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# Pengelolaan Rantai Pasok Garam di Daerah: Studi Kasus Industri Pengolah Garam dan Industri Pengguna Garam di Jawa Tengah

## Salt Supply Chain Management at Regional Level: Case Study of Salt Processing Industry and Salt Consumer Industry in Central Java

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**Abstrak** Kebutuhan garam untuk industri di Jawa Tengah masih banyak disuplai oleh garam luar provinsi, walaupun Jawa Tengah adalah salah satu provinsi penghasil garam utama di Indonesia. Penelitian ini mengkaji bagaimana sistem rantai pasok garam pada industri terpilih di Jawa Tengah, dengan melakukan studi kasus pada dua kelompok industri, yaitu: (1) industri pengolah garam, dalam hal ini dipilih dua perusahaan pengolah garam dan (2) industri pengguna garam, yaitu untuk kelompok produk pangan dan non-pangan di Jawa Tengah. Data penelitian meliputi: pola arus barang, arus finansial dan arus informasi yang digali melalui wawancara secara mendalam, untuk memperoleh struktur dan model rantai pasok garam. Metode pengolahan dan analisis data penelitian menggunakan analisis deskriptif kualitatif, yang mengacu pada dimensi kinerja model SCOR (*Supply Chain Operations Reference*). Hasil penelitian menunjukkan bahwa industri pengolah garam memperoleh bahan bakudari luar daerah melalui supplier mencapai kisaran 30%–70% kebutuhan garam. Industri pengolah garam yang memiliki gudang yang luas cenderung menampung persediaan dalam jumlah besar sebagai stok cadangan garam. Industri pengolah garam dengan kapasitas gudang kecil meningkatkan utilitas persediaan dan mempercepat konversi *cash to cash* dari persediaan garam. Rantai pasok garam pada industri pengolah garam memiliki reliabilitas yang baik. Hasil penelitian pada industri pengguna garam menunjukkan industri industri pengolah ikan dan industri tekstil hanya membeli garam dari suplier dalam daerah. Industri tekstil menerapkan manajemen kolaboratif dan mengambil peran kepemimpinan rantai pasok kolaboratif untuk menjamin kontinuitas persediaan garam.

**Kata kunci:** Garam; Jawa Tengah; pengolah, pengguna, rantai pasok SCOR (*supply chain operations reference*)

**Abstract** The need of salt for industry in Central Java Province ~~is~~ still largely supplied by salt products from other provinces, even though Central Java is one of the major salt-producing provinces in Indonesia. This study analyzed supply chain models of salt in selected industry in Central Java.. The study was conducted through case study on two selected industrial groups: (1) the salt processing industry, represented by two salt processing companies and (2) the salt user industry, represented also by two salt users (food and non-food industry), in Central Java. Indepth interview was applied to collect data, included the data on the flow of goods, flow of finances, and flow of information patern. The data was used to finalize the structure and model of salt supply chain in Central Java. The data were analyzed using descriptive qualitative analysis, which refers to SCOR (Supply Chain Operations Reference) model dimension. The study showed that the salt processing industry supplied majorly by out-region supplier, counted for 30 – 70% of raw salt material needed.. The salt processing industry with large storage tended to keep large amount of salt as investment (buffer stock). In addition, industry with smaller storage capacity attempted to enhance the stok utility and accelerated cash-to-cash conversion for the available salt. The salt supply chain model on the processing industry possessed good reliability. In addition, the fish processing and textile industry merely made purchase to local area suppliers. The textile industry applied a collaborative management and took leadership role in the collaborative supply chain to secure the salt supply continuity.

**Keywords:** Salt; salt processor; salt user; Central Java; SCOR (supply chain operations reference)

## INTRODUCTION

Salt is a strategic commodity. Not only it is consumed by people, it is also used as an industrial raw material. The usage of salt has been evolving, from merely food flavoring to being used for industrial production process in which it becomes main raw material in variety of industrial products (Gozan *et al.*, 2018). From the industrial perspective, the salt demand must be met either in quantity or quality. The lack of domestic supply causes the industries should import large volume of salt. The UN Comtrade (2018) data showed that the Indonesian total import of salt may reach 2 million tons per year, or it is about half of total demand in the country.

The salt import policy has always yielded debates as for instance shown by case of 2018 regulation on the salt import quota. According to the recommendation of Ministry of Fisheries and Marine Affairs, the import of salt was only recommended for 1.8 million tons, while the demand for industry was calculated at 3.7 million tons, according to the

Ministry of Industry (Tempo 4/4/2018). Therefore, the central government promulgated the Government Regulation Number 9 of 2018, in which the Article 3 verse 2 stated that the import permit of salt commodity as raw and additional material for industry is in the amount of 2,370,054.45 tons. Although the salt quantity is necessary, the quality also becomes the main reason of salt import. Generally, the salt quality produced by the local salt farmer has not met the Indonesian National Standard (SNI), for example the NaCl contains mostly below 94% (for consumption requires more than 94.7% of NaCl and some industries require NaCl contain more than 97% (dry basis)).

This research elaborates how the supply chain model of salt business in Central Java are formed. To understand the state of salt supply chain, this research employs case studies in two industrial groups: (1) salt processing industry and (2) salt consumer industry in the Central Java. As one of the salt producing provinces, Central Java has five regencies of salt production center, mainlyRembang, Pati, Demak, Jepara, and Brebes Regency with the total land area of 6.608,78 Ha. In the normal weather and climate, the salt production may reach 841.000 tons per year (DKP Jateng, 2017). The salt demand for direct human consumption and industry in Central Java reached 360.000 tons per year (Disperindag Jateng, 2017). According to the Central Java Office of Industry and Commerce (Disperindag), despite the massive production, the salt for industry still relied on the suppliers in different provinces. This data and information is intriguing to be further scrutinized, especially in how Central Java industry acquires its raw material supplies; the relations between the industry and the suppliers particularly whether it is a one-off trade or rather collaborative; how the industry formulates the amount of required raw materials particularly whether it is based on the market demand or massive production; and how the industry manages its raw materials and productions.

## RESEARCH METHODS

The field data collection was conducted during August to October 2018 in two different industrial groups in Central Java: (1) the salt processing industry and (2) salt user industry. The salt processing industry consisted of two companies: *first* was CV BGA in Pati Regency, which has been established since 2012. BGA produced salt briquettes, employed 18 people, with production capacity of 1.5 – 3 tons per day, and storage capacity 30 tons of raw salt material. Its marketing area covered the northern coast of Central Java. The second company ~~is~~ was GC, which also located in Pati Regency. GC processes salt into salt briquettes, fine table salt, and fine salt for the variants of food industry. It has been employing 70 people with production capacity of 10 – 25 tons per day and storage capacity of 6.000 tons. The market included the whole area of Central Java and other provinces.

The selected salt user industries consisted of textile industry as non-food industry and fish processing industry as the food industry. The sample of textile was PT. AIC, which located in Semarang Regency. PT AIC needed salt as component material in the soft water production. AIC was established in 1989, and has since produced *yam* (yarns), *grey* (raw cloth), and *denim* (jeans cloth). AIC is a world-class textile industry whose 55% of its products is marketed to 74 countries in 5 continents. Meanwhile, the fish processing industry sample is UD. Putra Usaha (shortened as PU) in Rembang Regency, which was established in 2013. It is operated by 20 permanent employees and 50 seasonal employees, producing dried anchovy and boiled fish. These products meet the demands of local market in Java, Kalimantan, and Lampung, as well as international demand in South Korea.

Collected data include structure and model of salt supply chain, flow of goods, flow of finances, and flow of information obtained from in-depth interview, which was thoroughly, systematically noted and supported by questionnaires. The questionnaires were arranged in accordance with the five main processes of Supply Chain Operations Reference Model (SCOR), namely: plan, source, make, delivery, return. The data include qualitative and quantitative data, and were analyzed using descriptive qualitative analysis, which refers to SCOR five dimension of performance model: reliability, responsiveness, agility, cost, and asset management efficiency.

## RESULT AND DISCUSSION

### *Salt processing industry*

The structure and model of salt supply chain in the two salt processing industries share different characteristics. BGA collected raw salt material from local or in the near provincial areas, such as Pati and Jepara Regency and out of region, such asMadura, East Java Province. GC used raw materials from its own salt farm, local area suppliers (such as in Pati Regency), and PT Garam (state-owned company in Madura East Jawa), and from outer island suppliers such as from Kupang Regency. BGA sold its salt products through individual and peddler (locally called *pedagang krombong*). While, GC sold its products through individual distributor, subsidiary, peddler, and direct sales to the consumer.

BGA requires raw salt material as many as 40 tons per month or equal to 480 tons per year. The raw salt material is principally bought from local area suppliers (50% from Pati Regency, 20% from Jepara Regency) and external area suppliers (30% from Madura). GC requires raw salt material in amount of 350 tons per month, in which 20% of them were supplied by its own farm, 10% from local area suppliers (Pati Regency), 20% from external area supplier (Kupang Regency), and 50% from PT. Garam in Madura.

Table 1. Sources of salt raw material in selected salt processing industries

| Description of selected processing factories | BGA | GC |
|---|---|---|
| Storage Capacity (tons) | 30 | 6.000 |
| Central Java | | |
| Own farm (%) | | 20 |
| Pati Regency (%) | 50 | 10 |
| Jepara Regency (%) | 20 | |
| East Java (Madura Island) (%) | 30 | 50 |
| East Nusa Tenggara (outer island) (%) | | 20 |
| Production process | manual | machinery |
| Production volume (ton/per day) | 1.5 - 3 | 10 – 25 |
| Package types | Half and one kg pack | Various pack |
| Relation to the suppliers/partners | Tend to be informal, | Formal with MOU |

Table 1 showed both companies purchase salt from external area suppliers which amounts to 30% - 70%. The raw salt material bought from local area suppliers are admitted to the salt quality level of higher quality (KW 2) to highest quality (KW 1), while salt from external area suppliers merit the premium quality category. Some of the salt products were the result of mixing both raw materials. The raw salt material quality improvement process did not merely involve washing process, but also through raw materials mixing. This process is conducted to produce salt products comply the desired grade, to eventually meet the national standard (SNI) requirements of 94% NaCl for consumption salt. The mixing process in fact also yielded economic benefits.

BGA has a smaller installment storage capable for about 30 tons. The company bought raw salt material for 18 tons every two weeks as safety stock. The salt purchase should comply the truck's capacity of 9 tons per truck for efficient shipping cost. The usage, however, depends on the market absorption. To anticipate raw material void, the company would immediately re-order the salt when the storage stock is half-consumed. There was once a stock out because of raw material scarcity in 2017, causing changes in the company's workdays from 6 days to 4 days a week. While, GC has bigger storage capacity which accommodates 6.000 tons. When the storage is full, it could fulfill a year-long production requirement. During the research, however, there was only 700 tons of stock in the storage. This number was considerably adequate to meet the production requirement of only two month periods. The company purchases raw salt material at the beginning of harvest, where the price usually starts to drop.

The production process of salt was started with the raw salt material washing process. Normal quality used mixed raw salt materials from local and other areas. The mixing and washing process conducted at the same time. In GC, the Class-A or premium salt products were produced by using premium raw material of salt from external area suppliers. The next process is to drain the washed raw salt material for at least 3 days. The draining process takes the longest time, and thus the company preserved dried salt stock that were ready for production process every day.

The raw salt material is grinded in a grinder machine, and at once mixed with iodine solution above 30 ppm. There was slightly different in salt briquette production between BGA and GC. BGA used manual mold in briquette production, while GC uses press molding machine. The briquette is then heated in the oven, air-dried, and then packed. The fine salt production in uses rotary dryer machine before being packed. The salt processor usually produced salt based on incoming order from the distributor, mainly once a week. The distributors order could be completed within three to four workdays. GC, with its molding machine has taken advantage in term of production volume, that might reach 10 – 25 tons of salt every day, compare to BGA with only 1.5 to 3 tons per day. In addition, as manual process, BGA also faced limited production process due to the lack number of employees.

Salt products of BGA are generally grouped into two types: half-kilogram package and one-kilogram package. The half-kilogram package has four trademarks (bandeng kmb, kerang abadi, bintang kmb, kidang), while the one-kilogram package has two trademarks (pesawat kmb, kerang abadi). Six salt product variants have equal quality. However, the company has yet to apply mass adjustment in its salt briquette production. While GC produces three salt brands. The first is Gardium, a premium quality product (grade A) with salt briquette variants of 2.5 kg package, 150 gr fine salt package, and 50 kg fine salt package (sack). The second brand is Kedong Songo, a salt briquette product with 1 kg and 2.5 kg packages covered in variety of colors, including blue, red, and green, which are adjusted to the preferences of each market area. The third brand is Prau Naga, which has equal grade and variant with Kedong Songo.

Return of goods is only applicable for processed goods, as the raw salt material has been adjusted to the salt sample that is agreed upon purchase. The return process was served when the distributor took another order afterwards. The only processed salt products that can be returned were damaged products, signified by broken seal or package and broken briquette. The damage was usually the result of poor-quality handling during containment or heating process. Damaged briquette usually detected early before packaging. The percentage of damaged goods during sales in fact was small, only amounts from zero to five packs out of 1.000 packs.

The buying and selling relations of the raw salt material with the suppliers is a one-off trade. The supplier offers the raw salt material directly to the company. Transaction can be immediately processed if the company found the price suitable without down payments. The company was allowed to pay after the goods were delivered. Apart from purchasing salt from suppliers, GC also uses salt from its own salt farm and purchase from PT Garam. Pricing for the salt of the self-managed salt farm is determined based on the time when the salt is used. For this matter, the transaction only carried out through the company's financial posting. As for the purchase with PT Garam, the transaction was processed after delivery order (DO) issued, which means the request was granted. The company must transfer the payment first before taking the raw salt material.

The financial transaction method among participants in supply chain majorly cash for BGA, and more various method for GC. Delayed payment also applied, with limit time of around three to four days. Peddler may purchase goods in small party order without any ordering process, whether using direct payment (cash) or other transaction method. In BGA, the distributors should keep the goods first before distributing to the retailers after three to five days of payment through the specified sales account. After the delivery order (DO) is approved, payment should be directly transferred by the industry. There is also a procurement procedure in the buyer's industry, in which the transaction is bound by purchase order (PO) contract. The goods are usually shipped first, while the payment may be extended for as long as the deadline, which is disbursed within 15 – 60 days after the goods are received by the buyer. In the meantime, GC made priority to any distributors who make payment transaction earlier. Distributors must also pledge collaterals such as land or building certificate to bind sales transaction.

In relation to the information flow, concerning raw material quantity, quality and price, the salt processors must be actively pursuing the information by themselves from various sources, including other companies such as PT Garam and suppliers. The price of salt raw material often fluctuate, affected by the availability in the market. The price would drop during harvest season (dry season) and rise during rainy season. In addition, the price also might be affected by dynamic of salt importation. The dynamic price of salt was clearly shown by following case. The higher quality of salt raw material (KW 2) from local area supplier during harvest season in 2017 was Rp1.000 / kg, but increase to Rp1,600 /kg in early 2018, and then reached Rp2,700 /kg in the mid of 2018. In the case of GC for instance, this processor bought 200 tons of salt from Kupang (outer island) with price of Rp1,500 /kg during 2017 harvest, which included shipping fees, but in the middle of 2018, the price had reached Rp3,000 /kg. In addition, GC also purchased salt from PT Garam in 2017 with price of Rp2,000 /kg, in which they had to pick up the raw material in Pamekasan, Madura. If the transportation cost to the factory location included, the price amounted would be to Rp2,500 /kg. With such price dynamic, the final (consumer) price of the processed salt products is also often dynamics.

As processor strategy dealing many of supply chain issues, the company always maintain good communication with participant in the supply chain. The processor also signed MoU with other companies and suppliers. The transaction with DO system has been also merely bound by single purchase contract. Contractual agreement between GC and its distributors is considered formal, as it is manifested in a MoU. Distributor can only sell in specified areas and the company is not allowed to accept other distributors' proposal in these areas. The deal with consumer industry is usually a single transaction Purchase Order system. In the meanwhile, the cooperation between BGA and its distributor network is rather informal without written regulations. BGA relied on strong trust in building business commitments.

Product brands and the amount of salt produced heavily rely on the market or consumer's demands. The information about these demands are obtained from retailers, collected by the distributors, and informed to the company as a purchase order. The company relied on the distributor network in managing information about demand as it is real-time and trustworthy. Distributor's order was met within less than a week. The company maintained its salt product stock in the storage as many as 1.000 packs to anticipate purchase outside regular order, which is usually made by peddler. However, the salt processors also have consumer from user companies directly bought to processor factory, such as: PT. Gunanusa (peanuts processing industry); PT. Dua Putra in Pati Regency (for fish processing) and PT. Mahera in Cilacap Regency (jellyfish and fish processing).

This study generally showed the ability of GC and BGA in managing supply chain to achieve salt production target on time, to attain product quality according to national standards or SNI, and to fulfill the number of orders. Therefore, the study showed that these companies possess the reliable quality in managing their supply chain (Pujawan, 2017). In the case of processor with massive storage capacity such as GC, it is more easy for such processor to store large amount of raw salt materials, particularly purchase during the low-price at harvest season. To date, salt has been characteristically inexpensive during harvest but rises during rainy season. However, if reviewed from the asset use, the company's (GS) performance would be poor because of install capacity was not achievable and thus resulted inefficiency of asset management. On the other hand, BGA possesses raw material storage with limited capacity of 30 tons. The raw material purchase is conducted every once in two week or when the stock only fills half of the storage. The storage capacity and supply pattern push the acceleration of cash-to-cash conversion rate from the raw salt material supply. The level of supply and utility are considered balanced, so if seen from the Asset Management Efficiency aspect, it is considerably good. In addition, the production mode of BGA is mostly based on distributor's order, and due to the small amount of processing activities, it is more easier for such processor to anticipate spontaneous purchases. Such business practices might be seen as response-based business model, even though as traditional response-based business practice. It is indicated by massive raw material supply, one-off raw material purchase, after-order production, and the void of production with mass adjustment (Bowersox, 2002). The model of supply chain in the two salt processing industry shows in Figure 1 and Figure 2.

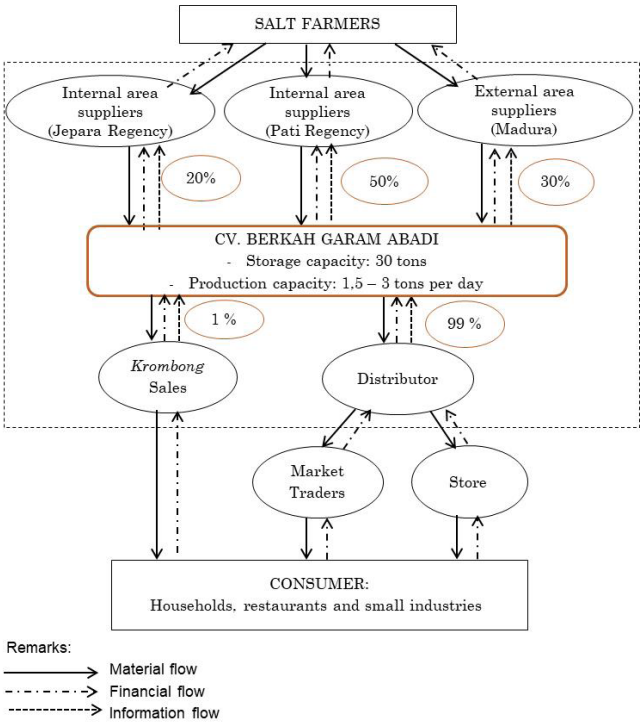


Figure 1. Salt supply chain model at BGA.

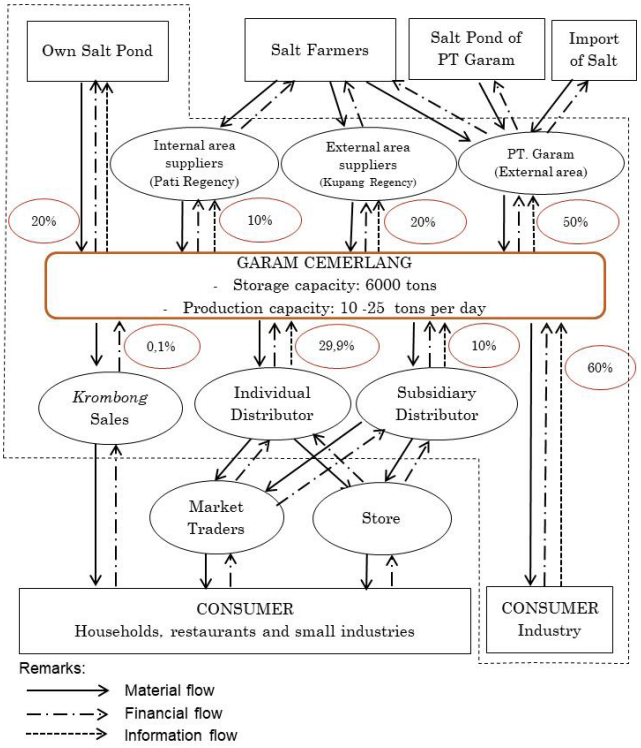


Figure 2. Salt supply chain model at Garam Cemerlang.

## Salt consumer industry

### *Fish processing industry*

Fish processing industry (UPI), particularly dried and salted fish such as anchovies, is a salt consumer industry within food industry. There are three main actors in salt supply chain for anchovies processing: 1) salt farmers, 2) internal area suppliers (families and neighbors), and 3) UPI itself. The processing of dried anchovy and boiled fish would require large amount of salt in every production process. The salt requirement for anchovy processing is about 3-5% of total fish weight as raw material, while for the boiled fish range of 8-15%. Every day, UPI processes 8-10 tons of boiled fish and 3-5 tons of dried anchovy. The number of salt used depend on the consumer's preferences (order) of salt contain in the products. For instance, the Kalimantan market tends to favor saltier taste, so it requires 15% of salt, while Medan and Jambi (Sumatra) need 10%, and 8% for Java. In total, it needs more than 1 tons of salt per day to process the dried anchovy and boiled fish.

The processing of boiled fish is started by soaking the fish in a concrete tub filled with 4-8% salt solution for a half to one hour for fresh fishes and a complete 24-hour for frozen fishes. Then the fishes are arranged in the slotted cage as a boiling and drying container. During the soaking and arrangement process of fishes in the container, other workers would prepare for boiler tub. The boiler tube is also filled with 4-5% salt solution adjusted to the desired salinity level. After the water boils, the arranged fishes in the slotted cage are put into the boiler tube for 5-10 minutes until they are cooked. Subsequently, the slotted cage is pulled up and put to the cart. Before being dried in the sun, the fishes are washed with clean water, and drained. They are then dried for a day until two days, depends on the desired dry level. After drying, the fishes are stored in the cold storage (Figure 3).

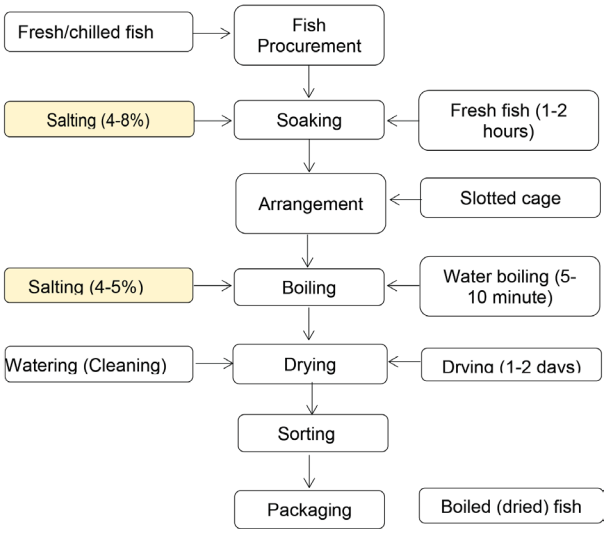


Figure 3. Production process of boiled fish

Similarly, the processing of dried anchovy starts with washing fish using clean water. The anchovies are then arranged on a green slotted cage as a boiling and drying container. During the anchovy arrangement in the container, other workers prepare for the boiler tub. The boiler tube is filled with 4-5% salt in accordance to the desired salinity level. After the water is boiled, the arranged anchovy in the slotted cage is put into the boiler tube for 3-5 minutes until they are cooked. The slotted cage is then pulled up, drained, and put on to the cart. The anchovies are dried in the sun for a half or full day after they were drained. Eventually, the anchovies are packed and stored in the cold storage.

UPI used a higher quality salt for the boiled fish processing and the highest quality counterfeit (KW1) salt specifically for the exported dried anchovy. The salt quality was determined by visual observation such as cleanliness, the color and palpability of salt water level. The salt used for production is bought from internal area suppliers, located in the factory vicinity. The UPI prioritized family link in supplying the salt needed. When the needs for salt increases and the supplier is not able to meet the UPI necessity, then UPI will buy from other suppliers, still located in the factory vicinity through neighbor relations.

The company has a raw salt material storage with capacity of 30 tons. It is adequate to meet its monthly production requirements. The UPI made salt purchase after the stock runs out. It did not take longtime to make the purchase, as the product will be delivered on the same day of the order. This is because the location of fish processing factory is close to the suppliers' salt storage. The purchasing process only requires a phone call. After the deal is achieved, the salt will be directly sent and delivery process only used the supplier's own transportation.

The payment method of the raw salt material is cash. Payment is made after the raw material is used, usually during the next delivery order. Only when there is salt scarcity in the market, supplier would ask for a payment after the package is delivered. In addition to the family

and neighbor link between the UPI and supplier, trust factor also plays an important part. Therefore, there are no concerns about payment methods. There are no tip, bonus, and discount in the transaction. The payment is based on the agreed price during purchase. If the payment is not on schedule or late, there is not a disincentive or fine. Supplier puts more concern in maintaining continuity and uncomplicated salt sale to the UPI.

The salt price in mid-2018 was Rp1.900 /kg for the higher quality category (KW2) and Rp2.400 /kg for the highest quality (KW1). This price includes shipping cost to the UPIs. The transportation used to ship the goods is usually rented. To minimize the shipping cost, the supplier would require and suggest a per time package for the transportation, which could be either truck or light truck.

The relations between UPI with its suppliers are informal, but it does not affect the performance of raw salt material provision. Supplier has been able to provide the order whenever the company need. This is why the company is not concerned with running out of raw salt material stock as it can be delivered anytime, they needed. This also includes when the fishing season is high, in which the production and the needs of raw material also increase. In this condition, the amount bought and the frequency of purchase for raw salt material also increases. At this time, the company will also buy from different suppliers. As the raw salt material needs can be fulfilled on time with the desired quality and matching amount to the production needs. Therefore, the salt supply chain in the selected UPI was considered to have reliability or the capability to support the fish processing works-well. The supply chain model at UPI shows in figure 4.

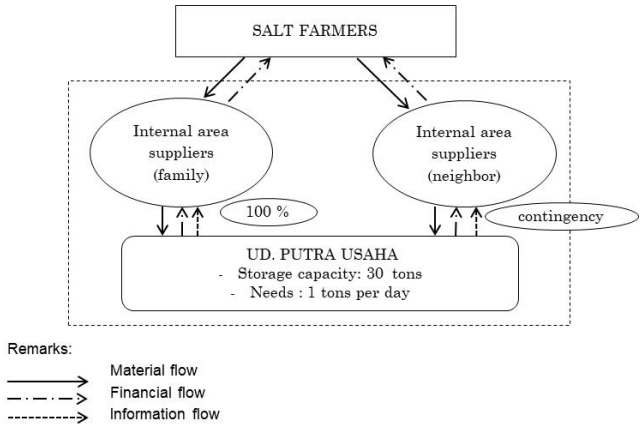


Figure 3. Salt supply chain model at UD. Putra Usaha.

*Textile industry*

Textile industry uses salt as an active ingredient to regenerate resin in the filtration system of industrial raw water (salt as component material). The filtration produces soft water. The textile industry requires soft water in massive quantity. PT AIC used the soft water for dyeing, boiler, and laundry. If these industrial processes only use hard water, they will be ineffective, inefficient, and are likely to cause stain on the textile. Besides, the crust-shaped hard water is risky as it could damage the boiler, pipe, and production unit.

The raw water material from the soil or surface water is flowed through a tube filled with resin, which binds the ion potassium (Ca), ion magnesium (Mg), and other ion carbonate compositions to create soft water. Resin's capability to bind these ions will gradually reduce. One liter of resin could produce around 600 liters of soft water. AIC has six resin tubes (2.500 liters of volume) which are operated simultaneously (3 being operated, 3 being on standby) to maintain the continuity of water needs. Each of the tubes has average capability of working effectively for 6-8 hours, followed by the resin regeneration process. The regeneration process is conducted by soaking resin inside a 10% salt solution for 120 minutes. After that, it is being washed with clean water and finally ready for reuse. The use of salt for the regeneration process is about 1 ton per day or 30 tons per month. The salt quality used has four main criteria, such as: the salt does not have to be white, with mildly coarse to coarse grain; less than 3% water content; less than 3% impurity; and less than one-minute solubility. The visual criterion was used to compare eligible and ineligible salt for direct use.

The company purchases salt at the supplier from the Central Java for close proximity reason, which has cheaper logistic cost and finally results in cheaper salt price as the package arrives at the factory. Besides, choosing raw material suppliers located too far from the factory would have more risk during shipping process includes delivery time. These obstacles could cause stock-out and failure to operate.

There are three salt suppliers in PT AIC, namely UD Hasil Makmur, UD Tri Mega, and UD Sekalsa. Recently, there is one salt supplier in the making, UD Mahayani, which is still in the process of proposing salt sample test. The company was unlikely to rely on merely single supplier in order to anticipate stock-out. The company could ascertain the salt availability in continuous way to control the price.

Planning of monthly salt supply is conducted by the Waste Water Treatment (WWT) Unit at AIC according to the proximity of daily needs within a full month. This plan is proposed once in six months. The changes of the approximate needs are coordinated in the dyeing, boiler, and laundry unit, conforming to the contractual work and production plan. For the salt supply process, WWT proposes reservation to the general store every month. General store functions to receive, control, and manage stocks. After reservation is accepted and approved, the general store will issue Purchase Requisition (PR). Subsequently, purchasing will follow up by contacting supplier to propose price offering or accommodate supplier who has previously agreed on pricing. Supplier is also asked to send the salt sample to be tested by the user in WWT. If the salt meets the requirements, purchasing unit will handle price negotiation.

The whole supply process (price offer and negotiation) was conducted through e-mail, so it is written and well-documented. Phone calls are only used for confirmation. After the salt type, amount, and price is agreed, the purchase unit will issue Purchase Order (PO). Supplier is not permanently bound in specific contract, instead only using the Purchase Order contract.

Every shipping must be equipped with the delivery orders and the salt sample to be re-tested. The shipping is always checked, weighed, confirmed, while the delivery orders will be signed by general store. The weight result is added to the delivery orders, which will become the supplier's referral to make invoice. There are three copies of delivery orders. The first is given to the supplier, the second is kept by general store, and the third is delivered to purchasing. The supplier then sends the invoice while attaching the signed delivery orders. If the signed delivery orders are not attached, then it cannot be disbursed. The invoice will be received by Purchasing by issuing the invoice receipt. The next is to make a payment request letter. The invoice, receipt, and payment request documents are submitted to the accounting to be verified. The complete documents will be submitted to the finance for payment process during deadline. The deadline usually ranges from 30 to 60 days, in accordance with the written agreement in PO. Payment process is made through transfer.

The raw salt material that did not meet the company's quality standard will be returned to the supplier and exchanged with the proper salt. This has occurred before, so the supplier always maintains the quality of ordered. However, in rainy season when the salt quality is low, the company is still likely to tolerate to some extend of the excess of water in the salt composition. Consequently, the company must use more amount of salt for every resin regeneration process, which risks regeneration failure. Such failure means the company must redo the process. Therefore, salt price usually make lower as compensation during the re-negotiation.

The whole payment process in AIC is made by the Finance. Payment is made through bank transfer to the supplier's bank account after due date, as written in the pay order (PO). The due date for salt supply is 30 – 60 days. The payment amount is based on the payment request letter made by Purchasing, attached with all supply documents which were previously verified by the Accounting. The payment amount could be unsuitable with the PO contract amount, because the number of salts shipped less than the agreed in the contract. It can be also because of disincentive, resulting from the inability to meet the salt quality standard.

The internal information management has been relying on the SAP (System Application and Product in Data Processing) to control and gather information about the products, including salt. For instance, it can be used to see a particular salt order process, whether it has been processed in the PO or not, when the package arrived, how much of them, and the storage capacity. This information has been already stored in the application. However, the physical documents should still be processed as administrative documents. Coordination between the internal units was formally conducted through frequent meetings, or informally through phone communications and WhatsApp messenger.

The price list in AIC was updated every month. If the supplier does not inform any change in the price offer, the supplier would still inform through an e-mail about new price offered. On the other hand, if the salt price change because of lack of supply, the supplier still have to fulfill the company's request, in accordance with the PO commitment. Inability to carry out the contract will result in distrust and abrupt PO termination. The change of purchase price was only allowed when both parties make a new PO in the start of the next month, or, in mid-month as long as it suits the company's needs.

In managing the information about price change, AIC was benefitted by the existence of different suppliers. Therefore, the company may compare the price offer from each of the supplier. However, the lowest price offer does not necessarily mean it will be chosen as supplier. There are more factors that become the main reason in selecting supplier, such as the salt quality and the already running long-term cooperation. A company could select multiple suppliers at once, if the price offer and quality are similar. Each of the suppliers is unlikely to offer high price offer, as it could diminish their opportunity to obtain PO. The price formation itself is made through negotiation.

AIC needs one ton of salt per day to implement resin regeneration in the soft water provision installation. Salt supplying through monthly purchase order process and the storage capacity were actually adequate to provide for a full month salt requirements, but the company usually schedule a weekly salt shipment. The company puts efforts for efficiency in managing the salt stock in the storage, facilitating the vivo process, and maintaining the salt quality by not allowing clumping. This supply management has directed to a collaborative management with the supplier. Information about the weekly salt needs is coordinated with the supplier. Such information and collaboration can be focused to maintain the flow and speed of the moving supply as long as the supply chain, in order to reduce storage investment, achieve on-time arrival, and minimize storage time (Bowersox, 2002). Therefore, collaborative process in AIC shows that the salt supply chain was qualified as reliable, by being capable to provide salt on-time with the proper quality in accordance with the company's standard and amount. The supply chain model at AIC is shown in Figure 5.

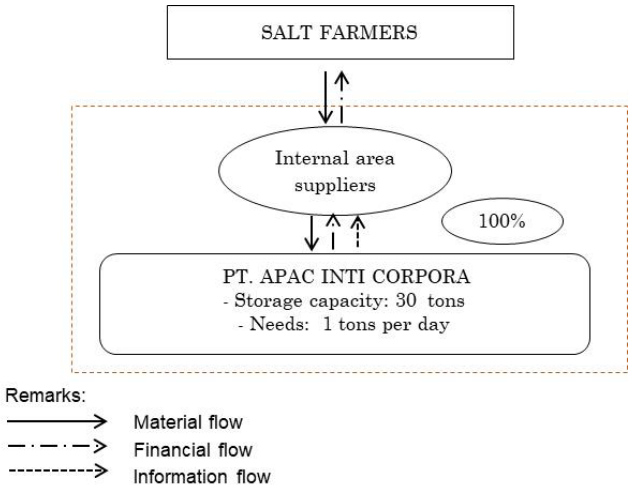


Figure 4. Salt supply chain model at PT AIC.

## CONCLUSIONS AND RECOMMENDATIONS

### *Conclusions*

The study shows that, in salt processing industry, it was counted about 30 – 70% of raw salt material was fulfilled from external area suppliers, including the access to the imported salt. It is mainly to fulfill the need of quantity and quality of salt product. The salt processing industry with large storage tends to keep and save large amount of salt volume and shows the storage as an investment. Industry with smaller storage capacity attempts to enhance the supply utility and accelerate cash-to-cash conversion for the supply. Salt processing industry applies a traditional response business practice and possessed to reliable supply chain management.

At the salt user industry, the need of salt not only differ in quantity but also quality and the supply agreement. Fish processing industry used higher quality grade (KW 2) salt to process dried boiled fish and the highest quality grade (KW 1) salt to process dried anchovy. The main market of the fish product determined the use of different level of salt quality. The fish processing unit merely makes purchase to local area supplier and builds informal business commitment with the supplier to maintain salt supply as needed (based on volume and quality). The family and neighbor link characterized the relationship between fish processing unit and salt supplier.

AIC, as industrial user of salt as component material established a formal cooperation with supplier in salt supply through a Purchase Order contract. This textile industry applies a collaborative management focused on controlling flow and speed of moving supply along the supply chain to reduce storage investment, maintain on-time arrival, and minimize storage time. Textile industry is not able to execute production without salt supply. Therefore, the textile industry took leadership role in the collaborative supply chain to secure the salt supply continuity.

### *Recommendation*

Salt processing industry assumes that local or internal area salt product has lower quality standard. Supervisions from the government to improve the quality were needed. The improvement in the production system was also needed to ensure the stable quantity of supply and better quality of salt products. The salt processing industry was expected to establish collaborative supply chain to secure salt supply when lack of raw material occured.

It is adequate for textile industry to use highest quality grade (KW 1) salt to regenerate resin in the soft water filtration system. As for other industries requiring massive amount of soft water such as paper industry, soap industry, tire industry, and other similar industries, using local area salt product is also adequate. The highest quality grade (KW 1) salt already meet the criteria to regenerate resin in the raw water filtration system.

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