Summary of
Preliminary Study – Chinese Market for Seaweed and Carrageenan Industry

July 6, 2007

Prepared by The JLJ Group – Solutions for China Entry & Growth

PREMISES

• This presentation include only key highlights from the MsWord Final Report “Preliminary Study – Chinese Market for Seaweed and Carrageenan Industry”

• For all detailed information refer to
  ✓ MsWord Final Report
  ✓ Excel Database
  ✓ Excel Economic Model to derive future demand

AGENDA

• Introduction
  ✓ Executive Summary
  ✓ Chinese market for carrageenan/solution providers
  ✓ Regulatory environment
  ✓ End-user industries
  ✓ China derived demand for seaweed
  ✓ Conclusions
  ✓ Appendix

OBJECTIVES OF THIS RESEARCH

• “A preliminary report that looked at global trade of seaweed/seaweed derivatives found that the Chinese market has grown rapidly in the last five years, but questions remained as to what China is using seaweed/seaweed products for…”

• The main objectives of this study were to:
  1. Understand the demand and use of seaweed in China, including the size, structure and nature of processing undertaken in China
  2. Identify the supply chains from seaweed producers in Indonesia to processors, solution providers and end-users in China
  3. Estimate the derived demand and future trends for seaweed requirement in China

Final Report also includes more topics (technology dimension, solution providers, end-user industries, etc.)
DOING MARKET RESEARCH IN CHINA

Generally speaking, doing market research in China is different and significantly more challenging than it is in developed countries because:

1. Size and diversity of China
2. Lack of reliable general/official information databases
3. Change is constant and extremely rapid - the whole China economic system is far from being in equilibrium

Solid market research must be based on a mix of secondary and primary sources
Using “models” to make estimates is OK

HOW THE WORK WAS DONE

Understanding original proposal and underlying project objectives
All materials from IFC, including visit to Makassar
News sources, websites, B2B websites, publications, etc. (English and Chinese)
Direct factory visits to ~20 carrageenan manufacturers/solution providers
~200+ telephone interviews with industry players, including carrageenan manufacturers and solution providers
~10+ interviews with end-users, food companies
Visit to food additives expo, face-to-face interviews with ~20+ solution providers
Ongoing analysis and re-elaboration of all facts and data gathered
JLJ collective China knowledge and in-house expertise/experience
...

Extensive primary research and analysis

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Chinese market for carrageenan/solution providers
Regulatory environment
End-user industries
China derived demand for seaweed
Conclusions
Appendix

EXECUTIVE SUMMARY

Market Overview
- 50-60 processors, also solution providers
- 100-130 “pure” solution providers
- Fujian, Hainan key locations
- Generally low technology levels

Value Chain
- Several parties can be involved
- Sourcing considered key success factor
- Often processor sell to end-users directly
- Significant export, ~30%

Key Market Dynamics
- Demand to continue, also for export
- Consolidation, increase level of sophistication
- Positive government attitude
- Usage of carrageenan to go beyond food

Regulatory environment
- Several government agencies involved
- GB standards
- Tariffs and VAT on import and export...
- ...but also VAT rebates
- Yet, no “dumping”

End-user industries
- 3 key industries, meat, jelly, and soft-sweet
- Accounting for 95% of the demand of carrageenan
- All growing, 10-20% per year
- Future demand driven by these industries + new non-food applications

Derived Demand for Seaweed
- Economic model based on supply, demand, and trade data
- Expected growth of 13% CAGR '07-'12
- Demand at 123,000/year Tons in 2012
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  - Key market dynamics
  - Case studies
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CARRAGEENAN INDUSTRY UNDERGOING CONSOLIDATION

**Snapshot**

- Number of processors (carrageenan manufacturers): 50 - 60
- Total domestic production: ~10,000 tons/year
- Export: 30% (or ~3,000 T/year)
- Industry growth rate: ~10% annually
- Price of RC (2007): RMB 60,000 – 70,000/T (or US$ 7,700 - 9,000/T)
- Number of “pure” solution providers: 100 - 130

- Industry experienced rapid growth in 1990s – high demand, low barriers to entry, attractive profits
- But currently undergoing consolidation – from >100 processors five years ago, to about 50-60 currently
- Increasing product requirements, and economies of scale force out small players who cannot meet standards or volumes…
- Predominant type of carrageenan produced is K-Kappa – using KCl precipitation
- Only 7 or 8 can produce lota carrageenan – using alcohol precipitation

PROCESSORS MAINLY IN HAINAN AND FUJIAN

Jiangsu and Shanghai also important

PRODUCTION VOLUMES BY LOCATION

Most use domestic machinery (except for alcohol precipitation)
TOP 5 PROCESSORS ACCOUNT FOR ~50% OF THE MARKET

<table>
<thead>
<tr>
<th>Company name</th>
<th>Year Established</th>
<th>Location</th>
<th>Annual production capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shanghai Bellian Gum</td>
<td>1998</td>
<td>Shanghai</td>
<td>1000 500</td>
</tr>
<tr>
<td>Jiangsu Changhang Hydrocolloid</td>
<td>2006</td>
<td>Jiangsu</td>
<td>500 500</td>
</tr>
<tr>
<td>Technology</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hainan Dazhong Ocean Industry</td>
<td>1958</td>
<td>Hainan</td>
<td>700 500</td>
</tr>
<tr>
<td>Guangzhou Lubao Biochemistry</td>
<td>1999</td>
<td>Fujian</td>
<td>700 400</td>
</tr>
<tr>
<td>Hainan Qionghai Longfeng Carrageenan</td>
<td>1986</td>
<td>Hainan</td>
<td>800 N/A</td>
</tr>
</tbody>
</table>

- Some recent entrants in top 5
- Competitive relationship among top 5...

MAJORITY PRODUCE K-KAPPA CARRAGEENAN

- KCl precipitation is used for gum recovery
- Domestic machinery is used

ONLY ~7 PRODUCE IOTA CARRAGEENAN

- Imported machinery used for alcohol precipitation

- These seven companies have alcohol precipitation facilities to produce Iota Carrageenan
  - Hainan Dazhong
  - Qionghai Longfeng
  - Hainan Haitian
  - Guangzhou Lubao
  - Shishi Global Agar
  - Shanghai Brilliant (Bellian)
  - Xieli

- However, Iota Carrageenan not a core product (only about 5% of total sales)
- These companies may also produce Na/Ca production if there is an order

100-130 “PURE” SOLUTION PROVIDERS

Do Not Produce, but Use, Carrageenan
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KEY PLAYERS IN THE VALUE CHAIN

PROCESSORS USUALLY SELL DIRECT TO END-USERS

KEY HUBS ALONG VALUE CHAIN
KEY MARKET DYNAMICS

Carrageenan
- Continued strong growth expected for demand of carrageenan
- Increasing carrageenan exports
- Consolidation in carrageenan industry
- Overall, positive government policy
- In the long run, increasing applications and use of carrageenan beyond food industries

Solutions
- Increasing quality of solutions required by food companies
- Increasing R&D for carrageenan-blended solutions

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FACTORIES CAN LOOK VERY DIFFERENT

Old company - 1986

New company - 1998
CASE STUDY 1: WELL-ESTABLISHED MANUFACTURER

- Established 1958, one of the oldest carrageenan manufacturers in China
- Owners of two of the top 5 companies were ex-employees
- Produces about 700 tons RC, 500 tons SRC, and 2,000 tons carrageenan-blended solutions annually
- Sells to large Chinese food companies

CASE STUDY 2: A NEW, AGGRESSIVE ENTRANT

- Hong Kong-invested company
- Imported machinery from Taiwan and Japan
- Produces 700 tons RC and 400 tons SRC annually

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SEVERAL REGULATIONS AFFECTING CARRAGEENAN MANUFACTURERS

<table>
<thead>
<tr>
<th>No.</th>
<th>Governing agency</th>
<th>Regulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>State Food and Drug Administration</td>
<td>Regulation on food safety</td>
</tr>
<tr>
<td>2</td>
<td>Standardization Administration</td>
<td>National standards for carrageenan</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>Regulation on the use of water resources</td>
</tr>
<tr>
<td>4</td>
<td>State Environmental Protection Agency</td>
<td>Regulation on the prevention of water pollution and protection of water</td>
</tr>
<tr>
<td>5</td>
<td>State Administration of Work Safety</td>
<td>Regulation on pollution fees</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>Regulations on production safety and clean production</td>
</tr>
</tbody>
</table>

Strengthening enforcement of the regulations partly lead to consolidation
MANDATORY NATIONAL STANDARDS FOR CARRAGEENAN

<table>
<thead>
<tr>
<th>Category</th>
<th>Unit Measure</th>
<th>China GB Standards</th>
<th>FCC Standards</th>
<th>EU Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sulphur oxide (SO$_4^{2-}$)</td>
<td>%</td>
<td>15 - 40</td>
<td>18 - 40</td>
<td>15 - 40</td>
</tr>
<tr>
<td>Viscosity</td>
<td>Pa.s</td>
<td>≥0.01</td>
<td>≥0.05</td>
<td>≥0.05</td>
</tr>
<tr>
<td>Weight loss after drying</td>
<td>%</td>
<td>≤15</td>
<td>≤12</td>
<td>≤12</td>
</tr>
<tr>
<td>Total ash content</td>
<td>%</td>
<td>≤30</td>
<td>≤35</td>
<td>15 - 40</td>
</tr>
<tr>
<td>Ash insoluble in acid (%)</td>
<td>%</td>
<td>≤1</td>
<td>≤2</td>
<td>≤2</td>
</tr>
<tr>
<td>Lead (Pb)</td>
<td>%</td>
<td>≤0.001</td>
<td>≤0.001</td>
<td>≤0.001</td>
</tr>
<tr>
<td>Arsenic (As)</td>
<td>%</td>
<td>≤0.0002</td>
<td>≤0.0002</td>
<td>≤0.0002</td>
</tr>
</tbody>
</table>

All carrageenan manufacturers must meet the GB standards.

THREE CATEGORIES OF TARIFFS

- **General tariff rate** – highest tariff rate that is applied to import from all countries that do not fall under the MFN or SPT tariff
- **Most Favored Nation (MFN) tariff** – lower than the general tariff rate, applies to import from all WTO member countries
- **Special Preferential Treatment (SPT) tariff** – lowest tariff rate, applies to import from all ASEAN countries

Import from Indonesia subject to SPT rate

7.5% TARIFF ON SEAWEED FROM INDONESIA

<table>
<thead>
<tr>
<th>Product</th>
<th>HS code description</th>
<th>HS-code</th>
<th>General tariff rate</th>
<th>Tariff rate for MFN(^1)</th>
<th>Tariff rate for SPT(^2)</th>
<th>Import VAT rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seaweed</td>
<td>Other locust beans, seaweed and other algae, sugar beet and sugar cane, fresh, chilled, frozen or dried, whether or not ground</td>
<td>12122090</td>
<td>70%</td>
<td>15%</td>
<td>7.5%</td>
<td>13%</td>
</tr>
<tr>
<td>Carrageenan</td>
<td>Other mucilages and thickeners derived from vegetable products</td>
<td>1302390090</td>
<td>80%</td>
<td>15%</td>
<td>8%</td>
<td>17%</td>
</tr>
</tbody>
</table>

Import VAT Must be paid, regardless of use of seaweed

13% EXPORT VAT REBATE FOR CARRAGEENAN

<table>
<thead>
<tr>
<th>Product</th>
<th>HS code description</th>
<th>HS-code</th>
<th>VAT rate</th>
<th>Export VAT rebate rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carrageenan</td>
<td>Other mucilages and thickeners derived from (non-endangered) vegetable products</td>
<td>1302390090</td>
<td>17%</td>
<td>13%</td>
</tr>
</tbody>
</table>

Rebates only on Export VAT, after carrageenan is exported.
VAT ALWAYS PAID ON IMPORTS, VAT PARTIALLY REFUNDED ON EXPORTS

<table>
<thead>
<tr>
<th>Process</th>
<th>Import-export tax implication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carrageenan manufacturer imports seaweed from Indonesia</td>
<td>- Manufacturer pays 7.5% import tariff for seaweed + 13% import VAT for seaweed</td>
</tr>
<tr>
<td>Processes seaweed to make carrageenan</td>
<td>- 7% export VAT for seaweed, but 13% is refunded (“VAT rebate”)</td>
</tr>
<tr>
<td>Carrageenan exported to other countries</td>
<td>- Only exception: if carrageenan manufacturer is located in a bonded export processing zone -&gt; no import/export tariff and import/export VAT</td>
</tr>
<tr>
<td>- However no carrageenan manufacturers in China are in such bonded zones</td>
<td></td>
</tr>
</tbody>
</table>

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THREE MAJOR END USER INDUSTRIES IN CHINA

<table>
<thead>
<tr>
<th>End-users</th>
<th>Description</th>
</tr>
</thead>
</table>
| Meat | - Industry still developing, growth of ~10% annually  
- Processed meat – 60% western style, 40% Chinese traditional products  
- Account for about 38% of carrageenan demand |
| Jelly | - Highly popular snack in China  
- 20% growth rate  
- Account for about 54% of carrageenan demand |
| Soft sweet | - 10-15% growth rate annually  
- China also Asia’s largest soft sweets market  
- Account for about 3% of carrageenan demand |
| Others | - Include dairy products, milk powders, vermicelli, etc  
- Account for about 5% of carrageenan demand |

~ 1000 MANUFACTURERS OF PROCESSED MEAT

Distribution of Top 50 meat manufacturers in China

Top 3 brands account for ~60% of processed meat market
HUNDREDS OF JELLY MANUFACTURERS

Top 3 account for 50% of the market

SOFT SWEETS INDUSTRY ALSO CONSOLIDATING

Production mainly concentrated in Fujian and Guangdong

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MODEL BUILT TO ESTIMATE SEAWEED DERIVED DEMAND

Seaweed derived demand estimated with a model based on three angles
KEY ASSUMPTIONS OF MODEL (I)

<table>
<thead>
<tr>
<th>Category</th>
<th>Assumption</th>
<th>Assumed value</th>
<th>Source and rational for assumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
<td>Ratio of seaweed to carrageenan</td>
<td>5</td>
<td>Derived from multiple sources including IFC and interviews of carrageenan manufacturers</td>
</tr>
<tr>
<td>Percentage cottoni demand</td>
<td></td>
<td>90%</td>
<td>From IFC-Pensa, SEAPlant.Net report</td>
</tr>
<tr>
<td>out of total demand</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total number of manufacturers by industry</td>
<td>Meat – 1,283</td>
<td>Sum of total number of small, medium and large manufacturers, based on industry reports and primary research</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Jelly – 525</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Soft sweets – 251</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>All other sizes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Demand side</td>
<td>Average production capacity of manufacturers by size</td>
<td>Example for meat (T/year): Small – 300 Medium – 6,000 Large – 30,000</td>
<td>JLJ estimates based on industry reports and primary research</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Average percentage of carrageenan</td>
<td>Meat – 0.1%</td>
<td>Refers to the amount of carrageenan needed in the product.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Jelly – 0.7%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Soft sweets – 0.2%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Forecast CAGR (2007-12)</td>
<td>Meat – 9%</td>
<td>Based on industry reports, news reports, and interviews</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Jelly – 29%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Soft sweets – 13%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Others – 8%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Export percentage of carrageenan out of total supply</td>
<td>30%</td>
<td>Means that about 30% of carrageenan produced in China is exported. Assumption is derived from field research</td>
</tr>
</tbody>
</table>

KEY ASSUMPTIONS OF MODEL (II)

<table>
<thead>
<tr>
<th>Category</th>
<th>Assumption</th>
<th>Assumed value</th>
<th>Source and rational for assumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply side</td>
<td>Total number of carrageenan manufacturers</td>
<td>57</td>
<td>Sum of number of manufacturers by province, based on field research</td>
</tr>
<tr>
<td></td>
<td>Average production capacity of manufacturers by size (T/year): Small – 40 Medium – 300 Large – 500 Top 5 – 1,000</td>
<td>JLJ analysis based on field research</td>
<td></td>
</tr>
<tr>
<td>Trade data</td>
<td>Forecast seaweed import</td>
<td>10%</td>
<td>Based on historical growth rate and demand trends</td>
</tr>
<tr>
<td></td>
<td>Forecast Carrageenan supply CAGR (2007-12)</td>
<td>13%</td>
<td>Based on historical growth rate and demand trends</td>
</tr>
</tbody>
</table>

SNAPSHOT OF MODEL

Model built in Excel, key assumptions highlighted and easy to change

ESTIMATES WERE MADE FROM THREE ANGLES

Seaweed demand estimated from demand and supply sides and trade data (2001-2012)

- Seaweed demand estimated from the supply side
- Seaweed demand estimated from the demand side
- Actual and forecast seaweed import

Estimates from three angles resulted in very similar values
DERIVED DEMAND FOR SEAWEED

Historical and forecast average seaweed derived demand, 2001-2012

- Expected CAGR '07 –'12 about 13%
- Demand of 123,000 tons/year in 2012

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KEY CHALLENGES IN CARRAGEENAN INDUSTRY

1. Intense price competition – industry undergoing consolidation

2. Predominantly low technology level – most processors are in low-mid end, poor product quality

3. Limited R&D capabilities – limited research in solutions, carrageenan sold directly to food companies

- Trend is toward consolidation and higher overall level of sophistication
- However, it will take some time

POTENTIAL AREAS FOR FURTHER STUDY

- Further study on end-users
- In-depth study on top carrageenan manufacturers
- Study on other types of blended solutions
- Other opportunities for further study identified by IFC (marketing…)
- …
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