

“Center for Scientific and Technical Cooperation
of the Salt Industry Enterprises” Association

Union of Potassium and Salt Manufacturers and Exporters
(SPEKS)

IODIZED SALT IN THE RUSSIAN FEDERATION

REVIEW AND SITUATION ANALYSIS



MOSCOW 2002

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This analysis was carried out as part of the preparations
for the National Conference of Iodized Salt Manufacturers
and Suppliers in the Russian Federation

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INTRODUCTION

Since time immemorial, common salt (NaCl) has played an enormous role in human development, including in commerce, politics, and culture. The diverse effect of salt is largely due to the fact that it is a source of sodium and chloride, two of the main chemical elements which play an important part in human metabolism. In addition, the cheapness and general availability of salt have prompted its use as a raw material for obtaining chemical compounds required in the production of plastics, aluminum, paper, soap, glass, and so on. There are more than 14,000 different uses for salt and its derivatives.

As the population grows and industry develops, the need for common salt increases. Apart from the use of salt in food, the main consumer of salt in most countries of the world is the chemical industry, which uses it to produce various compounds. In developed countries, industrial demand for “technical” salt is several times higher than the demand for table salt. For example, in the United States, almost 97% of all the salt produced (about 40 million tons) is used for non-cooking purposes. In developing countries, trends towards an increase in the use of salt for industrial purposes have only arose in the past few years, and in these countries up to 90% of salt is consumed by the population.

After a significant drop in salt manufacture in the early 1990s, a stable trend toward an increase in the production of common salt has been noted in the Russian Federation in recent years (Fig. 1), which is related primarily to an upswing in industrial production and an increase in demand by the food industry. Apart from domestic manufacturers, salt producers from Ukraine and Belarus have an appreciable foothold on the Russian salt market. These countries traditionally deliver significant volumes of salt to Russia for technical purposes, as well as to the food industry and for retail trade. The import of salt from other countries, just as the export of salt from Russia, is relatively insignificant in volume and does not have any great impact on the salt balance on the domestic market.

Fig. 2 presents the main routes common salt takes from the manufacturer (A) to the end consumer (B). As already mentioned, most salt is used for non-cooking (technical) purposes (**Route 1**). A certain percentage of salt is used in animal husbandry (**Route 2**). Only a relatively

Fig. 1. Salt production in Russia (million tons)

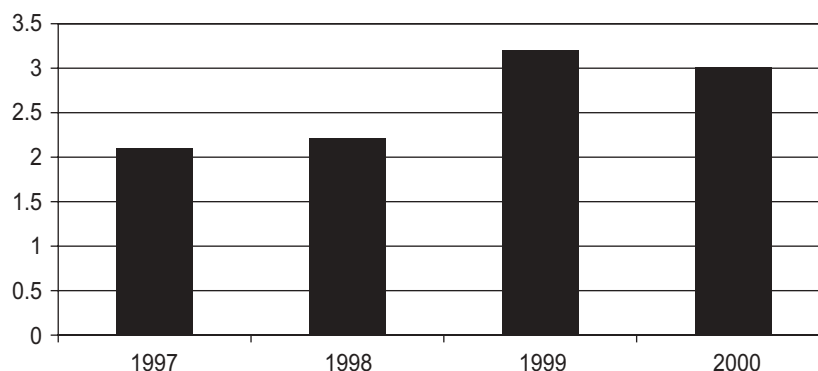
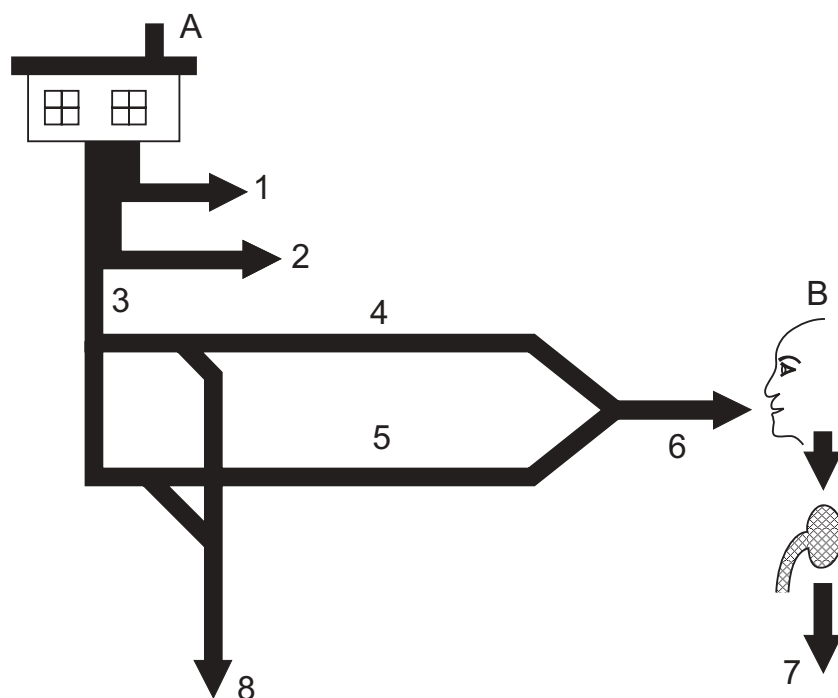


Fig. 2. The use of common salt



small portion is used for human consumption (**Route 3**). According to the recommendations of the World Health Organization (WHO), humans optimally require no more than 6 grams of salt a day.¹ But in practice, salt consumption by the population is much higher than this. First, a significant amount of salt is lost during cooking (for example, while boiling vegetables or pasta) and does not reach the human body (**Route 8**). Second, the Russian population traditionally consumes quite a large amount of canned food with a high salt content, including home-made preserves. Estimates of common salt consumption by the population (including iodized salt) are based on the fact that its per capita consumption amounts to approximately 10 grams a day, and the average annual consumption of common salt reaches about 3.5 kg per capita. Hence, the demand of the Russian population (146 million people) for common salt amounts to approximately 500,000 tons. It should be specified that we are talking about the **minimum consumption** of common salt sold mainly through the retail trade system. In practice, however, as much as 1 million tons of salt are needed in Russia for nutritive purposes (taking into account the needs of many branches of the food industry).

A rather high consumption of “market” salt is characteristic of Russia, as of many other countries of Eastern Europe, that is, cooking salt sold through the retail trade system (**Route 4**). This salt is used for preparing food under domestic conditions, adding salt to cooked dishes, and for canning home preserves (particularly during the summer and autumn). In rural areas, the same salt can be used both for family cooking and for preparing feed for the household cattle. Nevertheless, a trend characteristic of many developed countries of Europe and the US is already being observed in large cities toward an increase in ready-made (industrially prepared) foodstuffs containing “hidden” salt in the population’s diet (**Route 5**). These include not only such traditional products as bread and sausages, but also frozen and vacuum-packed products which are acquiring increasing popularity. As a result, the percentage of “market” salt in public catering is gradually declining. In many countries of Western and Central Europe, approximately 80% of the total amount of salt consumed by people (**Route 6**) comes from ready-made foodstuffs

¹ CINDI Dietary Guidelines. WHO Regional Office for Europe, 1999.

("hidden" salt), and no more than 2-3 grams of salt a day is used for salting dishes. This trend must be kept in mind when planning a long-term program for eliminating iodine deficiency in the nutrition of the population of Russia through universal salt iodination. The precise amount of salt a person consumes can be determined by the amount of sodium iodide excreted in his/her urine (**Route 7**).

Salt iodination for eliminating iodine deficiency in nutrition

Since people everywhere use salt in small but sufficiently constant amounts every day, it is the ideal means for providing the population with physiological doses of such microelements as iodine. The conception of enriching salt with micronutrients is not new. Salt iodination has been successfully used in several countries for more than sixty years now. But it is only in the last decade, thanks to the enormous increase in the manufacture of iodized salt, that significant progress has been made in overcoming iodine deficiency on a global scale.

At the World Summit for Children held in New York in 1990, the world leaders assumed responsibility for and came forward with an appeal to ensure every child a better future without delay. This meeting resulted in the adoption of the Plan of Action for the implementation of the Convention on the Rights of the Child. The countries which signed the Convention undertook, among other things, to improve child nutrition and health and **eliminate iodine deficiency disorders (IDD) before the end of 2000**. The Russian Federation also undertook the same after signing and ratifying the Convention on the Rights of the Child.

Implementation of the Convention on the Rights of the Child, and of the Plan of Action in particular, was discussed at a special international conference on Ending the Hidden Hunger held in Montreal in 1991, as well as at the international conference on nutrition in Rome in 1992. At these meetings, a strategy of action was defined for eliminating IDD – **universal iodination of household salt**. This approach was assessed as the most optimal and suitable for all countries, regardless of their geographical location, economic development level, and population size. The lessons of the past decades has shown the efficiency of this approach both in developed (Switzerland, Austria, the Netherlands) and developing countries. Thanks to salt iodination,

about 90 million newborns every year are protected from a significant reduction in their intellectual potential, and the number of households consuming high-quality iodized salt has increased from 10% at the beginning of the 1990s to 72% in 2000.

At a special session of the UN General Assembly dedicated to children which was held in May 2002, the international community reaffirmed its commitment to achieve successful elimination of IDD by means of universal salt iodination and ultimately resolve this problem by the end of 2005. During this session, an alliance among several international organizations (WHO, UNICEF, ICCIDD), the salt manufacturers' associations of Europe, America, and China, and several public and non-government organizations was officially formed, which is known as the Network for the

THE BENEFITS OF SALT IODINATION FOR PREVENTING IODINE DEFICIENCY IN NUTRITION

- Salt is consumed by almost everyone in approximately the same amounts throughout the whole year.
- The introduction of iodizing additives (potassium iodate or iodide) does not give salt a peculiar taste or smell.
- The salt iodination technique is simple and accessible, due to its low cost, to essentially all manufacturers.
- Iodination increases the price of salt by no more than 5%.
- Quality of iodized salt is easy to monitor during production, delivery, trade, and consumption.
- Vast international experience confirms the high effectiveness of iodized salt in eliminating IDDs.

Sustainable Elimination of Iodine Deficiency. The purpose of this alliance is to coordinate the efforts of the many partner organizations to achieve a common goal – eliminating iodine deficiency on a global scale in the next few years.

Experience in preventing iodine deficiency disorders in the Soviet Union and the Russian Federation through salt iodination

In the Soviet Union, there were no special laws or government resolutions regulating salt iodination. Nevertheless, iodine deficiency disorders were largely or completely eliminated (as, for example, cases of cretinism), or taken under control (endemic goiter). Essentially the only document regulating the prevention of IDD was Order No.37-m of the USSR Public Health Ministry of 14 February 1956 **“On Improving Efforts to Fight Endemic Goiter.”** Pursuant to this document, the following work was carried out:

- republics and regions of the Soviet Union were identified where the problem of endemic goiter was particularly acute;
- republican, regional (territorial) anti-goiter committees and clinics were organized;
- mass prevention of iodine deficiency was organized among the population through salt iodination.

This order played an enormous role in disseminating and implementing prevention measures against endemic goiter in the Soviet Union. It essentially formulated the entire health care policy in this field for the next forty years. Many of the provisions of this order have retained their importance. However, this document only regulated the prevention of IDD in individual regions of the country where manifestations of iodine deficiency in the form of endemic goiter were the most serious. In other territories where endemic goiter was not as prevalent, there was essentially no IDD prevention system in place. However, iodine deficiency is not a regional, but a national problem. In the mid-1980s, approximately 500,000 tons of iodized salt were produced in the RSFSR, which essentially met the demand of the population and the food industry for this product in full. But the quality of iodized salt at that time was unsatisfactory. According to an extensive survey conducted in 1989 by the Endocrinology Center of the Russian Academy of Medical Sciences, up to 50% of the salt samples had an inadequately low iodine content.²

On the whole, the concept of IDD prevention in the Soviet Union was meant for an extremely centralized state management system. The country’s disintegration and subsequent economic reform in Russia put an end to the centralized and distributive system in the economy. At the beginning of the 1990s, many enterprises of the salt industry and almost the entire wholesale and retail trade system were privatized.

All the same, after the collapse of the Soviet Union, there was essentially no legislative framework left in Russia for conducting an iodine deficiency prevention program under the conditions of a market economy. As a result, this program was practically curtailed, and in 1997 less than 20,000 tons of iodized salt were produced in Russia.

The situation regarding IDD prevention through iodized salt began to improve gradually after 1997 when, owing to the joint efforts of national salt manufacturers, the Russian government, and the Public Health Ministry with the active participation of and financial support from international organizations, primarily UNICEF, the problem of eliminating iodine deficiency received top priority attention again. On 2 May 1997, the Chief State Sanitary Physician of the Russian Federation issued resolution No. 11 **“On the Prevention of Iodine-Deficiency**

² See Problems of Endocrinology (in Russian), 1992, Vol. 38, No. 3, pp. 6–15.

Conditions.” Among other things, this resolution envisaged a ban on the import of non-iodized cooking salt. Unfortunately, this resolution was not put into effect due to interference by the Ministry of Justice which claimed that it violated several articles of effective legislation. According to this ministry, any restriction of citizen rights and freedoms must be regulated exclusively by federal legislation.

In November 1997, with active assistance from UNICEF and the Program for Eliminating Micro-Nutrient Deficiency (USA), the first conference of Russian, Ukrainian and Belorussian salt producers was held on the topic “The Production of Iodized Salt: Problems and Solutions.” The purpose of this assembly was to evaluate the obstacles to and reasons for carrying out universal salt iodination and develop measures aimed at expanding the manufacture of iodized salt in these countries. Reasons for the low quality of iodized salt, which essentially led to a halt in its production at the beginning of the 1990s, were the ineffective salt iodination technique and the use of relatively unstable potassium iodide as the iodizing fortificant. This iodized salt could only be kept for three months, which greatly reduced its commercial attractiveness, since merchants bore losses from having to throw out the low-quality product. (At that time, the manufacture of iodized salt was regulated by an imperfect state standard – GOST 13830-91.)

In the resolution drawn up at this conference, the Russian salt manufacturers recognized that IDD was a serious problem for the country and that by producing high-quality iodized salt, they could make a significant contribution to preventing IDD. Moreover, at this conference, the salt manufacturers of the three countries agreed to transfer to the use of a more stable iodizing fortificant – potassium iodate – and to raise the weight content of iodine in salt to 40 ± 15 mg/kg in keeping with international recommendations.³ New recommendations for the packaging and labeling of iodized salt were also discussed and adopted.

The conference’s recommendations were subsequently taken into account in the resolution of Chief State Sanitary Physician of the Russian Federation No. 11 of 3 April 1998 “On Additional Measures to Prevent Iodine-Deficiency Conditions.” According to this resolution, a new standard was introduced in Russia for iodine-enriched salt – 40 ± 15 mg/kg, and the length of storage for iodized salt was established: up to six months for salt containing potassium iodide, and up to nine months for salt containing potassium iodate. The enterprises of the salt industry were recommended to switch over to the manufacture of iodized salt using potassium iodate in accordance with the established standard by the end of 1998. Instructions were also given to draw up and approve methods of quality control over the iodine content in salt enriched with potassium iodate.

It should be noted that in 1997-1999, issues regarding micronutrient deficiency prevention, primarily iodine deficiency, were actively discussed by the Health Care Committee of the Russian-American Commission for Economic, Scientific and Technical Cooperation (better known as the Gore-Chernomyrdin Commission).

Russian iodized salt producers also took active part in the first Regional Salt Producers Conference of Central and Eastern Europe, the Commonwealth of Independent States, and the Baltic states held on 29 September – 1 October 1999 in Kiev. The Conference resolution noted that the generally accepted strategy in IDD prevention is eliminating iodine deficiency. Salt iodination is a safe, economic, and reliable way to prevent IDD, and salt manufacturers are the key link in the successful resolution of this problem. Russian salt manufacturers confirmed their intention to make regular investments in production technology, delivery, and trade of iodized salt and ensure the population’s broad access to iodized salt in order to reliably eliminate iodine deficiency.

³ Recommended iodine content levels in salt and instructions for checking them for correspondence and effectiveness. Recommendations of WHO, UNICEF and MSCIDD, Geneva, 1996 (trans. from the English).

It is worth noting that literally a few days after the end of the Conference, on 5 October 1999, the Russian Federation government adopted resolution No. 1119 “On Measures to Prevent Iodine Deficiency Disorders.” According to this resolution, several federal departments (the Ministries of Defense, Interior, and Justice, and the Russian Federation Federal Border Service) must purchase iodized salt every year. In addition, the executive power structures of the Russian Federation constituent entities were asked to adopt measures to saturate the market with food containing iodized salt and supply children’s preschool, educational, educational-cum-health-building establishments and health-building sanatoria with iodized food products, as well as conduct outreach work to raise the public’s awareness concerning IDD prevention. The plan of action for the first stage of implementing the state’s framework for ensuring healthy nutrition of the Russian Federation population until 2005, was amended to envisage, among other things, the design and approval of state standards for common salt and quality-control methods.

The next order of the Russian Federation Public Health Ministry No. 444 of 14 December 1999 and resolution of the Chief State Sanitary Physician of the Russian Federation No. 17 of 28 December 1999 made it mandatory that the children’s and medical institutions under the jurisdiction of the Public Health Ministry were provided with a continuous supply of salt and that quality control over iodized salt was stepped up during its manufacture and sale.

All enterprises of the salt industry have been modernized, which included process flow development and the design, installation, starting up, and adjustment of equipment for iodizing salt. At several enterprises, some of this equipment, as well as the potassium iodate for enriching salt, were provided by UNICEF in the form of humanitarian aid. As a result of this work, potential was created for manufacturing high-quality iodized salt in the Russian Federation capable of fully meeting the country’s demand for this product. But at present the capacities for producing iodized salt are only partially loaded, and production of iodized salt, although it has increased 6-7-fold compared with 1997, only meets 25–30% of the minimum demand for this foodstuff.

In 2000, the Russian State Standards Committee approved new state standards GOST 51574-2000 “Common Salt. Technical Specifications” and GOST 51575 “Iodized Common Salt. Methods for Defining Iodine and Sodium Thiosulfate.”

For the past five years, UNICEF has been maintaining close business contacts with Russian salt producers, the Public Health Ministry, and other government and public organizations concerned and has been rendering assistance to promote production and sale of iodized salt. For example, with the support of UNICEF, in May 2000, a delegation of Russian salt producers took part in the World Salt Symposium held in 2000 in the Hague (the Netherlands). Seminars were conducted with the participation of representatives of iodized salt-producing enterprises to raise the quality of iodized salt and draw up new quality assurance methods.

At the beginning of 2002, UNICEF supported the initiative of national salt manufacturers to hold another conference of manufacturers and the main suppliers of iodized salt in October 2002. During the preparations for this conference, the UNICEF Office in the Russian Federation, in close cooperation with national salt producers, decided to conduct a **situation analysis of the iodized salt market (SASM)**. The main purpose of the SASM was to assess the capability of the Russian salt industry to ensure the mass production of high-quality iodized salt and define the most important obstacles and problems which producers and major suppliers of iodized salt encounter while implementing the universal salt iodination program. The SASM included a study of the manufacture, transportation, wholesale and retail sales and consumption of common salt, as well as definition of the place and share of iodized salt on the overall common salt market in the country.⁴

⁴ Hereafter in this report cooking salt not fortified with iodine will be called “common salt,” in contrast to iodized salt, that is, iodine-fortified salt.

METHODOLOGY FOR CONDUCTING THE SASM

The SASM was conducted during June and July 2002 by a UNICEF consultant Prof. G.A. Geramisov along with President of the Solprom Association B.P. Apanasenko and Vice President of the Union of Potassium and Salt Producers and Exporters (UPSPE) V.P. Koltunov, who represented the two main groups of Russian salt-producing enterprises.

The SASM included gathering and updating information on the main Russian enterprises which produce common salt, their range and volume of production, their quality-control system for iodized salt, transportation, wholesale and retail sales of iodized salt, as well as the prospects for expanding the use of iodized salt in public catering, the food industry, and agriculture.

A special questionnaire sent to all salt-producing enterprises was used to gather information (see **Appendix**). It should be noted that the same questionnaire was used for conducting the SASM in 2002 as for the previous SASM conducted by UNICEF in 1999 on the eve of the Regional Salt Producers Meeting of Central and Eastern Europe, the Commonwealth of Independent States, and the Baltic states held on 29 September – 1 October 1999 in Kiev. This made it possible to compare the results of both studies and draw objective conclusions on the work carried out. The following information was gathered with the help of the questionnaire:

- the production capacities of the salt industry enterprises with respect to manufacturing common iodized salt;
- the salt iodination technique used;
- the system of quality control over iodized salt;
- the packaging and labeling of iodized salt;
- storage and transportation conditions for iodized salt;
- price formation conditions for iodized salt;
- mechanisms of internal and external quality control during the manufacture of iodized salt.

In addition to an analysis of the answers to the questionnaire, the authors of this report visited all the main enterprises manufacturing iodized salt, where they gathered additional information on the range and volume of production, the quality-control system, transportation, wholesale and retail sale of iodized salt, as well as the prospects for expanding production and using iodized salt in public catering, the food industry, and agriculture. For example, G.A. Gerasimov, B.P. Apanasenko and V.P. Koltunov visited the following enterprises: JSC Iletsksol, JSC Bassol, FSUE (federal state unitary enterprise) Sibsol, FSUE Tyretsky solerudnk, JSC Uralkalii, and JSC Silvinit. In addition, when drawing up this report, the authors made use of the reports based on earlier studies of Russian salt industry enterprises and the iodized salt market in the Russian Federation.⁵

⁵ Cf.: Mission reports of UNICEF consultant L. Locatelli-Rossi (1997, 1998); G. Gerasimov, "Market Research of Production, Transport and Distribution of Salt in the Russian Federation: Potential for Universal Salt Iodization". Report to UNICEF, Moscow, 1998; Salt Situation Analysis in Russia, Ukraine and Belarus. Consultancy report to UNICEF by G. Gerasimov, Moscow, 1999.

GENERAL REVIEW OF THE RUSSIAN SALT INDUSTRY ENTERPRISES AND THEIR PRODUCTS

Salt has been produced in Russia since the 11th-12th centuries when the first salt works appeared at which salt was extracted from underground sources of brine, as well as from deposits located close to the earth's surface. Some old Russian cities are still called "Usolye" (lit. trans. "by the salt"), that is located close to salt deposits. As the population grew, the industrial demand for salt also increased. At the end of the 19th century, development of the largest salt deposit at Baskunchak Lake began.

The rapid development of industry in the Soviet Union led to a high demand for common salt, particularly in the chemical industry. In 1987, the total salt production in the Soviet Union reached 15.4 million tons. After the collapse of the Soviet Union, salt production in Russia decreased from 3.6 million tons in 1992 to 2.1 million tons in 1996. The manufacturers of potassium fertilizers additionally supplied the market with over 1 million tons of salt, mainly for technical purposes.⁶ In recent years, a trend has shaped again toward an increase in salt production (see Fig. 1).

Organizational structure of the Russian salt industry

Two groups of enterprises are engaged in producing and processing salt in Russia. The first group consists of "**traditional**" **salt producers**, which are only engaged in the production and processing of sodium chloride. At one time (before 1992), they were part of the RSFSR Ministry of the Food Industry. At present, some enterprises in this group have been privatized with the formation of open joint-stock companies (JSC), and some are still state-owned in the form of federal state unitary enterprises (FSUE). Functionally, these enterprises are under the jurisdiction of the Russian Federation Ministry of Agriculture, but this state department does not interfere in the economic activity of the state enterprises, not to mention those that have been privatized.

This report presents information obtained from four enterprises in this group: JSC Iletssol, JSC Bassol, FSUE Sibsol, and FSUE Tyretsky Solerudnik. In addition to the listed enterprises, several small businesses which mainly serve regional needs are engaged in producing salt: the Burlinsky (Slavgorod, the Altai Territory), Troitsky (Kranoyarsk Territory), and Seregovsky (the Republic of Komi) salt enterprises. But at present the volume of salt production at these enterprises is not very high, and they do not manufacture iodized salt, so they were not included in this review. More detailed information about these salt enterprises can be found in our previous reports presented to UNICEF.⁷

⁶ The Economics of Salt, 1997, pp. 195, 203-205.

⁷ Cf.: G. Gerasimov, "Market Research of Production, Transport and Distribution of Salt in the Russian Federation; Potential for Universal Salt Iodination". Report to UNICEF, Moscow, 1998

The second group of manufacturers, for which the production of common salt is to a certain extent a collateral business, consists of enterprises **manufacturing potassium fertilizers**. These include JSC Uralkalii (Berezniki) and JSC Silvinit (Solikamsk). Both of these enterprises are located in the Perm Region about 30 km from each other. Both enterprises used to belong to the USSR Ministry for the Production of Mineral Fertilizers and were privatized in 1992.

Until the mid-1990s, the enterprises of the potassium industry did not manufacture common salt, but due to the possibility of a sudden reduction in the import of cooking salt from Ukraine (the largest salt producer in the Soviet Union) and other countries, they attracted the necessary investments, carried out modernization and began to produce pan evaporated and rock salt for the consumer market and food industry. It should be noted that in the economic respect both enterprises are oriented toward exporting their main product (potassium chloride) and control up to 20% of the world market of potassium fertilizers. In this respect, these enterprises have significant financial resources for technical retooling and for quality management of their product. Both enterprises have ISO 9002 certificates.

The classification of salt

According to the current GOST R51574-2000, common salt is subdivided as follows:

- **By production process** – pan, rock, capping, and bay salt. Pan salt in Russia is manufactured at JSC Uralkalii and FSUE Sibsol, rock salt at JSC Iletsksol, JSC Silvinit, and FSUE Tyretsky solerudnik; and capping salt at JSC Bassol.
- **By processing means** – with supplements or without supplements. All the listed enterprises produce salt with supplements of potassium iodate.
- **By quality** – extra, high, first, and second grades. The weight percentage of sodium chloride (in terms of dry substance) should be: 99.7% for extra, 98.4% for high, 97.7% for first, and 97% for second grade salt. Extra grade pan salt is manufactured at JSC Uralkalii and FSUE Sibsol. High, first, and second grade rock and capping salts are produced at JSC Iletsksol, JSC Silvinit, FSUE Tyretsky Solerudnik, and JSC Bassol. As a rule, second grade salt is not used for cooking purposes.
- **By grain size** – the grain size for extra grade and No. 0, No. 1, No. 2, No.3 ground salt.

On the whole, the technical specifications for common salt in Russia are entirely in conformity with the international recommendations set forth in **Codex Alimentarius** (Table 1).

Technical specifications for iodized salt

One of the main reasons for the essentially complete halt in the production of iodized salt in Russia at the beginning of the 1990s was its low quality. This was largely due to the inadequately designed GOST 13830-91 at that time, which stipulated a rather low weight proportion of iodine – 23 ± 11 mg/g). In addition, although this GOST did not directly prohibit the use of additives other than potassium iodide, the fact that there were no methods for testing salt enriched with potassium iodate hindered the broad use of this more sophisticated iodizing fortificant.

A turning point in resolving the problem of the quality of iodized salt came after the first conference of Russian, Ukrainian, and Belorussian iodized salt producers in November 1997, at which an agreement was reached on raising the weight proportion of iodine in salt to 40 ± 15 mg/g and gradually transferring to the use of potassium iodate. Resolution of the Chief State Sanitary

International specifications for common salt (Codex Alimentarius, 150-1985)

<p>1. Table salt is a crystalline product consisting primarily of sodium chloride. It is derived from sea water, underground deposits of rock salt, or natural brine. This standard applies to salt used in food which reaches the consumer either directly, or through products manufactured by the food industry. It also applies to salt used as a food supplement and/or nutritive substance.</p> <p>2. The NaCl content should be no less than 97% of the dry substance, not counting additives.</p> <p>3. The following food additives may be present in salt: the additives listed on the relevant pages of Section 3 and given below:</p>	
<u>Anti-caking agents</u> Calcium and/or magnesium carbonate, Mg oxide; tripotassium phosphate; silicon dioxide; Ca, Mg, Na aluminate or Ca, Al, Ca, Mg, K aluminosilicate or Na salts of myristic, palmitic or stearic acid	<u>Maximum level in the end product</u> 20 g/kg separately or in combination
Crystal modifiers	Na, K or Ca ferrocyanides {designated as $[\text{Fe}(\text{CN})_6]$ } 10 mg/kg separately or in combination. For Na и K ferrocyanides in preparations of "dendritic" salt, a maximum level of 20 mg/kg is permitted.
Polysorbate 80 Dimethyl polysiloxane	10 mg/kg 10 mg residue/kg
<u>Admixtures</u> Arsenic Copper Lead Cadmium Mercury	<u>Maximum permissible level</u> 0.5 mg/kg 2 mg/kg 2 mg/kg 0.5 mg/kg 0.1 mg/kg
In addition to the mandatory specifications listed in the General Standard for designating packaged food products, the following specifications are used:	The name of the product should be "salt," apart from the name "salt," the packaging should also indicate "cooking" or "for preparing food," or "table;" if the salt contains one or more ferricyanide salts added to the brine at the crystallization stage, the word "dendritic" may also be indicated along with the name, the label can also indicate the origin or method of production; if the salt is used as a nutritive substance carrier and is sold for healthcare purposes, this should be indicated, for example, "fluorinated salt" or "salt enriched with iron"; in such cases, the data of manufacturing must be indicated to avoid the sale of a product whose effectiveness has expired.

Physician of the Russian Federation No. 11 of 3 April 1998 officially approved this new standard for the weight proportion of iodine in salt. Later, in accordance with Russian Government resolution No. 1119 of 5 October 1999, new national standards were drawn up and approved: GOST 51574-2000 "Common Salt. Technical Specifications" and GOST 51575-2000 "Iodized Common Salt. Methods for Determining Iodine and Sodium Thiosulphate."

GOST 51574-2000 "Common Salt. Technical Specifications" sets forth detailed regulations for the technical specifications of iodized salt, its marking and packaging, quality-control methods and storage. For example, extra, high, and first grade common pan salt, high and first grade rock salt of No. 0 and No. 1 ground size for preventive purposes can be manufactured with an iodine additive (iodized salt).⁸ Substances classified as pure or higher are used as additives: for pan salt –

⁸ The manufacture of high and first grade iodized capping salt of No. 0 and No. 1 ground size at the Bassol Combine is additionally regulated by technical specifications TU 9192-092-00209527-2001.

potassium iodide according to GOST 4332 and potassium iodate according to GOST 4202; for rock and capping salt – potassium iodate, as well as imported substances duly approved by the agencies and institutions of the Russian state sanitary and epidemiological service. The weight proportion of iodine in iodized salt is stipulated at 40 ± 15 mg/g. Sodium thiosulphate according to GOST 27068 should be used as a stabilizer for potassium iodide. The weight proportion of sodium thiosulphate amounts to 250 ± 50 mg/g of salt. It is also noted that the weight proportion of moisture in salt with additives should be no higher than 1%.

Although the use of potassium iodide as an iodizing fortificant is permitted by the effective GOST, in practice, as the answers to the questionnaire showed, all the enterprises of the Russian salt industry produce salt enriched exclusively using potassium iodate. Taking into account that Ukrainian and Belorussian salt enterprises have also completely switched to the use of potassium iodate (apart from export deliveries to some countries), we can say with certainty that all products on the Russian iodized salt market are presently fortified with potassium iodate (with the exception of small imported batches of salt from France and several other countries).

In addition to general information (name of product, name and address of manufacturer, packager, exporter or importer, date of manufacture, and so on), iodized salt must also be **marked** with the type of iodine added (potassium iodide or iodate), the iodine content, and expiry date. Packages should also indicate that upon expiry, iodized salt can be used as common salt without preventive additives. This information should also be present in the document on quality accompanying the batch of salt during its sale.

The current GOST does not contain special requirements for **packaging** iodized salt, apart from mentioning that it should ensure preservation of the additive introduced for preventive reasons until the expiry date. Iodized common salt can be packaged in amounts ranging from 50 to 2000 g in polyethylene bags with or without added pigment (blue, yellow, brown, opaque), as well as in bags made from a combination of materials, or in cardboard and polymer boxes. Iodized salt for the production of foodstuffs is packaged in 50 kg polyethylene or propylene sacks.

In contrast to the former GOST, the stipulated **expiry dates** for iodized common salt (from the date of manufacture) have been noticeably extended and constitute the following: using potassium iodide – 6 months, using potassium iodate – 9 months, for pan salt – 12 months (the expiry time used to be only 3 months, and extra grade pan salt could not be iodized at all).

THE IODIZED SALT MARKET IN THE RUSSIAN FEDERATION: RESULTS OF THE SITUATION ANALYSIS, 2002

General information on the main Russian iodized salt manufacturers

In Russia, practically the entire volume of common salt for nutritional purposes, including all iodized salt, is manufactured at the six enterprises covered in this review. Territorially, three of them are located in the European part of Russia (Uralkaly and Silvinit in the Perm Region, and Bassol in the Astrakhan Region) and the other three, in the Asian part of the country (Iletsksol in the Orenburg Region, and Sibsol and Tyretsky Solerudnik in the Irkutsk Region). All the enterprises have a well-developed transportation infrastructure and are serviced by rail, road, and water transport.

A total of 29,318 people work at the six main Russian salt-manufacturing enterprises (Table 2). But it should be noted that at the Uralkaly and Silvinit, which are considered major enterprises, only a relatively small number of employees are engaged in the production of common table salt. The other enterprises of the Russian salt industry can be classified as medium-sized, with between 500 and 1,500 employees working at each.

In terms of form of ownership, four of the enterprises (Bassol, Iletsksol, Uralkaly and Silvinit) are joint-stock companies, and the other two (Sibsol and Tyretsky Solerudnik) are state-owned. The main consumers of their product (salt) are the chemical, metallurgical, and fuel and energy industries, road maintenance enterprises, and so on. Significant volumes of salt are sent in packaged form to retail trade companies and the food industry.

It should be emphasized that the enterprises furnished all the information on their production capacities, production volumes of common table salt, iodination methods, and so on, by voluntarily filling out questionnaires. Additional information was gathered by the authors while visiting all the enterprises included in this review in May – July 2002. For various reasons, not all of the Russian salt manufacturers were able to fully respond to all the questions included in the questionnaire.

Table 2

Number of employees at the main Russian salt enterprises

Category	Bassol	Iletsksol	Sibsol	Silvinit	Tyretsky Solerudnik	Uralkaly
Administration and white-collar workers	32	NI	35	1,001	114	1,817
Engineers, technicians, and blue-collar workers	700	NI	456	9,166	470	14,098
Total	732	NI	491	10,167	584	15,915

NI – no information

JSC Bassol

Address: 16 Gorky street, 416532, Nizhny Baskunchak, Akhtuba District, Astrakhan Region

Tel.: (85141) 55-275,

fax: (851-11) 55-284

e-mail: bassol@astranet.ru

Director-General: Yevgeny Petrovich Demichev

Bassol is the only one of the enterprises surveyed which mines salt deposited in Lake Baskunchak with the aid of salt combines (with its subsequent enrichment and refining). Salt is produced throughout the season (from April to October). After the salt is recovered by combine, a significant part is shipped to consumers (mainly for technical purposes) by rail in gondola cars or by river barge from the enterprise's own dock in the Akhtuba, a channel of the Volga River. Salt for nutritional purposes is sent from the lake in gondola cars for refining at the plant where it is crushed, classified by grade and ground size, dried, and packaged.

The Bassol enterprise was and still is the largest manufacturer of common table salt in Russia. At one time, it produced 5.8 million metric tons. In the mid-1990s, salt production decreased to 700–800,000 tons, but subsequently rose again. According to the enterprise management, the current production volume (approximately 1.5 million tons) is optimal for the enterprise and does not deplete the resources of the salt lake, thus preserving this unique natural phenomenon.

This is the first time that JSC Bassol has been included in a review of the Russian manufacturers of iodized salt. During the past few years, the enterprise's production line has been modernized and new equipment for producing iodized salt has been installed. The enterprise, which used to be oriented mainly toward manufacturing salt for technical purposes, is gaining a stronger foothold on the consumer salt market and increasing the volume and geographical delivery range of packaged salt, including iodized salt, to retail trade companies and the food industry.

Table 3

Annual production volumes of common table salt, including iodized salt, at JSC Bassol (metric tons)

	2000	2001	2002
Annual production volume of all common salt *	1,796,900	1,420,600	No data
Annual production volume of iodinated common table salt	5,182	6,537	2,810**

* Data of the Russian Federation State Statistics Board;

** Data for the first five months of 2002.

According to Bassol's Director-General Yevgeny Demichev, the enterprise's annual projected capacity for iodized salt manufacture amounts to 100,000 tons, but at present less than 10% of it is being used.

Salt iodination technology. Salt iodination at the enterprise is done by adding an iodizing fortificant (potassium iodate) using the wet method. Continuous salt iodination is performed automatically, with adding the iodizing fortificant to the vessel by hand and using a flow of salt of the appropriate ground size and grade, feeder, dosing pump, injectors, mixer, and control and automation devices. Individual batches of salt are iodinated (at the time the enterprise was visited, salt iodination was not taking place). Potassium iodate is imported from the Balkankhim

enterprise (Balkanabat, Turkmenistan) at a price of 580 rubles/kg (approximately \$19/kg). There is always a three-month supply of iodizing fortificant in the warehouse.

Quality-control system. Quality control of the salt is carried out in keeping with GOST 51574-2000, GOST 51575-2000, and TS 9192-092-00209527-2001. There is a well-equipped central production-technology laboratory at the enterprise which carries out quality control of the manufactured product, as well as input control of the raw and other materials used in the production process. The central laboratory is headed by production engineer T. A. Demicheva. Samples are taken regularly from packets of packaged product to determine the amount of iodine. An analysis of the iodine content in the selected samples of salt is conducted by means of titration according to GOST 51575-2000. The results of the control checks and measurements of iodine content in the salt samples are entered in a special laboratory log. The production staff are given instructions on adjusting the iodine content in accordance with the results of the control checks.

Packaging and labeling of iodized salt. At the Bassol enterprise, approximately 50,000 tons of salt, including most of the iodized salt, are bagged in small packets of 1 kg and less. The salt is packaged into 1 kg polyethylene bags by means of transfer lines and automatic packaging machines. The automatic method of salt packaging includes the automatic delivery of salt to the machine or transfer line, automatic feeding of the packaging material (bobbins of polyethylene bearing the appropriate stamp), pouring of the salt into the packet, sealing, and packaging of the sealed bags into consignments on the production lines. Polyethylene film bearing the appropriate stamp is used for packaging iodized salt, and the packets are closed by thermal sealing of the seam. A small amount of iodized salt is packaged in 550 g and 850 g plastic boxes with a salt shaker top. These boxes are filled by hand.

Each consumer packet is clearly marked with the name of the product, "Iodized salt." In addition, the following is printed on small packets:

- the name of the enterprise, its trade mark (logo), postal address, telephone number, fax, e-mail address, and Internet address;
- name of the product, production method, grade, ground size;
- name of the iodizing fortificant (potassium iodate), weight percentage of iodine (40 ± 15 mg/kg);
- net weight;
- manufacturing date and expiry date (9 months from the date of manufacture);
- TS designation;
- the following information: "Iodized salt is recommended by the Russian Federation Public Health Ministry as an enriched food product intended for restoring the iodine deficiency in diet. Five–six grams of iodized salt a day fully meets the daily requirement of this microelement."

On the consumer's order, some iodized salt is packaged in large bags (50 kg polypropylene sacks) and stitched closed on sewing machines. A label is sewn onto each sack which bears the inscription "Iodized salt," information about the salt manufacturer, the net weight, the manufacturing date, the expiry date, storage conditions, and the TS designation.

Transportation and storage conditions for iodized salt. The Bassol enterprise sends most of the iodized salt it produces to consumers by rail. The average delivery time does not exceed two weeks. Some iodinate salt is also shipped in the buyer's own trucks (self shipment), whereby the delivery time by road is no more than 1 – 2 days. Iodized salt is delivered to the consumers only in closed rail cars and trucks equipped with a tarpaulin cover.

Most iodized salt is manufactured according to the order of a specific purchaser and loaded directly into railroad cars. Apart from that, the enterprise also has a new end product warehouse with regulated temperature and humidity conditions. Iodized salt is stored on pallets and is

protected from direct sunlight. Iodized salt is shipped according to the principle “First – In – First – Out.” The enterprise does not have any information on how its major wholesale clients store iodized salt.

Bassol has a broad delivery range, but it did not provide any detailed information on the amounts of iodized salt delivered to individual regions of the Russian Federation, apart from the Astrakhan Region (89 tons in 2000, 124 tons in 2001, and 33 tons in the first five months of 2002).

JSC Iletsksol

Address: 1 Sovetskaya street, 461500, Sol-Iletsk, Orenburg Region,

Tel./fax: (35336) 2-13-63

e-mail address: salt@mail.esoo.ru; www.tts.ru/-salt/

Director-General: Irek Vilovich Abdurshin

Rock salt is mined by means of the underground chamber processing system. Chambers are worked in layers using Ural 10KS tunneling combines together with power-operated 5VS-15 wagons. The enterprise’s projected capacity is 560,000 tons and is fully utilized. The enterprise’s annual projected capacity for manufacturing iodized salt is 150,000 tons. At present, preparations are underway to refurbish the enterprise and set up new workshops for refining and packaging the salt.

Table 4

Annual volumes of common table salt production, including iodized salt, at JSC Iletsksol (metric tons)

	2000	2001	2002
Annual production volume of all common salt	584,438	569,096	158,694*
Annual production volume of iodinated common table salt	39,059	43,369	18,111*

* Data for the first five months of 2002.

In terms of its iodized salt production volume, Iletsksol outstrips all the other salt manufacturing enterprises in Russia, with the sales volume of iodized salt increasing with each passing year. According to Iletsksol Director- General Irek Abdurshin, after refurbishing, the enterprise will be able to manufacture all the iodized salt for the consumer market.

Salt iodination technology. Salt iodination at the enterprise is done by adding an iodizing fortificant (potassium iodate) by means of the wet method. Continuous salt iodination is carried out automatically, adding the iodizing fortificant to the vessel by hand and using a flow of salt of the appropriate ground size and grade, feeder, dosing pump, injectors, mixer, and control and automation devices. Individual batches of salt are iodized (at the time the enterprise was visited, salt iodination was not taking place). Potassium iodate is purchased at the Urals Chemical Reagent Plant (Verkhnyaia Pyshma, the Sverdlovsk Region). The annual cost of obtaining this iodizing fortificant is 2,700,000 rubles (approximately \$87,000). There is always a thirty-day supply of iodizing fortificant in the warehouse.

Quality-control system. Quality control of the salt is carried out in keeping with GOST 51574-2000 and GOST 51575-2000. There is a well-equipped central production-technology

laboratory at the enterprise which carries out quality control of the manufactured product, as well as input control of the raw and other materials used in the production process. The central laboratory is headed by chemical analyst G. A. Fogelberg. Samples are taken from packets of packaged product every four hours to determine the amount of iodine. An analysis of the iodine content in the selected samples of salt is conducted by means of titration according to GOST 51575-2000. The results of the control checks and measurements of iodine content in the salt samples are entered in a special laboratory log. The production staff are given instructions on adjusting the iodine content in accordance with the results of the control checks.

Packaging and labeling of iodized salt. Information about the amounts of salt bagged in small packets of 1 kg and less at the Iletsksol was not specified in its answers to the questionnaire. Salt is packaged in 1 kg polyethylene bags by means of transfer lines, Russian-made automatic packaging machines and machines manufactured in the Czech Republic, as well as in paper bags by means of AP8B automatic machines. The automatic method of salt packaging includes the automatic delivery of salt to the machine or transfer line, automatic feeding of the packaging material (bobbins of paper or polyethylene bearing the appropriate stamp), pouring of the salt into the packet, sealing or gluing and packaging of the sealed bags in consignments on the production lines. Polyethylene film bearing the appropriate stamp and paper (two bags, one inside the other) are used for packaging iodized salt. The bags and packets are closed by thermal sealing of the seam (polyethylene film) or by gluing with a special glue.

Each consumer packet is clearly marked with the name of the product, "Iodized salt." In addition, the following is printed on small packets:

- the name of the enterprise, its trade mark (logo), postal address, telephone number, fax;
- name of the product, production method, grade, ground size;
- name of the iodizing fortificant (potassium iodate), weight percentage of iodine (40 ± 15 mg/kg);
- net weight;
- manufacturing date and expiry date (9 months from the date of manufacture);
- GOST designation;
- the following information: "Iodized salt is recommended by the Russian Federation Public Health Ministry as an enriched food product intended for restoring the iodine deficiency in diet. Five–six grams of iodized salt a day fully meets the daily requirement of this microelement."

On the consumer's order, some iodized salt is packaged in large bags (50 kg polypropylene sacks) and stitched closed on sewing machines. A label is sewn onto each sack which bears the inscription "Iodized salt," information about the salt manufacturer, the net weight, the manufacturing date, the expiry date, storage conditions, and the GOST designation.

Transportation and storage conditions for iodized salt. The enterprise sends most of its iodized salt to consumers by rail. Iodized salt is also shipped in the buyer's own trucks (self shipment), whereby the delivery time by road is no more than 1 – 2 days. Iodized salt is delivered to the consumers only in closed rail cars and trucks equipped with a tarpaulin cover.

The Iletsksol enterprise does not have any warehouses for storing the end product and does not keep any supplies of iodized salt. Most iodized salt is manufactured according to the order of a specific purchaser and loaded directly into railroad cars or trucks. Very small batches of salt can be kept for several days in a storage wagon on pallets protected from rain and direct sunlight.

The enterprise has a broad delivery range to individual regions of the Russian Federation: all in all, iodized salt has been delivered to 47 regions of the country and the Republic of Kazakhstan. The largest purchasers of iodized salt in 2000 and 2001 were: the Altai Territory (2610 and 2786 tons, respectively), the Republic of Bashkortostan (5,842 and 5,914 tons), the Kurgan Region (970 and 632 tons), the Novosibirsk Region (1897 and 1864 tons), the Omsk

Region (1,105 and 1,704 tons), the Orenburg Region (6,159 and 6,964 tons), the Samara Region (1,358 and 910 tons), the Sverdlovsk Region (1,031 and 2,128 tons), the Tyumen Region (1,586 and 1,504 tons), the Republic of Tatarstan (5,023 and 6,457 tons), and the Chelyabinsk Region (1,670 and 1,720 tons, respectively).

FSUE Sibsol Plant

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Tel.: (39543) 6-97-40

Fax: 6-97-46

e-mail: info@salt-extra.ru, info@sibsol.com, sibsol@usolsib.ru

Director: Leonid Petrovich Beloborodov

Iodized salt marketing manager: L. A. Cheburei

The Sibsol enterprise is the oldest producer of vacuum-evaporated salt in Russia. Brine is recovered from under the ground by means of underground leaching. After caustic-sulfate-soda purification, the brine is evaporated in three open box-type vacuum-evaporation systems. After drying, the salt is sent to the packing shop to be bagged into packets and dispensed into polypropylene sacks. The enterprise's annual projected capacity for manufacturing salt is 160,500 tons, and its annual projected capacity for manufacturing iodized salt is 160,500 tons, i.e. 100% of the total salt production is intended for nutritional purposes. Most of the manufactured salt is, indeed, used for nutritional purposes (for retail trade and the food industry), and a part of it is delivered to enterprises of the chemical industry.

Table 5

Annual volumes of common table salt production, including iodized salt, at FSUE Sibsol (metric tons)

	2000	2001	2002
Annual production volume of all common salt	58,467	67,252	14,736*
Annual production volume of salt for nutritional purposes (retail trade and the food industry)	52,732	63,040	14,331*
Annual production volume of iodinated common table salt	13,714	12,985	5,461*

* Data only for the first four months of 2002 due to the scheduled repairs which lasted 50 days.

Salt iodination technology. At the enterprise, salt is iodinated by adding an iodizing fortificant (potassium iodate) by means of the wet method. Continuous salt iodination is carried out automatically, adding the iodizing fortificant to the vessel by hand and using a flow of salt of the appropriate ground size and grade, feeder, dosing pump, injectors, mixer, and control and automation devices (cf. the diagram). Individual batches of salt are iodinated. Potassium iodate is purchased at the Neftegazkhimkomlekt enterprise (Moscow) at a price of 470 rubles (without VAT) for 1 kg (approximately \$15 per kg). There is always a one-month supply of iodizing fortificant in the warehouse.

Quality-control system. Quality control of the salt is carried out in keeping with GOST 51574-2000 and GOST 51575-2000. N. T. Varvenko, head of the packaging shop, is responsible

for the output of iodized salt. There is a fully equipped central laboratory at the enterprise which carries out quality control of the manufactured product, as well as input control of the raw and other materials used in the production process. The central laboratory is headed by chemical analyst T. Ye. Deyeva. Samples are taken from packets of packaged product every four hours to determine the amount of iodine. An analysis of the iodine content in the selected samples of salt is conducted by means of titration according to GOST 51575-2000. The results of the control checks and measurements of iodine content in the salt samples are entered in a special laboratory log. In 2000, 1,412 analyses of iodine content were carried out, in 2001 – 1,220 analyses, and in 2002 – 408 analyses. In addition, the shift heads regularly control the amount of iodine in the flow of salt on the conveyor using a high-quality test system. The production staff are given instructions based on the results of the control checks and the iodine content in the salt is adjusted.

Packaging and labeling of iodized salt. Most of the Salt produced by the enterprise (51,286 tons in 2001) is packaged in small bags of 1 kg and less, which amounts to 76% of the total salt production and 81% of the common salt production for nutritional purposes. Salt is packaged in 1 kg polyethylene bags by means of transfer lines and automatic packaging machines. The automatic method of salt packaging includes the automatic delivery of salt to the machine or transfer line, automatic feeding of the packaging material (bobbins of polyethylene bearing the appropriate stamp), pouring of the salt into the packet, sealing, and packaging of the sealed bags into consignments on the production lines. Polyethylene film bearing the appropriate stamp is used for packaging iodized salt. The bags and packets are closed by thermal sealing of the seam (polyethylene film). A small amount of iodized salt is packaged in 550 g plastic boxes with a salt shaker top. These boxes are filled by hand.

Each consumer package is clearly marked with the name of the product, “Iodized salt.” In addition, the following is printed on small packets:

- the name of the enterprise, its trade mark (logo), postal address, telephone number, fax;
- name of the product, production method, grade, ground size;
- name of the iodizing fortificant (potassium iodate), weight percentage of iodine (40 ± 15 mg/kg);
- net weight;
- manufacturing date and expiry date (9 months from the date of manufacture);
- GOST designation;
- the following information: “Iodized salt is recommended by the Russian Federation Public Health Ministry as an enriched food product intended for restoring the iodine deficiency in diet. Five–six grams of iodized salt a day fully meets the daily requirement of this microelement.”

On the consumer’s order, some iodized salt is packaged in large bags (50 kg polypropylene sacks with a thinner bag inside, or laminated) and stitched closed on sewing machines. A label is sewn onto each sack which bears the inscription “Iodized salt,” information about the salt manufacturer, the net weight, the manufacturing date, the expiry date, storage conditions, and the GOST designation.

Transportation and storage conditions for iodized salt. The enterprise sends most of the iodized salt it manufactures to consumers by rail. The delivery time for iodized salt is 8 days at the most (as to the Sakhalin Island). Iodized salt is also shipped in the buyer’s own trucks (self shipment), whereby the delivery time by road does not exceed 1 – 2 days. Iodized salt is delivered to the consumers only in closed rail cars and trucks equipped with a tarpaulin cover.

Most of the iodized salt at the Sibsol enterprise is manufactured according to the order of a specific purchaser and loaded directly into railroad cars or trucks. Batches of iodized salt are also

stored in the end product warehouse on pallets protected from rain and direct sunlight. Salt is shipped to the consumer according to the principle “First – In – First – Out.”

The enterprise delivers iodized salt to sixteen regions of the Russian Federation (mainly in Eastern Siberia and the Far East) and exports it to neighboring Mongolia (1,496 tons in 2001). The largest purchasers of iodized salt in 2000 and 2001 were: the Republic of Buryatia (2,302 and 1,630 tons), the Irkutsk Region (4,517 and 2,332 tons), the Krasnoyarsk Territory (457 and 1,531 tons), the Chita Region (736 and 788 tons), and the Maritime Territory (501 and 856 tons, respectively).

FSUE Tyretsky Solerudnik

Address: 666331, Solerudnik, Tyret, Zalarin District, Irkutsk Region

Tel./fax: (39512) 9-14-63 and 9-23-42

Director- General: Alexander Yefimovich Starovoitov

The Tyretsky Solerudnik recovers rock salt by mining. The mining method is the chamber process with permanent strip pillars using Ural 20 and Ural 10 KS combines. The enterprise’s annual projected capacity is 420,000 tons of salt, including the projected capacity for iodized salt manufacture of 11,000 tons. The enterprise supplies salt to many branches of industry, retail trade companies, the food industry, and agriculture.

Table 6

Annual volumes of common table salt production, including iodized salt, at FSUE Tyretsky Solerudnik (metric tons)

	2000	2001	2002
Annual production volume of all common salt	222,272	334,024	61,3848*
Annual production volume of salt for nutritional purposes (retail trade and the food industry)	88,000	173,936	28,865*
Annual production volume of iodized common table salt	4,458	5,593	1,684*

* Data for the first five months of 2002.

Salt iodination technology. Salt iodination at the enterprise is done using an iodizing fortificant (potassium iodate) by means of the wet method and dry mixing. Dry mixing is used only when filling 550 g polyethylene terephthalate (PETP) boxes. When using the dry method, potassium iodate is added to the salt and continuously mixed in a blender at a constant speed for 15 to 20 minutes. Forty kg of salt can be loaded into the blender at one time. Continuous salt iodination is carried out automatically, adding the iodizing fortificant to the vessel by hand and using a flow of salt of the appropriate ground size and grade, feeder, dosing pump, injectors, mixer, and control and automation devices. Individual batches of salt are iodinated. Potassium iodate is purchased at the State Troitsky Iodine Plant (Troitskaya Station, the Krasnodar Territory). In 2001, 725 kg of potassium iodate were used costing a total of 315,375 rubles (approximately \$10,000). The average cost of potassium iodate amounted to 435 rubles/kg (approximately \$14 per kg). The order for iodine deliveries from the Troitsky Iodine Plant is renewed approximately every six weeks.

Quality-control system. Quality control of the salt is carried out in keeping with GOST 51574-2000 and GOST 51575-2000. There is a well-equipped central chemical-technology laboratory at the enterprise with a staff of eight persons which carries out quality control of the manufactured product, as well as input control of the raw and other materials used in the production process. The central laboratory is headed by chemical analyst I. A. Vasilyeva. Samples are taken from packets of packaged product every four hours to determine the amount of iodine. An analysis of the iodine content in the selected samples of salt is conducted by means of titration according to GOST 51575-2000. The results of the control checks and measurements of iodine content in the salt samples are entered in a special laboratory log. The production staff are given instructions in accordance with the results of the control check: the laboratory technician corrects the work of the salt iodination control man in accordance with the scheme “too little” – “standard” – “too much.” If there is too little iodine, injection of the iodine supplement solution is increased or the flow of salt is decreased, and the injector cone is cleaned. If there is too much iodine, injection of the solution is decreased, or the flow of salt increased.

Packaging and labeling of iodized salt. In 2001, 5,072 tons of salt were packaged at this enterprise in small bags of less than 1 kg. The salt is packaged in 1 kg polyethylene bags by means of transfer lines and automatic packaging machines. The automatic method of salt packaging includes the automatic delivery of salt to the machine or transfer line, automatic feeding of the packaging material (bobbins of polyethylene bearing the appropriate stamp), pouring of the salt into the packet, sealing, and packaging of the sealed bags into consignments on the production lines. Polyethylene film bearing the appropriate stamp is used for packaging iodized salt. The bags and packets are closed by thermal sealing of the seam. In addition, iodized salt is packaged by hand in 550 g PETP boxes with salt shaker tops.

Each consumer packet is clearly marked with the name of the product, “Iodized salt.” In addition, the following is printed on small packets:

- the name of the enterprise, its trade mark (logo), postal address, telephone number, fax;
- name of the product, production method, grade, ground size;
- name of the iodizing fortificant (potassium iodate), weight percentage of iodine (40±15 mg/kg);
- net weight;
- manufacturing date and expiry date (9 months from the date of manufacture);
- GOST designation;
- the following information: “Iodized salt is recommended by the Russian Federation Public Health Ministry as an enriched food product intended for restoring the iodine deficiency in diet. Five–six grams of iodized salt a day fully meets the daily requirement of this microelement.”

On the consumer’s order, some iodized salt is packaged in large bags (50 kg polypropylene sacks) and stitched closed on sewing machines. A label is sewn onto each sack which bears the inscription “Iodized salt,” information about the salt manufacturer, the net weight, the manufacturing date, the expiry date, storage conditions, and the GOST designation.

Transportation and storage conditions for iodized salt. Table salt, including iodized salt, is sent to the consumer by rail, truck, river barge (when shipped to northern areas), and a combination of the above (rail – ship when delivering salt to Norilsk). The average transportation time is ten days. Iodized salt is also shipped in the buyer’s own trucks (self shipment). Iodized salt is delivered to the consumers only in closed rail cars and trucks equipped with a tarpaulin cover.

Most iodized salt is manufactured according to the order of a specific purchaser and loaded directly into railroad cars or trucks. Batches of iodized salt are also stored in the end product warehouse on pallets protected from rain and direct sunlight. Salt is shipped to the consumer according to the principle “First – In – First – Out.”

The enterprise delivers iodized salt to 15 regions of the Russian Federation in Siberia and the Far East. The largest purchasers of iodized salt in 2001 were: the Kemerovo Region (936 tons), the Irkutsk Region (725 tons), the Krasnoyarsk Territory (736 tons), the Novosibirsk Region (1,366 tons), and the Maritime Territory (853 tons).

JSC Uralkaly

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Technology Director: Sergei Petrovich Dyakov

Deputy Technology Director: Yevgeny Viktorovich Konoplev

Iodized Salt Marketing Manager – Georgy Borisovich Osenchakov

The main product manufactured by the Uralkaly enterprise is potassium chloride, an important raw material for the production of mineral fertilizers and the chemical industry. During the 1990s, the enterprise also began producing sodium chloride: vacuum-evaporated salt is manufactured in a vacuum-crystallization unit for producing potassium chloride. The enterprise's annual projected capacity for its entire salt production amounts to 2 million tons, and the projected capacity for iodized salt production is 200,000 tons.

Table 7

Annual volumes of common table salt production, including iodized salt, at JSC Uralkaly (metric tons)

	2000	2001	2002
Annual production volume of all common salt	1,0121,00	714,940	262,720*
Annual production volume of salt for nutritional purposes (retail trade and the food industry)	181,100	119,900	41,900*
Annual production volume of iodized common table salt	26,921	13,152	1,625*

* Data for the first six months of 2002

The process for refining basement rock salt into common table salt consists of the following stages (flow sheet):

- underground salt mining using the chamber processing system and Ural 20 combines;
- dissolving rock preground to the necessary size in hot dissolving lye;
- purifying the hot saturated solution of suspended admixtures (saline and clay sediment) by means of sedimentation with subsequent feeding of the purified solution into the vacuum crystallization unit;
- crystallizing sodium chloride in the vacuum crystallization unit to obtain crystals of the granular and chemical composition required of table common salt;
- dehydrating the crystallized sodium chloride in a centrifuge;
- treating the salt with a solution of potassium iodate and drying the damp crystallized substance in fluidized bed furnaces with subsequent classification of the dry product on vibrating screens;

- sending the dry end product to the packaging shop, packaging and labeling the obtained product, quality acceptance control of the end product, delivery of the end product to the consumer.

Common salt is produced at the enterprise in 1 – 2-week cycles every 2 – 3 months. The main potassium chloride production is halted in advance and all the technological equipment used for dissolving, purifying, crystallizing, and dehydrating the salt is carefully treated and washed out. The cycle for obtaining vacuum-evaporated salt does not begin until this preliminary treatment is complete.

Salt iodination technology. Salt iodination at the enterprise is carried out using an iodizing fortificant (potassium iodate) by means of the wet method. The damp salt travels by conveyor to the drying department. The amount of salt is constantly controlled and registered by means of conveyor scales. Then the damp salt is fed onto intermediate conveyors, where it is processed with a 6.4% solution of potassium iodate. The potassium iodate solution is prepared in a 5 meter³ stainless steel vat into which the reagent, which has been weighed in advance, is loaded and compressed air supplied for mixing. The potassium iodate solution is pumped from this vat into a service vat, from where it passes through a sieve and system of shut-off valves into a pulverizing injector for processing the damp salt on the conveyor. The solution is pulverized through the injector with the aid of purified compressed air. The amount of reagent is regulated depending on the supply of damp salt according to a previously set algorithm with the aid of SIPART devices. The salt treated with potassium iodate solution goes into a fluidized bed furnace where the potassium iodate is evenly distributed (in the process, some of the iodate is lost, the amount of which is restored when mixing the potassium iodate with the salt). After hot-air drying, the salt goes by elevator for classification, after which the entire fraction goes by dry concentrate conveyor to the packaging shop.

Potassium iodate for salt enrichment is supplied by the Urals Chemical Reagent Plant (Verkhnyaia Pyshma, the Sverdlovsk Region). No information on the annual cost of iodizing fortificant deliveries, its price, and iodizing fortificant supplies in the warehouse was provided in the answers to the questionnaire.

Quality-control system. Quality control of the salt is carried out in keeping with GOST 51574-2000 and GOST 51575-2000. In addition, Technological Production and Quality Control Regulations for Iodized Salt have been adopted which were drawn up by the enterprise in cooperation with a research institute. Director of the Fourth Mine Administration V. I. Gorodetsky and Deputy Director for packaged product production B. F. Zakiev are responsible for the output of iodized salt. The enterprise has an accredited potassium research laboratory “PRL” which carries out quality control of the manufactured product, as well as input control of the raw and other materials used in the production process. Samples are taken from packets of packaged product by the technical control department staff to determine the amount of iodine. An analysis of the iodine content in the selected samples of salt is conducted by means of titration according to GOST 51575-2000. The results of the control checks and measurements of iodine content in the salt samples are entered in a special laboratory log. The production staff are given instructions in accordance with the results of the control checks and the iodine content in the salt is adjusted.

Packaging and labeling of iodized salt. In 2001, 100% of the iodized salt (13,152 tons) produced at the enterprise was packaged in small bags of 1 kg or less. The salt is packaged in 1 kg polyethylene bags on transfer lines and by automatic packaging machines. The automatic method of salt packaging includes the automatic delivery of salt to the machine or line, automatic feeding of the packaging material (bobbins of polyethylene bearing the appropriate stamp), pouring of the salt into the packet, sealing, and packaging of the sealed bags into consignments on the

production lines. Polyethylene film with a tricolor stamp is used for packaging iodized salt. The bags and packets are closed by thermal sealing of the seam (polyethylene film).

Each consumer packet is clearly marked with the name of the product, "Iodized Salt." In addition, the following is printed on small packets:

- the name of the enterprise, its trade mark (logo), postal address, telephone number, fax;
- name of the product, production method, grade, ground size;
- name of the iodizing fortificant (potassium iodate), weight percentage of iodine (40 ± 15 mg/kg);
- net weight;
- manufacturing date and expiry date (12 months from the date of manufacture);
- GOST designation;
- the following information: "Iodized salt is recommended by the Russian Federation Public Health Ministry as an enriched food product intended for restoring the iodine deficiency in diet. Five–six grams of iodized salt a day fully meets the daily requirement of this microelement."

Iodized salt is not packaged in large amounts (polypropylene sacks of more than 10 kg) at the Uralkaly enterprise.

Transportation and storage conditions for iodized salt. Given the cyclic nature of salt production, the enterprise has an intermediate warehouse for storing salt (including for iodized salt), where the salt goes after drying and from where it is gradually sent to the packing shop. During the production cycle, up to 5,000 tons of iodized salt comes to the intermediate warehouse. Here the salt is protected from unfavorable weather conditions and sunlight, but the temperature and humidity parameters in it are not regulated.

The enterprise sends most of the iodized salt it produces to the consumer by rail. The transportation time is no more than 14 – 16 days. Some iodized salt is also shipped in the buyer's own trucks (self shipment), whereby the transportation time does not exceed 1 – 2 days. Iodized salt is delivered to the consumers only in closed rail cars and trucks equipped with a tarpaulin cover.

Iodized salt from the intermediate storehouse is packaged according to the purchaser's order and loaded directly into railroad cars or trucks. Batches of salt are also stored in the end product warehouse on pallets protected from rain and direct sunlight. Salt is shipped to the consumer according to the principle "First – In – First – Out."

No information about the deliveries of iodized salt by Uralkaly to regions of the country was provided in the answers to the questionnaire. This is partially because salt marketing is carried out centrally by the enterprise's subsidiary company, Mineraltrading, in Moscow.

JSC Silvinit

Address: 14 Mir street, 618500, Solikamsk, Perm Region

Tel.: (84253) 5-41-53

fax: 5-16-06,

e-mail: post@silvinit.ru

Director- General: Pyotr Ivanovich Kondrashev

The main product manufactured by Silvinit (like the Uralkaly enterprise) is potassium chloride, which is a raw material used in the production of mineral fertilizers and in the chemical industry. A significant difference is that Silvinit does not use the vacuum-crystallization method for producing potassium chloride and, consequently, cannot manufacture vacuum-evaporated

common salt. For this reason, the enterprise specializes in the exclusive manufacture of rock salt. Rock salt is produced by underground mining using the chamber processing system. Chambers are worked in layers using tunneling Ural 10KS combines together with power-operated 5VS-15 wagons. Due to the special features of the seam beds of potassium chloride, their processing is selective, and for nutritional purposes only some of the rock salt is used which meets the specifications of grade 1. Most of the salt produced by Silvinit contains less than 97% sodium chloride and is used only for technical purposes. The enterprise's projected capacity of salt manufacture (mainly for technical use) amounts to 2,300,000 tons.

When the enterprise was visited (July 2002), major refurbishing was nearing completion along with the building of new workshops for refining and packaging table common salt (at that time, iodized salt was being manufactured experimentally under a temporary system). As a result of refurbishing, the enterprise's annual projected capacity for iodized salt manufacture will increase to 50,000 tons.

Table 8

Annual volumes of common table salt production, including iodized salt, at FSUE Tyretsky Solrudnik (metric tons)

	2000	2001	2002
Annual production volume of all common salt	1,234,224	865,935	296,017*
Annual production volume of salt for nutritional purposes (retail trade and the food industry)	3,809	3,244	5,730*
Annual production volume of iodized common table salt	37	138	22*

* Data for the first six months of 2002.

Salt iodination technology. Salt iodination at the enterprise is carried out using an iodizing fortificant (potassium iodate) by means of dry mixing. This method was chosen since it best preserves the potassium iodate in rock salt. A unique installation was designed and built for producing iodized salt at the enterprise (in collaboration with a research institute). Crushed (to ground size No. 1) grade 1 rock salt goes by conveyor to the iodination unit. A premix is used for enriching the salt which is constantly prepared in a mixer by combining salt with a certain amount of potassium iodate. Then the premix passes through a special vibration feeder into the flow of salt on the conveyor, and is subsequently blended in the mixer. The rate and amount of salt fed onto the conveyor and the addition of iodizing premix is regulated by control and automation devices.

Individual batches of salt are to be iodinated at the enterprise. Potassium iodate is purchased from the Urals Chemical Reagent Plant (Verkhnyaia Pyshma, the Sverdlovsk Region). Since there is no large-scale production of iodized salt at the enterprise, no information on the annual cost of iodizing fortificant deliveries, its price, and supplies at the warehouse was provided in the answers to the questionnaire.

Quality-control system. Quality control of the salt is carried out in keeping with GOST 51574-2000 and GOST 51575-2000. In addition, Technological Production and Quality Control Regulations for Iodized Salt have been adopted which were drawn up by the enterprise in cooperation with a research institute. Director of the Third Mine Administration V. P. Skryabin and head of the table salt shop M. N. Kuznetsov are responsible for the output of iodized salt. The enterprise has an accredited central laboratory for the analysis of potassium and table salt which carries out quality control of the manufactured product, as well as input control of the raw and other materials used in the production process. Samples are taken from packets of packaged

product by employees of the quality acceptance department to determine the amount of iodine. An analysis of the iodine content in the selected samples of salt is conducted by means of titration according to GOST 51575-2000. The results of the control checks and measurements of iodine content in the salt samples are entered in a special laboratory log. The production staff are given instructions for adjusting the iodine content in accordance with the results of the control checks.

Packaging and labeling of iodized salt. Before the table salt shop went into operation, a total of 60 tons of salt had been packaged in small bags of less than 1 kg during the first six months of 2002. Packaging of iodized salt (a total of 22 tons) was carried out experimentally. After the table salt shop goes into operation, salt will be packaged in 1 kg polyethylene bags on transfer lines and by automatic packaging machines. Work is also in progress to design small packets for iodized salt. There are no plans yet to package iodized salt in sacks of more than 10 kg.

REVIEW OF THE PRODUCTION AND SALES OF IODIZED SALT IN THE RUSSIAN FEDERATION (2000–2002)

The salt situation analysis conducted in 2002 in the Russian Federation makes it possible to evaluate both the current situation and the prospects for expanded production of iodized salt at the country's salt industry enterprises, identify the main problems and obstacles hindering an increase in iodized salt production, and draw up several basic recommendations for measures aimed at better supplying the population with high-quality iodized salt.

Although this situation analysis only covers the period from 2000 to the beginning of 2002, the restoration and expansion of iodized salt production in Russia began in November 1997, when the first Conference of Iodized Salt Manufacturers of Russia, Ukraine, and Belarus was held in Moscow, which was attended by more than 70 participants. In retrospect, it can be noted that by 1997, iodized salt production in Russia had essentially ceased with less than 20,000 tons being manufactured. Russian iodized salt manufacturers (as well as their counterparts in Ukraine and Belarus) at that time faced the following problems:

- The absence of sufficient production capacities for manufacturing iodized salt. Due to the extremely difficult economic situation, the breakdown in traditional production ties, and the elimination of the previous centralized state system of product order and distribution (including iodized salt), many enterprises essentially stopped producing iodized salt, the manufacturing equipment fell into disrepair and required replacing or refurbishing.
- GOST 13830 “Common Table Salt” adopted in 1991, which regulated the production of salt, in fact hindered the mass manufacture of iodized salt. Pursuant to this document, only relatively unstable potassium iodide (PI) was permitted as an iodizing fortificant, it was forbidden (!) to iodize evaporated “Extra” grade salt, and the storage time for iodized salt was limited to three months.
- There were significant difficulties in providing the salt industry enterprises with iodizing fortificants, the production of which had essentially ceased in Russia and other CIS countries. Enterprises of the salt industry also experienced financial difficulties when purchasing iodizing fortificants, the price for which was often unjustifiably high.
- Consumer demand for iodized salt was extremely low since potential clients and consumers were poorly informed about the beneficial preventive properties of iodized salt. Other reasons for this low demand included the extremely short storage time (three months), which restricted its sales, and the relatively low quality of iodination.

It should be noted that Russian salt manufacturers had a responsible attitude toward reviving and expanding the output of iodized salt. A situation analysis of the production and sales of iodized salt in Russia, Ukraine, and Belarus conducted in 1999 on the initiative of UNICEF showed that as early as 1998, the production of iodized salt had risen to 83,000 tons.⁹ The financial crisis, which was soon to follow, and the rapid devaluation of the ruble created temporary difficulties for domestic salt producers, but a new upswing and period of growth in the Russian economy promoted an increase in demand for common table salt and an improvement in the economic state of the salt industry.

⁹ G. Gerasimov. Salt Situation Analysis in Russia, Ukraine and Belarus. Report to UNICEF. Moscow, 1999.

Thus, by 2002, Russian table salt producers have built up sufficient production capacities, refurbished the production facilities, drawn up and introduced new advanced quality standards based on international experience, and improved iodination, quality assurance, and the packaging of iodized salt. **It is safe to state that there are no longer any real obstacles in the Russian salt industry to fully meeting the country's demand for iodized salt.**

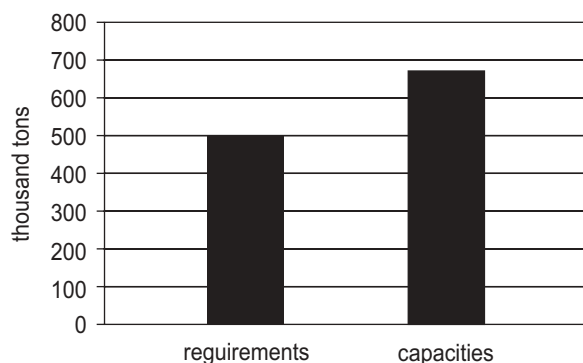
Below, we will not only take a closer look at the achievements of Russian salt producers, but also review the outstanding problems which hinder meeting the total demand of the population and food industry for iodized salt.

Creating production capacities for manufacturing iodized salt

According to this situation analysis (Table 9), the six main Russian enterprises have the technology potential to produce 671,000 tons of iodized salt a year. In addition to the salt-producing enterprises, salt iodination is also carried out at several salt-packaging enterprises which have an estimated total capacity for the annual production of approximately 20,000 tons. **In this way, the domestic salt industry alone (not counting import) is capable of fully meeting Russia's demand for iodized salt.** As was noted above, the estimated demand of the Russian Federation for iodized salt amounts to approximately 500,000 tons (based on 3.5 kg of salt per capita a year and a population size of 143 million people).

Unfortunately, the existing capacities for manufacturing iodized salt are underused: only 6.5% at Bassol, 29% at Iletsksol, 8% at Sibsol, 50% at Tyretsky Solerudnik, 6.5% at Uralkaly, and less than 1% at Silvinit.

Fig. 3. Production capacities and the requirements for iodized salt in the Russian Federation



An increase in iodized salt manufacture

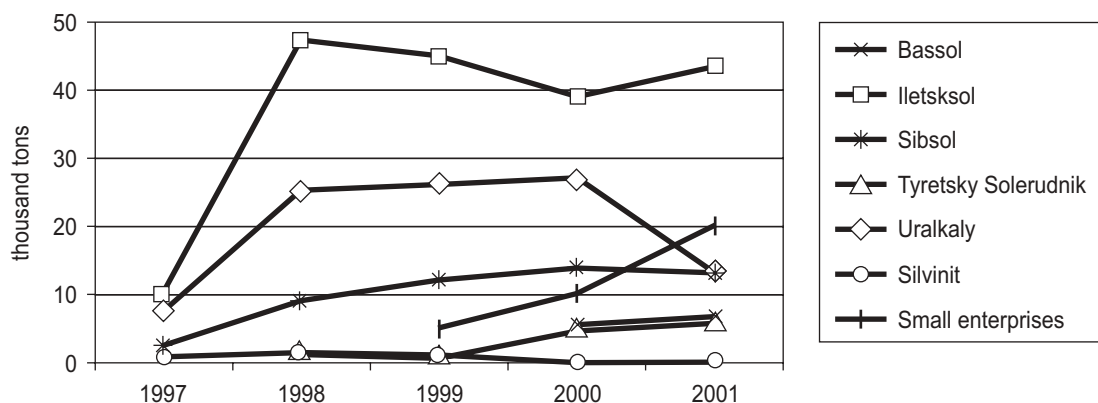
Since 1997, there has been a steady rise in the production of iodized salt at most Russian salt industry enterprises. Figure 4 shows the production dynamics for iodized salt at individual Russian salt-producing enterprises between 1997 and 2001. A trend toward an increase in iodized salt manufacture can be seen at most enterprises of the salt industry. This is particularly obvious for “**traditional**” producers of common table salt which are engaged exclusively in the

Table 9

Summary data on the production of iodized salt at the main salt-producing enterprises in 2000 – 2002

Enterprises	Salt iodination capacity (metric tons)	Volume of iodized salt production (metric tons)			Salt production method	Salt iodination method	Types of packaging	System of quality assurance for iodized salt	Delivery range of iodized salt
		2000	2001	2002 (first 4–5 months)					
BASSOL	100,000	5,182	6,537	2,810	Deposited in the salt lake	Wet salt shakers	polyethylene, paper, plastic	Titration method Urals	Southern Region, Volga Region,
ILETSKSOL	150,000	39,059	43,367	18,111	Rock	Wet	polyethylene, paper, plastic salt shakers	Titration method	Urals, Western Siberia, Volga Region
SIBSOL	160,000	13,741	12,985	5,461	Evaporated	Wet	polyethylene, paper, plastic salt shakers	Titration method	Eastern Siberia, the Far East
TYRET	11,000	4,458	5,593	1,684	Rock	Wet and dry paper, plastic salt shakers	polyethylene, method	Titration	Eastern Siberia, the Far East
URALKALY	200,000	26,921	13,152	1,625	Evaporated	Wet	polyethylene	Titration method	Urals, Center and North-West
SILVINIT	50,000	37	138	22	Rock	Dry	polyethylene	Titration method	Urals, Center and North-West
Total:	671,000	89,371	81,772	29,713					

**Fig. 4. Iodized salt production dynamics (1997–2001)
at the main enterprises of the Russian Federation**



production and refining of sodium chloride (Bassol, Iletsksol, Sibsol, and Tyretsky Solerudnik). The manufacture of iodized salt at these enterprises increased from **57,153 tons** in 1998 to **62,450 tons** in 2000 and **68,620 tons** in 2001, that is, the average increase amounted to 10% per year.

Since 1999, the number of small regional salt-packaging enterprises has risen, which have also begun independent production of iodized salt to meet the needs of the local market. These packaging enterprises consider it profitable to purchase common salt from salt-producing enterprises and iodize it at their own production facilities. According to the “Center of Scientific and Technical Cooperation of the Salt Industry Enterprises” Association, the production volume of iodized salt at packaging enterprises (such as Chelyabinsk’s “Metall,” St. Petersburg’s “Monarch,” Novosibirsk’s “Stan,” the Burlinsk salt works, and others) amounted to around 5,000 tons in 1999, 10,000 tons in 2000, and 15,000 tons in 2001. Regrettably, most of these packaging enterprises only maintain sporadic contacts with the above-mentioned association, so it was not possible to gather more precise information.

The manufacture of common table salt in general and iodized salt in particular at enterprises of the potassium industry (Uralkaly, Silvinit) is not their main line of production and does not form the basis of their economic and financial viability. These enterprises are the leading suppliers of potassium salts for the manufacture of mineral fertilizers and the chemical industry, both on the domestic and on the world market. At Uralkaly, the manufacture of iodized salt rose from 7,200 tons in 1997 to 25,200 tons in 1998. Until 2000, its manufacture of iodized salt continued to rise, but in 2001, this enterprise put out only 13,152 tons of iodized salt, or 50% of its 2000-production volume. The iodized salt manufacturing rates remain low in 2002. According to experts of the Union of Manufacturers and Exporters of Potassium and Salt (UMEPS), this is due to restructuring of the iodized salt sales system, which are currently carried out through an exclusive dealer, the Mineraltrading company. During the past two years, refurbishing of common table salt production and construction of a new workshop for manufacturing table salt with a capacity of up to 50,000 tons a year has been in progress at the Silvinit enterprise. A unique production line for the dry iodination of salt has been designed and built at the enterprise, which should go into operation at the end of 2002. This will enable the enterprise to switch from the manufacture of experimental batches of iodized salt to full-scale production with an output volume of up to 50,000 tons.

Iodized salt import

Unfortunately, we were unable to obtain any official data on the volumes of iodized salt imported into the Russian Federation. The traditional suppliers of common table salt to Russia are Ukraine (essentially all the deliveries come from the Artemsol enterprise in the Donetsk Region) and Belarus (the Mozysol enterprise in the Gomel Region). These same enterprises deliver iodized salt to Russia: grade 1 rock salt from Artemsol and evaporated “Extra” salt from Mosysol.

Deliveries of iodized salt from other countries (Denmark, Germany, France) are extremely small and apparently do not exceed a total of 1,000 – 2,000 tons a year. Iodized salt from these countries is mainly sold in rather expensive supermarkets in large cities. Salt produced by Akzo-Nobel (Denmark) is conspicuous on the Moscow and St. Petersburg market. This salt (the trade name of which is Zimushka-Krasa) is manufactured especially for the Russian market according to national standards, and its retail price is close to the price of domestic salt of similar quality.

According to the “**Ukrsol**” Association (S. F. Galushko), the export of iodized salt to Russia from the Artemsol enterprise amounted to 11,878 tons in 2000, and 18,447 tons in 2001. Between January and August 2002, 15,141 tons of iodized salt were delivered to Russia, which is 23% higher than for the same period last year.

It is more difficult to evaluate the delivery volumes of iodized salt from **Belarus**, since due to the economic specifics of this country, some of the salt reaches Russia without going through traditional channels. According to the “Center of Scientific and Technical Cooperation of Salt Industry Enterprises” Association, the deliveries of iodized salt from the Mozysol enterprise reach 15 – 20,000 tons a year (the Moscow salt-packaging enterprise alone receives approximately 6,000 tons of iodized salt annually in large sacks for repackaging).

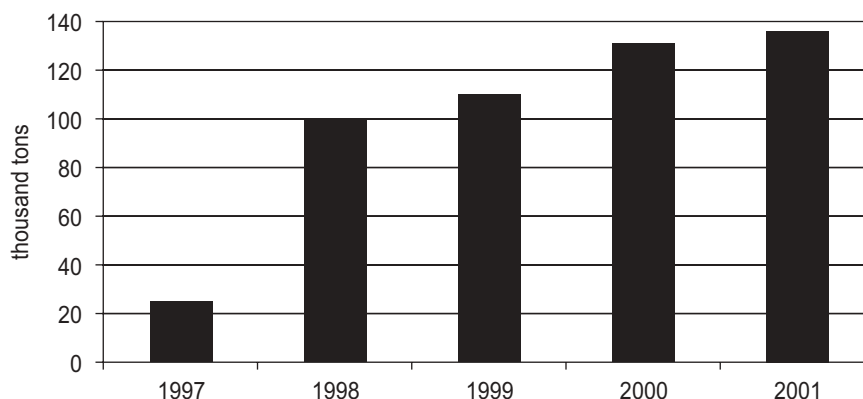
The “penetration” dynamics of iodized salt on the Russian common table salt market

Various methods are used to evaluate the consumption of iodized salt by the population. One of the most popular is the mass randomized households survey, in which the iodine content of salt in samples (right from the kitchen) is determined with the aid of rapid testers. This method is recommended by WHO and UNICEF.¹⁰ In those cases where it is difficult to conduct a households survey, another approach is used. For instance, the European Association of Salt Manufacturers evaluates the penetration index of iodized salt, that is, the percentage of iodized salt in the total output of table salt.

Although the questionnaire sent to salt manufacturers contained a question about the volume of salt produced for nutritional purposes, for various reasons not all Russian salt producers provided this information. For this reason, the penetration index was calculated not on the basis of the actual volume of nutritional salt manufactured or sold, but proceeding from the estimated demand of the Russian population for iodized salt, which constitutes, by conservative estimates, 500,000 tons. The penetration of iodized salt in 2000–2001 amounted to 131–136 tons, or 27%. The data on the penetration dynamics of iodized salt in 1997–2001 is presented in Fig. 5.

¹⁰ See Assessment of Iodine Deficiency Disorders and Monitoring their Elimination. A guide for program managers, Second edition. WHO, C 2001.

Fig. 5. Total volume of production of iodized salt and its import to the Russian federation



It should be noted that the penetration of iodized salt is quite precisely reflected by the real indices of iodized salt consumed by the population at the household level. For example, according to the findings of a study conducted by the Center of Public Health and Development in cooperation with the Russian Public Health Ministry Center for Iodine Deficiency Disorders, approximately 24% of the population in the Russian regions surveyed consumed only iodized salt.¹¹

The data obtained show a perceptible increase during the past five years in the degree of penetration of iodized salt in Russia. However, in order to completely eliminate the iodine deficiency in the Russian population, no less than 90% of the population should consume only iodized salt.

Quality of iodized salt

GOST 51574-2000 and GOST 51575-2000 are the main documents determining the production regulations for and assurance control of iodized salt at Russian salt-producing enterprises. At Ukrainian enterprises, similar documents are used: “Common Table Salt. General Technical Specifications” (GOST 13830-97) and “Common Table Salt. Technical Specifications” (TS U18.446-97). They are based on CIS standards for common table salt.

The enterprises have technical specifications which regulate the production of iodized common table salt. These specifications include sections which set forth the methods and quality-control procedures to be used during the production of iodized salt.

All the salt-producing enterprises have central laboratories which carry out quality control of the manufactured product, including iodized salt, as well as input control of the raw and other materials used in the production process. If the installation is functioning normally, quality control of the product is carried out two to four times during a shift. Samples are taken from packets of packaged product. An analysis of the potassium iodate content in each randomly selected sample is conducted according to GOST 51575-2000. The potassium iodate content in the common salt is determined by laboratory titration, which is based on the reaction between hypiodous potassium and potassium iodate in an acidic medium and titration of the precipitated free iodine in a solution of sodium thiosulphate. The results of quality control checks are entered

¹¹ Iodized salt in Russia. Awareness, Attitude and Consumption Experience. Moscow, 2001.

in a special log which is numbered, laced, and affixed with a stamp. Instructions are given to the production staff in keeping with the control checks.

The situation analysis shows that all Russian enterprises have completely switched to salt enrichment using potassium iodate. This also applies to the Ukrainian and Belarussian iodized salt manufacturers. The use of stable potassium iodate has made it possible to dramatically increase the storage time of iodine and the quality of fortified salt. **According to the salt manufacturers, no more than 5 to 7% of iodized salt is discarded at the production level because its iodine content does not meet the standards.**

The manufacturers of iodized salt want to supply the consumer with high-quality salt and are taking measures to improve its production. The situation analysis shows that most of the salt-producing enterprises have refurbished the facilities and replaced their salt iodination equipment, or are planning such measures in the near future.

All this gives reason to maintain that Russian salt manufacturers are supplying consumers with iodized salt which meets international quality standards.

The production and delivery of the fortificant for iodizing salt

Hypoiodous potassium, or potassium iodate (GOST 4202-75), for fortifying salt with iodine is manufactured by two enterprises in Russia.

The Troitsky Iodine Plant (Krymsk, the Krasnodar Territory) manufactures pure and analytical grade potassium iodate. The price of 1 kg of pure potassium iodate (June 2002) was 440 rubles (\$14), and for analytical grade potassium iodate 520 rubles (\$16.7). Potassium iodate is manufactured at the Troitsky Iodine Plant from iodine recovered from iodine-rich drilling water.

The other potassium iodate manufacturer is the **Urals Chemical Reagent Plant** (Verkhnyaia Pyshma, the Sverdlovsk Region). Iodine for the manufacture of potassium iodate is purchased from the Troitsky Iodine Plant, and the cost of pure and analytical grade potassium iodate is the same as its cost at the Troitsky plant.

According to the situation analysis findings, all Russian salt manufacturers, with the exception of Bassol, purchase potassium iodate at one of these two domestic enterprises. (Bassol buys potassium iodate from the Cheleken Chemical Plant in Turkmenistan.) Based on the current production scale of iodized salt, 67 g of potassium iodate for one ton of iodized salt, the annual demand for potassium iodate at Russian enterprises amounts to approximately 7 tons. In order to produce 500,000 tons of iodized salt, the demand for potassium iodate will increase to approximately 35 tons a year.

In a telephone interview with representatives of the two Russian potassium iodate producers, the latter refused to provide information on their potassium iodate production capacities, claiming it was a commercial secret. Indeed, the impression is that the two enterprises are engaged in active competition to attract potential consumers. For example, the Urals Chemical Reagent Plant does not purchase raw material directly from the Troitsky Iodine Plant, but through agents, since it was denied direct deliveries. Both enterprises state that they have unlimited potential for manufacturing and delivering potassium iodate. Given the long storage time for potassium iodate (three years), both enterprises always have a sufficient amount in their warehouses and immediately ship it to their clients on order.

Not one of the salt manufacturers noted any problems with potassium iodate deliveries in their answers to the questionnaire (in contrast to a similar survey conducted in 1999 and earlier).

Thus, during the past few years, the problem of the production and delivery of iodizing fortificant for enriching common table salt has been completely resolved in Russia.

The pricing of iodized salt

In their answers to the questionnaire, all the salt manufacturers correctly indicated why iodized salt is preferable to the consumer: it promotes brain development (increases learning capacity) in children and prevents thyroid gland diseases.

Regrettably, many retail consumers of iodized salt have formed the incorrect idea that iodized salt is much more expensive than ordinary salt. This is largely due to errors in displaying iodized salt in retail trade:

- Sometimes iodized salt is displayed separately from ordinary salt among the so-called dietetic products (for diabetic patients, for example) at an artificially high price.
- Cheap common salt manufactured in Russia is often placed alongside imported iodized salt which is 5–8-fold higher in price than domestic iodized salt in ordinary packaging.
- In recent years, domestic salt manufacturers have also started the output of iodized salt in attractive, but more expensive, packaging (plastic salt shakers). If iodized salt in ordinary cheap packaging is not on sale along with it, the buyer may be given the impression that all iodized salt is much more expensive than ordinary salt.

In fact, at the production level, the price of iodized salt is 5–15% higher than the price of ordinary salt mainly due to the additional spending on purchasing potassium iodate.

Table 10

Difference in wholesale price (rub./ton) of ordinary and iodized salt packaged in polyethylene bags and shipped in closed rail cars (price list data for the 2nd and 3rd quarters of 2002)

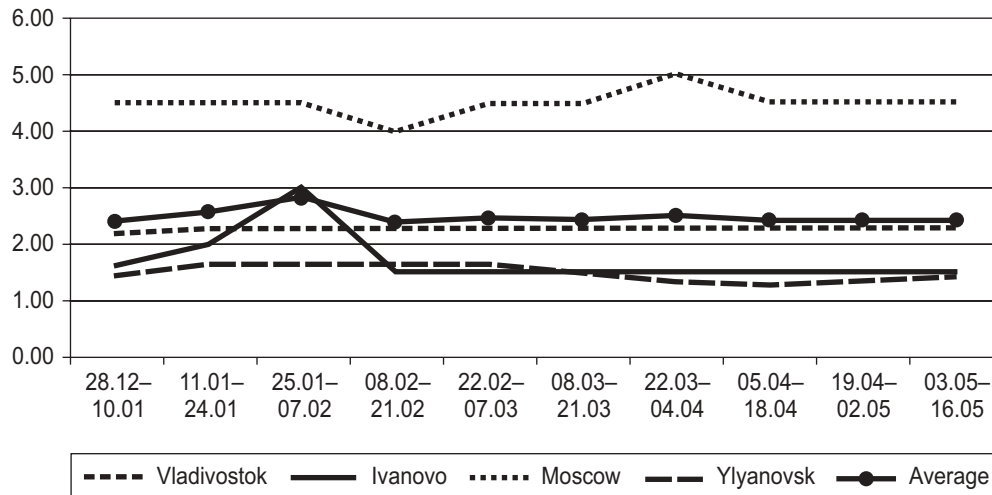
	Iletsksol (rock, grade 1)	Bassol (deposited in a salt lake, grade 1)	Sibsol (evaporated, extra grade)	Mozyrsol (evaporated, extra grade)
Common salt	1 573	1 188	2 262	1 590*
Iodized salt	1 749	1 375	2 347	1 694*
Difference in price (%)	11	15	4	6

* Price without VAT.

So the difference in price between iodized and ordinary salt (their packaging being the same) is very small. In most regions of Central Russia, the difference in price between iodized and non-iodized salt in polyethylene bags amounts to 20 – 25 kopecks. In Moscow, both the price of any salt and the difference in price between ordinary and iodized salt are higher. For example, according to the monitoring data¹² (Fig. 6), the price of a package of salt in Moscow was almost twice as high as in other cities of Russia. But even in Moscow, the difference in price between ordinary and iodized salt is in general no more than one ruble. On the whole, during the past two-three years, iodized salt has become much more available and appeared in many food stores in Moscow, the Moscow Region, and other regions of Russia. In the process, the following interdependence is noted: there is always iodized salt (in a wide range) in supermarkets where families shop who are better off than the average. In “ordinary” food stores and kiosks located in residential areas, iodized salt is also frequently for sale along with ordinary salt. But at “wholesale” markets, where goods are sold at the lowest prices to consumers with low incomes, iodized salt is often absent. As a result, precisely those in the greatest need of it are deprived of the opportunity

¹² The Salt Market. Bulletin of the System of Interregional Marketing Centers, 2001.

Fig. 6. Dynamics of the Average Retail Prices for Extra Grade Salt (rub./kg) Between January and May 2001



to buy iodized salt, that is, poor families which cannot compensate for the iodine deficiency in their diet by consuming more expensive products rich in iodine, such as sea fish and fish products.

According to practically all the salt manufacturers, the existing difference in price between iodized and ordinary salt should not stop most consumers from purchasing only iodized salt.

Raising consumer demand for iodized salt

Salt manufacturers are perfectly aware of the need to raise the consumer demand for iodized salt and are trying to achieve this goal.

In particular, all salt manufacturers have adopted measures to improve the appearance of iodized salt packaging in order to attract the attention of potential consumers. Information about the benefits of iodized salt is printed on the packaging: "Iodized salt is recommended by the Russian Federation Public Health Ministry as an enriched food product intended for restoring the iodine deficiency in diet. Five–six grams of iodized salt a day fully meets the daily requirement of this microelement." Salt manufacturers are actively working with the main wholesale dealers, recommending that they purchase primarily iodized salt for retail trade. In 2000 and 2001, salt manufacturers and wholesale dealers took an active part in regional meetings on the promotion of iodized salt which were organized with the assistance of UNICEF in the Southern and North-Western federal districts. These efforts made a certain impact and have promoted the gradual increase in the production and sale of iodized salt during the past two years.

Nevertheless, salt manufacturers are not conducting sufficient marketing work to actively promote iodized salt. The enterprises frequently do not have a manager in charge of promoting specifically iodized salt. Due to a lack of coordination in marketing policy, the Uralkaly enterprise has reduced the production and sale of iodized salt by 50%. Salt manufacturers most frequently refer to the fact that they produce iodized and ordinary salt on the orders of wholesale dealers and do not have the proper influence on the orders of the end consumers of iodized salt, that is, retail trade and the food industry. In addition, in economic terms, the production of iodized salt is not very profitable, since the difference in price between ordinary and iodized salt only covers

the purchase of iodizing fortificant and production costs. During the interviews, salt manufacturers often noted that in those Russian regions where preventive work is being conducted on the initiative of the local administrations and sanitary epidemic surveillance structures, the number of orders for iodized salt perceptibly increases. The Orenburg and Omsk Regions, and the Republics of Tatarstan and Bashkortostan are cases in point.

During the interviews, all the salt manufacturers replied in the negative to the direct question: “Can your enterprise manufacture only iodized salt for nutritional purposes?” In the competitive environment of the common table salt market in Russia, halting the production of ordinary salt could lead to a loss of this important segment of the salt market, which will immediately be “seized” by competing enterprises. Nevertheless, essentially all the salt manufacturers had a generally positive attitude toward the suggested introduction of government regulations which would envisage equal terms for all the salt manufacturers and make it mandatory for them to produce only iodized salt for the consumer market.

Taking into account the low price of common table salt and the high competition on the market, salt manufacturers cannot include advertising and active promotion costs in the price of iodized salt. Moreover, during the interviews, they expressed the opinion that promoting iodized salt as a way to prevent iodine deficiency disorders should be the responsibility of the local authorities and public health system, rather than of the salt manufacturers. All the same, salt manufacturers are willing to participate in joint efforts to advertise and actively promote iodized salt. They pointed out that after publication of articles in the press about the benefits of iodized salt, or following educational television programs, the demand for iodized salt increases.

CONCLUSION AND RECOMMENDATIONS

The findings of the situation analysis of the production and sale of iodized salt in Russia show that between 1997 and 2002 Russian salt manufacturers have created the necessary conditions for fully supplying the country's consumers with iodized salt to achieve rapid elimination of iodine deficiency disorders.

- Production capacities have been created for the output of approximately 700,000 tons of iodized salt a year.
- Retooling has been conducted at most of the main salt industry enterprises, including renovation of salt iodination and packaging equipment which now ensures the reliable preservation of the preventive properties of iodized salt.
- Russian salt manufacturers are maintaining contacts with their partners in the CIS countries and establishing new contacts with salt manufacturers in West European countries and the European Association of Salt Manufacturers. They also participated in the international symposium "Salt 2000" in the Hague (Netherlands).
- Based on national and international experience, new national standards GOST 51574-2000 "Common Table Salt. Technical Specifications" and GOST 51575-2000 "Iodized Common Table Salt. Methods for Determining Iodine and Sodium Thiosulphate" have been drawn up and introduced.
- The quality of iodized salt has been raised by using a more stable iodizing fortificant (potassium iodate), increasing the amount of iodine in iodized salt from 23 ± 11 to 40 ± 15 mg/kg, and improving the technology for salt iodination and packaging. As a result, the storage time for iodized salt has increased to 9 – 12 months, which has dramatically raised its attractiveness to the consumer.
- Problems concerning the delivery of iodizing fortificant (potassium iodate) to enterprises of the salt industry have been completely resolved. The existing capacities of the two above mentioned chemical enterprises are sufficient for supplying the salt industry with the necessary amounts of potassium iodate at reasonable prices.
- As a result of the efforts of the manufacturers and suppliers of iodized salt and the partners cooperating with them, the production, import, and sales volume of iodized salt increased from 20,000 tons in 1997 to more than 130,000 tons in 2001, which covers approximately 27% of the potential demand of the population for iodized common table salt.
- The price of most iodized salt is only slightly higher (by 5 – 15%) than the price of ordinary salt (mainly due to spending on the purchase of iodizing fortificant). Iodized salt is the cheapest product capable of meeting the population's iodine requirements, and is affordable to all social groups without exception.
- In the technical and production respect, salt manufacturers are willing and in general support the need to introduce universal iodination of nutritional salt, primarily packaged salt for retail trade, and are ready to deliver the necessary amount of iodized salt to the Russian consumer.

A whole series of measures aimed at streamlining the state regulation of the output and sale of iodized salt, raising the knowledge and skills of salt manufacturers in the field of efficient iodized salt marketing, conducting an active promotion and advertising campaign in the media and joining the efforts of iodized salt manufacturers and suppliers, government bodies, non-governmental and public organizations, the scientific and medical community and other interested parties is needed to eradicate iodine deficiency disorders by means of universal salt iodination in the Russian Federation. In this respect, iodized salt manufacturers:

- recommend adopting relevant regulations at the government level with the priority goal of eradicating iodine deficiency disorders in the Russian Federation before 2005 and regulating universal salt iodination in order to achieve this goal;
- are interested in further expanding contacts and exchanging experience with colleagues from those countries in which universal salt iodination has helped to eradicate iodine deficiency disorders, as well as with the European Association of Salt Manufacturers, UNICEF, and other international organizations;
- believe it advisable to expand contacts with associations and enterprises of the food industry, primarily the bread-baking and meat-processing enterprises, to advocate the use of only iodized salt in the manufacture of their products;
- suggest forming a public council, including representatives of the salt industry, government bodies, public and other organizations, for coordinating joint action to achieve rapid eradication of iodine deficiency disorders in the Russian Federation;
- believe it important to carry out further training of sales departments' personnel in up-to-date approaches and methods for marketing iodized salt based on international experience, as well as developing a national logo for iodized salt for all the salt-producing enterprises;
- are willing to participate in and actively support an advocacy campaign in the mass media on the advantages of using iodized salt, as well as work in this area with wholesale suppliers of iodized salt.

QUESTIONNAIRE FOR SALT SITUATION ANALYSIS (SSA)

Information from main Russian salt producers

A. General Information:

1. Name of the company:
2. Name of Chief Executive Officer (CEO) or other contact person:
3. Affiliation:
 - state owned,
 - municipal,
 - joint stock company,
 - private,
 - other (specify)
4. Full address of the company, telephone number, fax, e-mail:
5. Number of employees (no seasonal laborers included):
 - _____ senior management
 - _____ administration
 - _____ laborers (full-time employed)
6. Does the company have a specific person who manages the marketing of **iodized** salt?
 - If yes, give:
 - a) name of **iodized** salt marketing manager
 - b) brief details of the marketing strategy used
7. Main customers of the end product:
 - retail trade,
 - food industry,
 - other industries,
 - agriculture,
 - other (specify)

8. Production of **iodized** salt:

_____ Yes
_____ No

- If yes, is the production of **iodized** salt
_____ in successful operation
_____ in operation, but not fully successful
_____ still being planned

If the answer to question 8 is affirmative, complete the other sections of this questionnaire.

B. Production capacity and amount (total and of *iodized* salt):

1. What method(s) of salt production (extraction) are used?

_____ rock salt
_____ lake/sea salt
_____ vacuum salt

Describe briefly or specify the mining method, if any (dry, wet, etc.)

2. What is the **projected** annual production capacity for all salt?

_____ tons

3. What is the **projected** annual production capacity for *iodized salt*?

_____ tons, or _____ % of total salt production

4. What is the **actual** production of all salt?

_____ 2000 (tons)
_____ 2001 (tons)
_____ 2002 (tons for ___ months)

5. What is the **actual** production of **edible** salt?

_____ 2000 (tons) _____ % of total production
_____ 2001 (tons) _____ % of total production
_____ 2002 (tons for ___ months) _____ % of total production

6. What is the actual production of **iodized edible** salt?

_____ 2000 (tons) _____ % of edible salt production
_____ 2001 (tons) _____ % of edible salt production
_____ 2002 (tons for ___ months) _____ % of edible salt production

7. What is the **actual** production of salt for animal consumption?

_____ 2000 (tons) _____ % of total production
_____ 2001 (tons) _____ % of total production
_____ 2002 (tons for ___ months) _____ % of total production

8. What is the **actual** production of *iodized* salt for animal consumption?
_____2000 (tons)_____ % of salt production for animals
_____2001 (tons)_____ % of salt production for animals
_____2002 (tons for ___ months)_____ % of salt production for animals

C. Salt iodization technology employed:

1. Describe briefly the salt iodization technology employed by the company:

_____dry mixing

_____wet mixing

Any other description:

_____batch process (individual batches of salt are iodized)

_____continuous process (all salt is iodized)

2. Where do you obtain your fortificant supplies? Please name producer and/or supplier of fortificant

3. What is annual cost for supply of fortificant?

_____local currency

_____US\$ (or other convertible currency)

4. Do you keep a stock of fortificant (state amount, if possible)?

D. Information on quality assurance (QA):

1. Do you have a written **description** (manual, guideline, etc.) of the QA method or procedure which is routinely applied in the production of *iodized* salt?

_____Yes

_____No

If yes, obtain a copy if possible.

2. Who developed this **document**?

_____Producer itself

_____Salt producers' association or Institute

_____Government

3. Does salt iodization facility have designated *iodized salt* production manager?

_____Yes

_____No

If yes, note the person's name and qualifications

4. Does production facility have **laboratory** and/or laboratory **technician** in charge of continuous *iodized* salt testing?

_____ Yes

_____ No

If yes, note the person's name and qualifications

5. Describe briefly the method used for testing of iodine in salt.

_____ Rapid testers

_____ Titration

_____ Other: (Describe)

6. If the titration method is used for testing iodine in salt, is the testing quality controlled?

_____ Yes

_____ No

- If yes, the method is quality controlled, please give brief details :

_____ internally/externally controlled

_____ frequency of testing

_____ number of samples

_____ other

7. Does the production facility have **records** showing that iodized salt samples are systematically taken during production runs, and tested for iodine?

_____ Yes

_____ No

8. Is there evidence that the results of these tests are used for adjusting the salt iodization process?

_____ Yes

_____ No

Describe the evidence, if any

E. Iodized salt packaging and labeling:

1. What laws, regulations or industry standards prescribe what type of salt **packages** should be used for *iodized* salt?

2. What laws, regulations or industry standards describe the type of **labeling** which should be used for *iodized* salt?

3. What amount of salt of this company is packaged in **small-sized** (1kg and below) bags?

_____ tons

_____ % of total salt production

_____ % of amount of edible salt

4. Describe briefly the method used for **small-sized** packaging (machine, manual, etc):
5. What type of packaging material is used for small-sized **iodized** salt?
_____ polyethylene (plastic) bags
_____ paper bags
_____ carton bags
_____ plastic or carton shakers
6. How are the small-sized **iodized** salt packages sealed ?
_____ heat sealed
_____ glued
_____ other (Describe)
7. Are these bags or packages imprinted clearly with the product name: "***Iodized salt***"?
_____ Yes
_____ No
8. What other information is printed on the label of the small-sized packages?
_____ origin of production (producer's name, address, etc.)
_____ date of manufacturing
_____ shelf life (end date of consumption)
_____ company *logo*
_____ **logo** of the National IDD Program
9. Do salt producer use attractive designs and/or informational message on small-sized **iodized** salt packages?
_____ Yes
_____ No
10. Is **iodized** salt packaged in bulk size containers (more than 10 kg)?
_____ Yes
_____ No
11. What type of packaging material is used for bulk-sized **iodized** salt?
_____ Polyethylene (plastic) bags
_____ Jute bags
_____ Other (Describe)
12. How are the bulk-sized **iodized** salt packages sealed ?
_____ Heat sealed
_____ Glued
_____ Sewn
_____ Tied
_____ Other (Describe)

13. Are these bulk size containers clearly labeled with product name "*Iodized salt*"?

_____Yes

_____No

14. Do the bulk-sized containers have information about producer?

_____Yes

_____No

15. Is the date of manufacturing/expiry and/or shelf life permitted printed on the bulk-size containers?

_____Yes

_____No

16. Do the bulk-sized containers have instructions for vendors and/or consumers on how to correctly store *iodized* salt?

_____Yes

_____No

17. Describe the packaging/labeling of *iodized* salt for animal consumption, if any.

F. *Iodized* salt transport and storage conditions:

1. What is the usual way for the delivery of *iodized* salt to customers?

_____rail

_____truck

_____river barge

_____sea vessel

_____other (specify)

2. What is average duration of this transport?

_____days

_____weeks

If more than one means of transport, please answer this question for the **longest** duration (specify)

3. Does the delivery of *iodized* salt have special preferential treatment?

_____protected from (bad) weather conditions

_____separate from other bulk goods

_____priority over other supplies for transport

_____other (specify)

4. Find out if the producer keeps the *iodized* salt stocks well protected:

- salt bags are stored **elevated** from the floor
- salt bags are stored in **well-ventilated** areas
- salt bags are stored protected against **rain** and **direct sunlight**
- any other observations about stocking conditions (specify)?

5. To avoid iodine losses from long-term storage, the principle of "First-In-First-Out" (FIFO) should be applied. Is the FIFO principle applied by the company?

- Yes
- No

6. Has the producer similar information of his major clients (retail sales companies)?

- Yes
- No

If yes:

- on storage conditions (see question 4 above). Specify.
- on FIFO practices (see question 5 above). Specify.

G. Pricing of *iodized* salt:

1. Find out whether owner (management) of the company can mention reasons(s) why *iodized* salt is better for consumers:

- improves brain development (learning abilities) in children
- prevents thyroid diseases
- has better taste
- is preferable for pickling
- other (specify)

2. Is there any price difference between *iodized* and non-iodized salt?

- Yes
- No

3. If yes, characterize the price margin:

4. Is iodized salt (from the point of view of producer) affordable for the majority (>80%) of consumers

- Yes
- No

if no, describe the reason:

H. Data on iodized salt inspection and enforcement of legal requirements:

1. Does the law, regulations, ordinance or standards define an accepted **authority(ies)** that will inspect salt at producers level?

- Bureau of Standards (or its local branch)
- Ministry of Health (or its branch)
- Ministry of Trade (or its branch)
- Ministry of Justice (or its branch)
- other (specify)

2. Is (are) the inspection authority(ies) making regular (i.e. at least once every 3 months) visits to producer's facilities?

- Yes
- No

3. During these visits, does the inspector take **iodized** salt samples for analysis in the inspection's laboratory?

- always
- sometimes
- never

- If taken, please give the approximate number of samples collected per visit _____

4. Does the salt producer **always** receive feed-back information from the inspection, irrespective of the results of the iodine tests?

- always
- sometimes
- only if results are **not adequate**

5. Does the inspection have a mechanism of recovering the costs of the inspection?

- Yes
- No

6. Does the producer pay the inspector for his service?

- Yes
- No

7. Are the results from inspections in any way used for the IDD program monitoring system?

- Yes
- No