The future opportunity for EVVEN C.A. is to make best use out of all by products the shrimp is offering. In this page EVVEN offers an extract of its Business plan.
EVVEN C.A. is currently in contact with several scientific groups that have the capability to convert shrimp shell output into profitable Chitin/Chitosan. The World Market for Chitin and Chitosan products in 1999 was estimated by several sources to be 17,085 metric tons at an average value of $15,000 per metric ton or $255 million.

Glucosamine, another product derived from Chitin, is sold in the health food market as a dietary supplement for the treatment of arthritic pain, has an estimated world market of $392 million.

Chitin is the second most abundant polymer occurring in nature.
Chitosan - a derivative of chitin - is obtained by a chemical deacetylation of crustacean chitin.
Chitin/Chitosan is a basic building block of living tissues and the best source is crustacean shells such as shrimp.
Future industries will be based off of Chitin/Chitosan products which are derived from shrimp shells giving EVVEN unlimited future growth potential in the years to come. There are many current product lines and with its physiological compatibility with living tissues, it is widely recognized that the uses of chitin and chitosan are only limited by the creativity of the biomedical engineer. Chitin could serve as replacements for bone, veins, cartilage, arteries, and tissue replacements in a wide variety of applications.

The market for chitosan as a nutraceutical, sold in capsules as a dietary supplement already has a large profitable market for the purpose of lowering cholesterol and absorption of fat to avoid its digestion.
This new industry uses all other natural compounds extracted from crustacean shells including Astaxanthin and Glucosamine.
Astaxanthin is the red orange pigment now used for salmon coloring, it is also an antioxidant and is gaining recognition as being superior to vitamin E, being 100 fold more potent in free radical scavenging in some tests (LeHaye Laboratories, Redmond Washington.)
Glucosamine is claimed to be effective for osteoarthritis and is the number 1 dietary supplement sold in the US according to Nutraceutical World, May/June 2000.

Chitosan possesses a unique combination of a number of useful properties:

- **High reactionary ability** (it enters into the reaction of alkylation, acetylation, sulphation, carboxylation etc., which also gives a possibility to use it in a number of derivatives with new properties);
- **Stability to radiation** (it possesses stability to gamma radiation (emanation) thanks to which it can be used with the purposes of protection and purification from radionuclides);
- **Splendid sorption ability** (of transitive and especially heavy metals such as copper, zinc, nickel, cobalt, vanadium, titanium, antimony (stibium), ruthenium, strontium); **Selectiveness** (the ability to separate (divide) some metals: ferrum and copper, nickel and ferrum, cadmium and nickel).
- **It perfectly absorbs toxic metals:** mercury, cadmium, lead);
- **It does not cause allergic reactions and rejection;**
- **It degrades under the action of ferments; it is not toxic and is easily removed out of the organism;**
- **It does not cause concurrent reactions or functions;**
- **It hinders bacteria growth and reproduction and suppresses mould growth;**
- **Good adhesion; the ability to absorb low density cholesterol complex;**
- **It stops haemorrhage** and has
- **Immunostimulating activity** (preparations based on it increase the protective ability of the organism and have antisclerotic and antitumour effects).

Crustacean Shell Meal (CSM)

Crustacean shells, a by-product of the isolation of meat from crustaceans (shrimp, crab, lobsters) are composed mainly of chitin, protein and minerals (calcium salts) and the reddish pigment called astaxanthin. These "wet" by-product shells can be processed into chitin directly or dried and ground into CSM. CSM uses include additives for animal feed and soil amendments and when milled into a fine powder, it is ideal for injection through irrigation systems.

Chitin

By removal of proteins and mineral from wet shell or dried shell (CSM), Chitin is recovered as a wet/dry product. Chitin is a high molecular weight polymer made of the repeating sugar N-Acetyl-D-glucosamine (GlcNAc). Since chitin has been purified from the shell, its uses become more defined and selective. Chitin is insoluble is most common solvents including water and thus it is most often converted into derivatives or chitosan, both of which can be dissolved in either water or aqueous acids. Major uses of chitin are the production of chitosan and glucosamine.

Chitosan

This versatile product is produced from the chitin by chemical treatment to remove *N*-acetyl groups as acetic acid. Chitosan, essentially a polymer of repeating glucosamine sugar groups, is a cationic (positively charged) polymer. Many of its uses in cosmetics, water purification, waste recovery, food, medicine, and agriculture, utilize its cationic nature to cling to negatively charged surfaces such as skin, hair, etc.

Glucosamine
Although N-Acetyl-D-glucosamine (GlcNAc) is the major component amino sugar of chitin, glucosamine (GlcN) is the major sugar isolated from chitin, usually by depolymerization of chitin with acid (HCl or by enzymes). Although both GlcN and GlcNAc have been shown in multinational studies (Europe, Canada and USA) to be effective in relieving pain of osteoarthritis, GlcN appears to be more effective.
The market today for glucosamine for nutraceuticals, is ~$390 million (2).

A few Opportunities for Chitin, Chitosan and Glucosamine

Nutraceuticals/Healthcare--Chitosan's ability to bind fats and lipids has led to the oral use of Chitosan to effectively lower blood cholesterol levels (e.g., ChitoClear-A Versatile Marine Health Care Ingredient, Primex Ingredients ASA). Several combinations of Chitosan in tablet, capsule, and liquid forms are commercially available as dietary supplements.

Food/Functional Food Additives--Chitosan has been "self affirmed" as GRAS by Primex, AS (Generally Recognized As Safe) status in 2001. GRAS status is expected to greatly accelerate the use of Chitosan as a functional food additive in health foods. GRAS status of Chitosan will also stimulate the use of Chitin; the precursor of Chitosan derived from shellfish by-products.

Glucosamine--The building block of Chitosan, but commercially obtained from Chitin, is the No. 1 dietary supplement sold in the US and, according to Nutraceutical World, May/June 2000, sales of glucosamine are $392.4 million/year (2).

Cosmetics--Chitosan is currently used in a variety of creams and lotions as a moisturizing agent and in a variety of shampoos and hair conditioning products. Chitosan is used to take advantage of its cationic nature to allow adherence to skin and hair, improving texture.

Medical Applications--Chitosan is targeted in a number of biomedical applications, including drug delivery. There are several patented applications where Chitosan is used to deliver drugs in a more controlled fashion. These applications will require a very high purity product made under strict FDA guidelines.