's comment will be considered by a qualified management representative prior to the release of any document.
- b) Documents will be designed with RVI's computerization plans in mind.

### **2.3.2 Document Modification**

- a) From time to time, documents may need to be modified to reflect changing conditions. In the event that such a change is to be made, the end user must review any proposed changes. The end user's comment will be considered by a qualified management representative prior to the release of any document.

### **2.3.3 Document Tracking**

- a) Two levels of documentation are to be maintained: current documents and historical documents.
- b) Modification levels are to be identified by a Release number.

## **2.4 Purchasing**

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### **2.4.1 Evaluation of Suppliers**

- a) Subcontractors and suppliers will be evaluated on the basis of their ability to meet specific requirements, including this quality system.

### **2.4.2 Purchasing**

- a) Purchasing documents will contain data clearly describing the product ordered, type, class, grade, or any other positive identification.

### **2.4.3 Verification of Purchased Product**

- a) Verification of purchased product by RVI does not imply that the supplier need not supply acceptable products, nor does it prevent RVI from subsequently rejecting non-conforming product.

## **2.5 Control of Customer Supplied Product**

---

### **2.5.1 General**

- a) Procedures for the verification and storage of customer supplied materials will be established.
- b) Verification by RVI does not imply that the customer need not provide acceptable products.

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## **2.6 Product Identification & Traceability**

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### **2.6.1 General**

- a) RVI will establish and maintain appropriate procedures for identifying the product and materials throughout the manufacturing and delivery process.

## **2.7 Process Control**

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### **2.7.1 Monitoring and control of product characteristics**

- a) Statistical quality control methods will be used to monitor the packaged weight of SCN. The purpose of this procedure is to determine if the filling process is in a state of statistical control.
- b) Sampling techniques will be used to monitor the moisture content of SCN, to determine conformance of a given production batch.
- c) Sensory testing methods will be used to monitor appearance, smell, and taste characteristics of both DCN and SCN.

### **2.7.2 Criteria for workmanship**

- a) A specification manual will contain explicit procedures or criteria for judging product conformance.

### **2.7.3 Equipment maintenance**

- a) Test and measurement equipment will be calibrated periodically. The frequency of calibration should be sufficient to guarantee proper operation of the equipment.

## **2.8 Inspection & Testing**

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### **2.8.1 Receiving Inspection**

- a) RVI recognizes the importance of good quality raw materials to the continued success of its operations.
- b) Suppliers will be evaluated on the basis of their ability to meet requirements including this quality system and any specific quality requirement.

### **2.8.2 In-Process Inspection and Testing**

- a) RVI will perform sensory testing in-process for cut, odor, color, and taste.
- b) Visual inspection will be used to detect extraneous matter.
- c) RVI will perform 100% inspection for metal contamination by using magnets.

### **2.8.3 Final Inspection and Testing**

- a) RVI will make finished goods samples available to customers at their request.
- b) RVI will sample finished goods for moisture, chemical composition, and microbiological contamination.

## **2.9 Control of Inspection & Test Equipment**

---

### **2.9.1 General**

- a) Procedures to calibrate and maintain inspection, measuring and test equipment will be established and documented.

## **2.10 Inspection and Test Status**

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### **2.10.1 General**

- a) The conformance or non-conformance of a product shall be clearly identified by suitable means.

## **2.11 Control of Non-Conforming Product**

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### **2.11.1 Segregation**

- a) Non-conforming products will be sorted according to their disposition, ie. scrap or rework.

### **2.11.2 Identification**

- a) Non conforming products will be stored in bins or pallets clearly labeled with the disposition of the product, ie. scrap bin or rework bin.

### 2.11.3 Documentation

- a) The volume and disposition of nonconforming products will be recorded in the Production Variance Report.

## 2.12 Corrective & Preventive Action

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### 2.12.1 Corrective Action

- a) Customer feedback is an essential component of continuous improvement. The Customer Feedback Form will be used to document specific customer complaints.
- b) A Production Anomaly Report Form will be used by the production team to document abnormalities in production, including but not limited to line stoppage, equipment failures, and non-conforming products.
- c) Data from the Customer Feedback and Production Anomaly Report Forms will be reviewed periodically to establish trends. An analysis will then be made to rectify any undesirable situation.

### 2.12.2 Preventive Action

- a) All persons on the production floor shall follow good shop practices, as defined in the RVI procedure manual.

## 2.13 Handling, Storage, Packaging, & Delivery

---

### 2.13.1 Handling

- a) Products and materials will be handled in such a manner that does not detract from the item's fitness for intended use.
- b) The physical health of employees must be safeguarded from repetitive motion injury or overexertion.

### 2.13.2 Storage

- a) Products and materials will be stored in such a manner that does not detract from the item's fitness for intended use.
- b) Warehouse design criteria will be strictly observed to ensure proper storage of materials and products.

### **2.13.3 Packaging**

- a) Products will be packaged in a manner that enhances the item's fitness for intended use.

### **2.13.4 Delivery**

- a) Products will be delivered in such a manner that does not detract from the item's fitness for intended use.
- b) Products will be delivered in a timely fashion.

## **2.14 Control of Quality Records**

---

### **2.14.1 General**

- a) Quality records shall be maintained to demonstrate conformance to specified requirements and the effective operation of the quality system.
- b) Records will be kept in an easily accessible but secure environment.

## **2.15 Internal Quality Audits**

---

### **2.15.1 General**

- a) Internal Quality audits will be conducted as a proactive tool for problem solving.
- b) Audits may be conducted on a fixed schedule, or at the discretion of management in response to changing operating conditions.
- c) Results of Quality Audits will be recorded.

## **2.16 Training**

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### **2.16.1 Qualification**

- a) All new production personnel will undergo orientation prior to working on the production floor. This orientation may include brochures, videos, and customer site visits.
- b) Once on the production floor, all new production personnel will undergo on the job training. This training will be carried out under the direct supervision of the production supervisor. The training will rotate the new employee among all production stations.



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### **2.16.2 Re-Qualification**

- a) Training will occur on-the-job, on a continuing basis.
- b) The production supervisor will continually monitor the performance of production personnel.

## **2.17 Statistical Techniques**

---

### **2.17.1 General**

- a) RVI will rely on statistical techniques for establishing, verifying, and controlling process capability and product conformance.
- b) Procedures for the application of statistical techniques will be established and documented.

## **Appendix D. Sample Procedure: Inspection & Testing**

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### 3.8.1 Receiving Inspection

#### A. DCN Sampling upon request of Customer

Upon request of the customer, RVI will draw samples of incoming DCN from the shipping lot (one container van). The samples will be forwarded to the concerned customer or its representative.

Materials	Alcohol	Aluminum Foil	Knife
	Sample Spoon	Whirl Pack Bags	Cellophane or Masking Tape
	Logsheets	Shipping Cartons	

#### Sample Preparation

1. While unloading the container van, prepare one pallet for sampling by placing three non-sample bags on the bottom layer of the pallet.
2. Set aside every ninth bag removed from the container (every eight bag if the container has 450 to 500 bags) and place the bag on a sample pallet
3. Transfer the bag code from the top panel of the bag to a side panel where it will be legible once the bag is palletized.
4. Repeat steps 2 and 3 until fifteen sample bags have been placed on the sample pallet.
5. Affix two "SAMPLE" and one "LOT NUMBER" sticker to the front and back of the pallet.
6. Repeat steps 1 through 5 until sixty sample bags have been palletized. There should be exactly four sample pallets at the end of step 6.

#### Material Preparation

Use care to aseptically sample these lots as the samples are to be used for microbiological and chemical testing. Once sanitized, the utensils should not be touched or allowed to come into contact with anything other than the sample.

1. Sanitize utensils immediately before use.
2. Wash the knife and sample spoon with hot water, let dry, and dip in alcohol. Remove and shake off any excess alcohol.
3. Place the knife and spoon in pieces of aluminum foil which have not been handled in the center positions. Once the alcohol has evaporated, wrap the knife and spoon in aluminum foil.
4. Once sanitized, be careful not to touch the utensils in any area that may come into contact with DCN.

#### Sample procedure

### A. DCN Sampling upon request of Customer (Continued)

1. Number 60 Whirl Pak bags sequentially from 1 to 60. Also number DCN bags from 1 to 60.
2. List the Bag Codes of the sample bags on the logsheet provided. Ensure that all numbers match between the logsheet, sample bag, and whirl pak bag. i.e. the Bag Code from coconut bag #1 is listed in position 1 on the logsheet and that the sample from coconut bag #1 is collected in the whirl pak bag labelled 1.
3. Use the knife to cut an inverted V into the side of the DCN bag. Each leg of the cut should be approximately four inches long. Re-place the knife in the aluminum foil while not in use.
4. Open the whirl pak bag by removing the tear strip and pulling the bag open by the small tabs in the center of the bag. DO NOT TOUCH THE INSIDE OF THE BAG.
5. Use the sample spoon to fill the whirl pak bag approximately half way. Re-place the spoon in the aluminum foil while not in use.
6. Tape the inverted V cut in the sample bag with two inch wide cellophane or masking tape.
7. Repeat steps 3 through 6 until all 60 whirl pak bags have been filled.
8. Affix a sticker to whirl pak bag #1 that indicates the DCN lot number.
9. Place all 60 whirl pak bags and the DCN bag code list in a corrugated box and seal for shipping.
10. Ship the sample box to the requesting customer, or its representative via overnight delivery.
11. The knife and spoon must be washed and sanitized before they can be used again.

### B. Verification of Purchased Product

All purchased product will be validated against purchase orders and / or specifications outlined in the appropriate sections under 4.0 Quality Requirements Specification Manual.

Materials	Purchase Order	4.0 Quality Requirements Specification Manual
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Inspection procedure

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## B. Verification of Purchased Product (Continued)

1. Prior to docking the container van, examine the paperwork presented by the driver. If there are any discrepancies, inform the traffic manager before continuing to unload the container van.
2. Verify that the item description, including type, class, or grade, matches the specifications on purchase order or bill of lading.
3. Verify that the order quantity and scheduled delivery dates coincide with the information on the purchase order.
4. Look for any information on the purchase order regarding specific requirements for the carrier, e.g. climate controlled carrier. Examine the carrier for compliance with the requirement.
5. Methodically examine the container van for signs of infestation or contamination. If either is suspected, DO NOT ALLOW the container van to dock. Notify the traffic manager promptly.
6. Once it has been determined that the container is free of infestation or contamination, dock and open the container van following good warehouse practice.
7. Inspect the cargo to verify if it is in fact labeled as the items specified on the purchase order.
8. Also note the condition of the cargo and the container van. If there is any question as to the acceptability of the cargo, inform the traffic manager.
9. If inspection sampling has been requested for DCN, follow the procedure found in item "A. DCN Sampling upon request of Customer" in this section.
10. If all of the above items are in order, begin unloading the container van.
11. As the container van is unloaded, continue to monitor points 7 and 8.
12. Verify the physical count against the purchase order or bill of lading.

## 3.8.2 Final Inspection

### A. Acceptance Sampling for Retail Packages

RVI will sample all production lots of SCN that are packaged for retail.

Materials	Alcohol	Aluminum Foil	Knife
	Sample Spoon	Whirl Pack Bags	Cellophane or Masking Tape
	Logsheets	Shipping Cartons	

Drawing samples

### A. Acceptance Sampling for Retail Packages (Continued)

1. Prepare an empty bin to hold packaged SCN samples each time a new production lot reaches the packaging operation.
2. Examine the table below to determine the number of samples to draw and the frequency at which sampling should occur.
3. Following the instructions from the table, draw samples of SCN as they are about to be placed in cartons. Place all samples in the Sample bin.
4. Repeat step 3 until all the necessary samples have been placed in the sample bin.
5. Accomplish the Acceptance Certification Form and place it in the sample bin.
6. Promptly deliver the Sample bin to the lab for testing.

If the package is ...	then draw ...	after...	send to...
7 oz.	1 bag	every 300 bags	RVI Lab
10 oz.	1 bag	every 200 bags	RVI Lab
14 oz.	1 bag	every 100 bags	RVI Lab
16 oz.	1 bag	every 100 bags	RVI Lab
32 oz.	1 bag	every 100 bags	RVI Lab
<p>●●●●●●●● Products</p> <p>(See ●●●●● Documentation for further details)</p>	one 10 oz. bag	every start of shift	<p>LIBRARY</p> <p>●●●●●●●● ●●●●●●●● ●●●●●●●● ●●●●●●●●</p>
<p>●●●●●●●● Products</p> <p>(See ●●●●● Documentation for further details)</p>	60 samples of 2 scoops of coconut from every third box.	Plant Start-up for a period of 5 production days	<p>●●●●●●●● ATTN: ●●●●●●●● ●●●●●●●● ●●●●●●●● ●●●●●●●● ●●●●●●●●</p>
<p>●●●●●●●● Products</p> <p>(See●●●●● Documentation for further details)</p>	1 sample of 2 scoops of coconut per hour and compost into big whirl-pak	First 5 days of production	<p>●●●●●●●● ATTN: ●●●●●●●● ●●●●●●●● ●●●●●●●● ●●●●●●●● ●●●●●●●●</p>

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### 3.8.3 Physical Test Procedures

#### A. Flake Size Testing for Specialty Cuts

Flake sizes must conform to specifications outlined in the appropriate sections under 4.0 Quality Requirements Specification Manual.

Materials	Scale	4.0 Quality Requirements Specification Manual	
	Test Report	Pen	Ruler

##### Inspection procedure

1. Weigh 5 grams of SCN.
2. Sort the SCN by length into two groups: Group A. SCN within size specification, and Group B. SCN outside size specification.
3. While sorting observe the color of the SCN, and whether or not black or brown specks can be seen on the flake. Note observations on the Test Report.
4. Weigh group A and compute the percentage by dividing the weight of group A by total weight sample. (5 grams).
5. Weigh group B and compute the percentage by dividing the weight of group A by total weight sample. (5 grams).
6. Record the percentages of groups A and B on the Test Report.
7. If percentage weights do not conform to specification, draw a check mark on the appropriate box in the Test Report.
8. Discard the sample.

#### B. Sieve Testing for Standard Cuts

Flake sizes must conform to specifications outlined in the appropriate sections under 4.0 Quality Requirements Specification Manual

Materials	Ro-Tap Machine	4.0 Quality Requirements Specification Manual	
	Scale	Test Report	Sieve Screens

##### Inspection procedure

### B. Sieve Testing for Standard Cuts (Continued)

1. Weigh exactly 100 grams of SCN.
2. Select screens to be used for this particular test according to the Specification manual.
3. Arrange sieve screens according to increasing mesh number, with the pan at the bottom, followed by highest numbered mesh screen. At the top of the nest should be the mesh screen with the smallest number.
4. Place the 100 gm. sample on the topmost sieve and cover with a lid.
5. Place the entire nest on the Ro-Tap shaker and set the timer for 5 minutes.
6. When the Ro-Tap stops, take the screens out and set them on a working table.
7. Weigh individually DCN retained on each sieve screen. Record each weight against the corresponding sieve screen number.
8. Sum up the obtained weights and get the percentage retention by dividing the retained weight by the total weight sample. (100 grams)
9. If percentage weights do not conform to specification, draw a check mark on the appropriate box in the Test Report.
10. Discard the sample.

### A. Packaged Weight Data Collection

Packaged weight is monitored automatically by the Triangle machine. All packages are inspected, and those found to be underweight are rejected.

Materials	Pen	Packaged Weight Summary Report
-----------	-----	--------------------------------

Recording Data

1. Reset the long term weighgard at the beginning of each production lot by pressing the Weighgard key twice, then pressing the 708 Enter Address key.
2. The Triangle machine will automatically monitor packaged weights as the lot is produced.
3. At the end of the production lot, display the Long Term Weighgard by pressing the Weighgard key twice.
4. Using the information on the Long Term Weighgard display, accomplish the Packaged Weight Summary Report.

## 3.8.4 Chemical Test Procedures

### A. Moisture Test for SCN

Materials	Ohaus MB200 Moisture Tester	4.0 Quality Requirements Specification Manual
	Pan Liner	Test Report

Inspection procedure



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### A. Moisture Test for SCN (Continued)

1. Place one pan liner on the Ohaus MB200. Press SET TARE button to reset weight reading to zero.
2. Place 10 grams of SCN on the pan liner.
3. Close the cover and set to 120 C, 30 minutes. Press ON button.
4. At the end of 30 minutes, read the percent moisture from the equipment read out screen.
5. Record the moisture content in the appropriate box on the Test Report.
6. Discard the sample.
7. Dispose of the pan liner.

## 3.8.5 Sensory Test Procedures

### A. Color Test for SCN

Flake color must conform to specifications outlined in the appropriate sections under 4.0 Quality Requirements Specification Manual

See item A. Flake Size Testing for Specialty Cuts in section 3.8.3 Physical Test Procedures for Color testing of Specialty cuts.

1. While preparing the Bulk sample for quartering, observe the color of the SCN, and whether or not black or brown specks can be seen on the flake. Note observations on the Test Report.
2. If SCN color does not conform to specification, draw a check mark on the appropriate box in the Test Report.

### B. Olfactory Test for SCN

Flake odor must conform to specifications outlined in the appropriate sections under 4.0 Quality Requirements Specification Manual.



This test should only be performed by individuals who have been free of medication or tobacco use for a period of one day prior to test date.

Materials	Test Report	4.0 Quality Requirements Specification Manual
Inspection procedure		

### B. Olfactory Test for SCN (Continued)

1. Bring the sample to the sensory test area.
2. With the sample on the work surface, position yourself so that your face is no more than 18 inches away from the sample.
3. Inhale gently and repeatedly.
4. Dispose of sample.
5. If SCN odor does not conform to specification, draw a check mark on the appropriate box in the Test Report.

### C. Taste Test for SCN

Flake sizes must conform to specifications outlined in the appropriate sections under 4.0 Quality Requirements Specification Manual.



This test should only be performed by individuals who have been free of medication or tobacco use for a period of one day prior to test date.

Materials	Test Report	4.0 Quality Requirements Specification Manual
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#### Inspection procedure

1. Drink a glass of water prior to testing.
2. Bring the sample to the sensory test area.
3. Taste the sample.
4. Dispose of sample.
5. If SCN taste does not conform to specification, draw a check mark on the appropriate box in the Test Report.

## **Appendix E. RVI Brochure**

### Simple things can affect Quality in a big way

Small things go a long way in the production of high quality coconut products. Here are some examples of simple but important guidelines we follow on the production floor.

- Wear a clean uniform and a hairnet. If you have a beard, wear a beardnet too.
- Jewelry may fall into the coconut or get caught in production equipment. Keep jewelry in a safe place - don't wear any rings, watches, or bracelets while working.
- Coconut absorbs odors very easily. To keep the coconut smelling fresh, smoking will not be permitted on the premises.
- Wash your hands thoroughly before returning to work. This helps to keep the coconut free from bacteria.
- Keep cosmetics, personal medication, and similar items in designated areas, to prevent the possibility of accidental contamination.
- If you are not feeling well, and you suspect you might have an illness, tell your supervisor immediately. The germs causing your illness could find its way into the coconut.
- If you notice something unusual about the coconut or other materials you are working with, get the supervisor's attention right away. Even if you are not sure, it's always better to check.

## Allow us to introduce Ourselves ...

*Committed to the highest level of quality*

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RV INDUSTRIES, INC.  
Doraville, Georgia

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RV INDUSTRIES, INC.  
Doraville, Georgia

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- If you notice something unusual about the coconut or other materials you are working with, get the supervisor's attention right away. Even if you are not sure, it's always better to check.

Allow us to  
introduce  
Ourselves ...

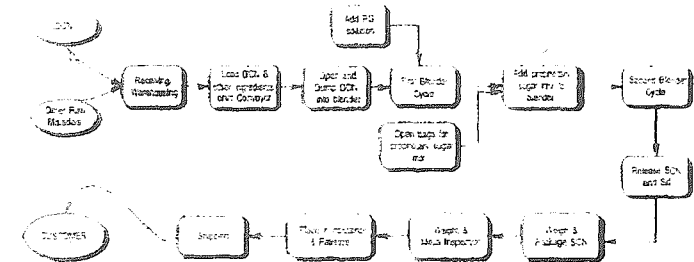
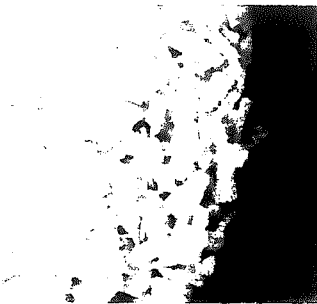
*Committed to the highest level of quality*

Doraville, Georgia

Doraville, Georgia

*Every job and every person at RV Industries plays an important role in producing some of the finest quality coconut products in North America.*

RV Industries supplies sweetened and desiccated coconut to several major food manufacturers. Our coconut products are used in cakes, candies, granolas, snacks, ice cream and a variety of other products.



How do we make Sweetened Coconut? The main ingredient is good quality desiccated coconut (DCN). Various sweeteners are blended with the coconut to produce sweetened coconut. The final product is sealed in polyethylene bags and put in boxes for delivery to our customers.

### Safety

Because our product goes into many different kinds of foods, we have to be sure that everything we produce is safe for people to eat. Even something as simple as forgetting to wash your hands before returning to work could transfer bacteria to the coconut. Our responsibility to the public, as individuals and as a company, is to provide a safe product.

DCN comes in a variety of cuts. This picture shows a close up of medium cut DCN. The coconut should appear soft white in color, without any black or brown specks. DCN possesses a naturally pleasant odor. Coconut that is too old for sweetening appears slightly yellowish in color, and has a distinct pungent smell.

### Naturally Sweet Taste

Safety is not enough, however. No one is going to buy a safe product that doesn't taste good. If we want to stay in business, our coconuts should look appetizing, smell fresh, and taste naturally sweet. Our competition also understands this, but while our coconuts are better, the quality of their coconuts are not so far behind.

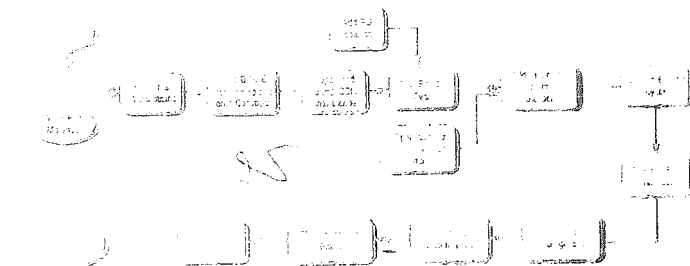
### Service

We can, however, provide good service. This means delivering the right product, at the right time, in the right amount. It also means we must listen to our customers, and work with them to give them exactly what they need.

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## Vita

### Octavio C. Siochi

Born on October 21, 1970, in Quezon City, Republic of the Philippines, to Andres and Loiva Siochi.

Received undergraduate degrees from Purdue University: B.S. Industrial Engineering Technology, option in Electrical Engineering Technology, A.A.S. Computer Integrated Manufacturing Technology, Certificate in Quality Control. Graduated with distinction, 1992.



**END OF  
TITLE**