

Composites Business: Stake Holders And Their Roles In Production

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There are several stake holders in the manufacture and use of composite products. They have a collective responsibility to see that the products that they make are of standard quality ensuring the users' confidence. FRP TODAY plans a series of articles on this topic highlighting the roles and responsibilities of each of the operatives in the production chain and by providing right information. The end users and each one in the production chain also needs guidance to ask for what they want from their suppliers. This first article introduces the scheme and its structure. We also solicit articles from the stake holders themselves bringing out their experience and suggestions.

Introduction

Composites are advanced material systems with wide ranging applications in industrial, infrastructure and social sectors. Composites are not new to mankind. Nature has created most of its living species including human body by using biologically grown composites. Traditional man made composites like concrete, plywood etc. have been in use for several centuries. But the modern composites made of chemically made fibres, resins and other materials and their technology is only seven decades old. In spite of this short history, the developments in the material system, manufacturing technology and application designs have been phenomenal. Advanced composites have been adjudged by the American Academy of Engineering, as one of the top ten technological achievements of the 20th century. This is a testimony of this technology showing how significant it is for the growth and development of modern technology.

Composites have already established their supremacy in the aerospace and

defense applications. In sectors like general industries, infrastructure and social applications like housing, composites are effectively replacing steel, aluminium, titanium and wood. Composites manufacture is a knowledge-based activity that requires sound knowledge and skill to produce good quality products. Each operative or stake holder has to be guided in their task for achieving the required quality level. While standards are available for the guidance, many are not adhering to them or are ignorant of such standards.

We are therefore planning to bring out a series of articles that can serve as a helpline to the composites industry. It is not a formal training programme, but an information dissemination scheme.

The Stake Holders

Before a product reaches the end user, its physical creation is due to the action of several operatives whom I prefer to call as *stake holders* because every one in the production scheme has a financial and technical stake in the products they make. Each one of

these stake holders require certain level of understanding about the product and how well they can contribute to the success of the product. The information and guidance needed by different stake holders can be different. Table 1 lists the stake holders in the composites' production process and the role of each holder in the production process.

How To Categorise Products?

Composites industry makes and supplies a variety of products; big and small, products that are safety critical, products that have to last for a few years or few decades, and products that are heavily loaded. The design methods, the sophistication and accuracy needed in design and manufacture, the method of manufacture and the safety margin selected have a bearing on the production scheme. Table 2 shows the way products can be categorized based on their importance. The products during the design stage itself must be categorized based on the designer's judgment and with the concurrence of the purchaser. The products during the design stage itself must be categorized based on the designer's judgment and with the concurrence of the purchaser.

Production Scheme

Products are made primarily in two schemes of production; (i) Customer

Table 1

List of Stake holders	
Stake holder	Role in product making
Purchaser	Purchasers come forward with their requirements for making the product. Manufacturer makes the product on behalf of the purchaser. The purchaser may or may not be the end user.
Market researchers/ developers	They identify the need or demand for a product. They do it on behalf of the manufacturer and hence these are for manufacturer initiated products.
Designers	Designers carry out the design of the product fulfilling the functional, safety, reliability, durability and cost effectiveness requirements. They do this on behalf of the purchaser or manufacturer. Designers need creativity, knowledge and experience.
Product Manufacturers	Product Manufacturers, like the end users, are the principal stake holders in the chain. They create the products as per the design and as per the purchasers' requirements using the materials and manufacturing process. The quality of product that they make depends to a large extent on their understanding of the technology and their resolve to have profit with honour.
Raw materials manufacturers/ suppliers.	Product is shaped to the required geometry using the materials. In composites, the materials are also created by the manufacturer using the fibres, resins and other raw materials. Raw material has a substantial influence on the performance and durability of the product. Supplier is an intermediary who buys and supplies the materials to the manufacturer.
Quality surveyors	Quality surveyors monitor the quality during manufacture and also monitor testing of products. Based on this, they certify the worthiness of the product.
Purchasers	Purchasers are intermediaries who buy composite products in bulk and use as component of their products. The purchase may be based on their orders and/ direct components made in ready to use form from the manufacturers/ bulk purchasers
Product dealers	Dealers are intermediaries who buy the product from the manufacturer and supply to the purchasers or end users.
End users	End users are the ultimate beneficiaries of the products. End user may be an individual, group of people or a society. Very often end users do not have any say in the manufacture, but it is essential that they monitor the product documentation to see whether products are with right materials and control.

Each operative in the list in Table 1 has to contribute to the quality production. They should therefore know what data they would need to fulfill their responsibilities and what they should do.

Table 2

Product category	
Category	Description
Category A	Products meant for high precision and sophisticated applications. Examples are aircrafts, machine elements, rockets and missiles, spacecrafts, communication equipment etc. They are safety critical products of high reliability.
Category B	These are primarily load bearing structures that are safety critical, the failure of which can lead to heavy financial loss or loss of life and that have life periods of more than 15 years. They include bridges, tall structures, pipes, wind turbine blades, chemical equipment etc. Durability and cost-effectiveness are prime considerations. Design uses higher margin of safety and less rigorous design techniques. Often, design is based on standard specifications.
Category C	Products that are similar to category B products but with a life span of 5 to 15 years. They include automobile and heavy vehicle parts, electrical insulation products, building components, furniture etc. Customer must get value for money, but failure may not lead to very heavy losses. Less margin of safety is used and design is not based on rigorous procedures.
Category D	Products that have a life span of up to 5 years. Pallets, waste bins, instrument covers etc. are examples.
Category E	Products of the use and throw type. Composites are not generally used for this category.

initiated production and (ii) manufacturer initiated production.

a. Customer initiated production: In this production scheme, the customer approaches the manufacturer to make the products

for his direct use or for using them as components of their products. In some cases, the dealers may take the role of purchaser. The customer must specify what he wants and the manufacturer must make the

products as per the requirements. Many manufacturers prefer this route because they have an assured outlet for their products and they need not worry about marketing. The bulk purchaser is not the end

Table 3

List of documents to be prepared in a typical production process	
Document	Description
1. Problem statement	When a purchaser approaches the manufacturer and the purchaser is not ready with the specifications, he must at least give in writing a clear statement of what he requires
2. Product design	The manufacturer or purchaser must first obtain a product design taking all the requirements. The designer must present a design report which shall contain all that he has considered in design. This report is mandatory for the class A and Class B and C type products listed in Table 2. A design summary must be sufficient for the other two types of products.
3. Working drawings	Based on the design, detailed working drawings have to be prepared. The drawing is a means of communicating by the designer to the manufacturer and the manufacturer to his shop floor staff. Any deviation made from the drawing must be recorded in the manufacturing document
4. Specifications	It is a document that is prepared based on design giving the details of materials, tolerances etc. It serves as a means for communication between designer and his clients/ manufacturer and as a document for tendering the work. Required for both innovative and routine designs.
5. Material and cost estimation	This information is useful for purchasing the materials, preparing the materials for the manufacture of the product and to estimate the cost for tender purposes.
6. Manufacturing plan	This document records the various operations carried out during manufacture. Information includes the preparation of pattern, mould or mandrel, monitor the incoming materials, arrange the workers and execute the manufacturing process.
7. Quality assurance plan	For each product made, there must be a testing and quality assurance plan. This must be either included in the specification or can be given separately. This includes the tests performed on the incoming materials, in process testing and final tests for product qualification.
8. Transportation to the site or location	This document lays down the procedure for transportation and the precautions to be taken.
9. Product certification	When the product goes to the end user, it must carry a certificate of quality production.

user of the product. The role of the purchaser is very important in ensuring product quality and protecting the rights of end user. If they are complacent or are ignorant, product quality may suffer.

b. Manufacturer initiated production: These are bulk manufacturing operations where the manufacturer selects the products, make them in bulk and market them. The sectional water tanks, FRP roofing sheets etc. are examples. They must assess the end users' requirements into consideration while making the product. The end user has no direct involvements, but they have the right to choose or not to buy the product. If he is not capable of assessing what he wants and what he must look for, he will be the loser.

Documentation

While the product is being made, the process related operations must be documented. Table 3 gives a list of documents that are to be prepared during the production and product evaluation.

Many in the industry feel that such documentation is unwanted luxury and is time consuming. However, those who have the ISO 9000 certification will understand the need for such documentation. The documents for very important products must be retained for the entire life period. The documentation gives four specific benefits.

(i) It will clearly show what steps are taken by each stakeholder in the production and to assess whether the steps are correct.

(ii) If a need arises during the use for repair, the technical information available in the document will help to carry out the repair correctly.

(iii) If there is a product failure of any type, it is possible to trace back what could be the reason for such a failure.

(iv) In case of a dispute, clear documents will help to fix responsibilities.

Duties And Responsibilities

Each stakeholder has a specific role in the production chain. It is required to define the role of each of them and the responsibilities they must share and the activities they must undertake. This aspect will be taken up in the next issue.

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