

CHAPTER III

HISTORY AND DEVELOPMENT OF MATCH INDUSTRY IN INDIA, TAMIL NADU AND VIRUDHUNAGAR DISTRICT

Introduction

In this chapter an attempt has been made to trace the history and development of the match industry in global level and India level. This chapter analyses the history and growth of the match industry, modern matches and its development, India as a match making country, production of mid-fifties, origin and growth of the match industry in India, state-wise distribution of match industries in India, match industries in Tamilnadu, match industries in Virudhunagar District, match industries in Sattur Taluk, raw materials required for manufacturing the match products, classification of the match industry, types of matches, production of matches and the like.

3.1 History and Development of Match Industry

Match manufacturing is best suited to the cottage sector. Being labour intensive it creates employment opportunities on a substantial scale for village people of skilled and unskilled men and women. Being a light manufacturing activity, the physically handicapped and the old age people can also be easily absorbed and no education is needed to learn this job. Thus, this industry has a

great socio-economic significance in bringing the livelihood to the peoples door steps with out their resorting to migration. Gandhiji has very well emphasized this point years back.

“Where a fully equipped automatic factory employs one man, a village unit making 1 to 10 gross match boxes a day will employ 10 men. If all the matches were made by cottage match industry it could employ 10 times more people. The whole of our match consumption, it must be remembered, can be met by cottage manufacturers”.¹

Safety matches are one of the most important necessities for human life. Safety matches, which are found today, have undergone so many changes. Technically and otherwise, people first learnt to produce fire by striking stones with each other. It will be interesting here to refer to the development of matches in the beginning and its growth later. The pocket fire carrier containing sulphuric acid for the dipping match was the earliest form of matches. The method adopted for the generation of fire in the pocket fire carrier was very simple. When the match sticks, the tips of all of which have been coated in potassium chlorate (an oxidizing agent) is dipped into sulphuric acid they get readily ignited. This type of match was invented in 1805. It was from the ‘Lucifer matches’ later the safety matches are evolved.²

¹Nag T.K.: *Jagruti Anniversary*, November 1980, pp. 37-39.

²www.anjac.org.

When the Tierra del Fuegians, a primitive people living in the inhospitable southern tip of south America, were first discovered by Europeans, they had no knowledge of how to start a fire. They simply waited for nature to produce it and then kept it going for years to end. Israelites in the old testament were rubbing sticks together to produce fire. The ancient Greeks gave us the word “Match”, which is derived from their word for dried fungus, which was saved up to ignite by flint-produced sparks. Archimedes started fires by directing the sun's rays through a lens. Things developed rather slowly for the next 2000 years. By the early 1800s, the tinderbox was a standard ingredient in every home and in every gentleman's pocket. But, as Charles Dickens once complained, with luck, one might get a fire from a tinderbox in half an hour on a damp day.

In 1827, however, a French chemistry student, Charles Sauria, discovered the principle of the phosphorus match. After watching a demonstration of the reaction of sulphur mixed with chlorate of potash, Sauria eventually experimented by rubbing the prepared end of his match on a wall where there was some phosphorous. His match immediately ignited, and so did the development of the match industry. The first phosphorous friction matches were manufactured in the United States in 1836.

By 1850, there were 60 match industries in the entire country. In that same year, the first such industry opened in California, New York, with 18, was far

ahead in both number and production. Connecticut was second with nine, and Massachusetts was third with eight. By 1860, the number of plans had increased to 75. The industry then employed 604 men and 648 women, many working part-time or at home.

By 1880, however, the number of match manufacturers dropped from 79 to 37. As the larger companies had become mechanized, smaller business that used older, less efficient machines had been pushed to the edge of failure. Many had been forced to shut down after the stock market crash of 1873 led to a deep depression. To make matters worse, the nation's two largest match companies were deadlocked in a ruinous price war.

Swift and Courtney and Beecher, a consolidation of three match makers, had entered ST. Louis and the Midwest from the east coast. Accordingly, O.C. Barber built a factory in Philadelphia and cut prices even further. Swift and Courtney and Beecher struck back by introducing new and cheaper brands. Between 1878 and 1880, Barber's company lost about \$90,000. He and William Swift, president of Swift and Courtney and Beecher, finally agreed that they were each cutting their own throats and that a merger would be best for every one. The two great giants of the industry, and ten other companies, merged to form the Diamond match company of Connecticut in December, 1880, although production did not begin until early 1881. With the formation of Diamond, and its purchases

of the rights to Joshua Pussey's match book in 1894, the American match industry was born.

Although worldwide, the 20th century industry was dominated by Swedish match here at home the domestic industry was ruled by the big five. Diamond, universal, lion, ohio, and D.D. Bean. The American match industry reached its height in the 1940s and 1950s. It should be noted, however, that D.D. Bean's "slice" of the industry was basically vending machine matches. Its match books were cheap, poorly made and usually disdained by collectors. In 1991, though, after acquiring new four colour printing equipment, D.D. Bean introduced the first Joe camel cigarette set. Since then, their cigarette advertising covers, at least, have been slick and attractive.

By the mid-1980s the industry had collapsed here in the United States. It just could not compete any longer with foreign imports. Most of the previous great companies were gone. Today there are only four major manufacturers left in north America, all in the United States. They are Diamond (which only makes boxes), Bradley industries (which owns Atlantis match), Atlas match corp (both Atlantis and Atlas produce basically all of the small business match books), and D.D. Bean (which still has the resale / vending market).³

³www.fao.org

3.2 Modern Matches and its Development

In early days every where certain appliances in some form or other were devised to cause friction and generate heat to produce fire. Africans had their Bow Drill. Americans devised a fire Brace, the people of Arctic region used their cord and Drill. Britons adopted two pieces of woods, the Chilean and Argentine people used Pyrites and stones. The people of Hindustan got fire sparks by striking flint against Flint. All these appliances were based practically on the same principle and though the contrivances may now be thought quite primitive and ugly, these were in fact the predecessors of the modern matches.

Further scientific investigations were conducted with chemical composition, combining both the principles of creation of a fire traceable in nature. e.g. friction and chemical energy finding expression in thunder and volcano.

In the year 1827 the first friction match chemical composition head at the tip of a wood splint was produced by J. Walker. These were non-phosphorus matches. Savarisse and Markel also attempted the same with a composition prepared to chlorate of potash, Minimum, Antimony sulphide, sulphur, pumice and Gum. Its introduction consequently proved a great success at the time. This improvement was first made in 1831 by Dr. Sauria. Romar (1937) substituted lead peroxide for chlorate of potash.

Bettger (1842-43) recommended a mixture of minimum and Saltpetre or lead Peroxide and lead Nitrate as a substitute of Chlorate of Potash.

Wagner (1855) recommended less phosphorus and experimented with Barium Nitrate and Bichromate of Potash. He also tried with lead Dioxide. But they proved costly.

Elimination of the phosphorus was all that was particularly needed to make Matches non poisonous. In Hochstatter's non-poisonous Matches, oxygen compounds used were chlorate of potash, bichromate of potash, lead dioxide and the like. And phosphorus was replaced by a mixture of antimony oxy-sulphide and flowers of sulphur. The oxidisable ingredients of canonils composition consisted of sulphur, iron pyrites and various cyanogen compounds. Bals tried a fused mixture of sulphur and phosphorus while pascher introduced phosphorus sulphide instead of phosphorus but found few followers.

Sesqui-sulphide of phosphorus or tetraphosphorus tri-sulphide discovered early in 1864 by Lemoine could not, most unfortunately, command a wide-spread use for a long time, possibly due to stubborn conservatism of the manufacturers and consumers. Yellow phosphorus was expensive and being spontaneously combustible on exposure to air it entailed great fire tasks and above all when

phosphorus poisoning cases were becoming very common amongst the labourers of the match industries.

Thus from 1831 onward till the close of the nineteenth century the strike any where matches, commonly called lucifers, formerly made with yellow phosphorus and later on with sesqui – sulphide of phosphorus, held the ground to the entire satisfaction of the consumers.⁴

3.3 India as a Match Making Country

The development of an industry for the perfection of an ideal product should satisfy the public necessity and taste. Indian conditions as a Match making country, studied from all sides ensure her fitness for Match manufacture. And that (India has a very suitable soil for the development of the Match industry hardly needs mention today). By her constant efforts for the last four decades, beginning from the close of the nineteenth century till today. India has now fully asserted her claim to be one of the suitable countries for matches manufacture. The magnitude of the home market, the volume of trade in products allied to the Match industry are immense in India. Availability of important raw materials, abundance of cheap labour and cheap transport facilities particularly by water routes, all find India a fit field of operation of the industry. Lastly the facts that imports are not free and

⁴Notes of lessons on cottage match industry: “*Khadhi Gramodyog Vidyalaya for Extension officers (Industries)*”, Gandhiniketan Ashram, T. Kallupatti, Madurai District, pp.1-3.

competition from abroad is not easy are very favourable conditions India possesses. Labour is very cheap in India. With reference to match industry it may now be said that the adeptness of indigeneous labour is quite fair and favourable. Imports of foreign Matches from abroad are not free and unfettered and cannot give and stand any competition with the products made and possible to be manufactured within the country. The revenue duty imposed on imported matches affords a good protection towards the growth of the indigenous Match industry in India. Upto 1916 the duty on imported Matches was per 5 percent advalorem.⁵

In southern India, manufacture of Matches on cottage scale was taken up by some enthusiastic entrepreneurs and soon developed rapidly at three centres. Sivakasi, Sattur and Kovilpatty all in Tamil Nadu. They emerged to compete in quality and price with semi mechanized and mechanized sectors. The cottage sector gained momentum and by 1954-55. 90 percent of non WIMCO (Western India Match Company) production was contributed by the factories located at Sivakasi and its adjoining areas. With a view to promote Match manufacturing under cottage sector using bamboo and waste paper to conserve traditional raw material, the soft match wood because of its limited availability in the country. schemes of cottage Match manufacture were taken up with the constitution of All

⁵Ravisankar N.: and Khauroowala ziuddin, "Safety match industry in India", *Rural India*, July – August 1984.

India khadi and village industries board and later the khadi and village industries commission.

With increased outlays and encouragement throughout the first 3 five year plans the Match manufacturing industry kept up steady progress and within the span of 60 years this industry has become completely self reliant in every respect to meet the needs of the country.

As on 1976-77 there were over 2800 non-mechanised industries contributing to the tune of 70 percent of the country's total yearly production against WIMCO's (Western India Match Company) share of 70 percent of the country's total annual.⁶

3.4 Production in Mid-fifties

The khadi and village industries commission has rendered financial assistance to 1,650 industries and technical assistance to over 1,050 industries as on 1978-79 and 1979-80, 3,417 industries have been covered under financial assistance and 1,804 industries under technical assistance bringing the total number to over 5000. To corporate bodies, like cooperative societies, registered charitable institutions and to individual entrepreneurs who wish to go into cottage match manufacturing, the commission offers financial assistance for machinery,

⁶Sangaralingam S.S.: "Small units contribution to match industry", *Commerce* 14, July – 1979.

equipments, tools and also working capital. Other assistance by way of free training supply of raw materials through raw material banks, free technical and managerial guidance and marketing assistance is also provided. Grants and loans are given to home based industries for box making and frame filling, individual mobile selling booths and central sales depots for marketing of finished products. In case of industries in weaker sections on hill and border areas, 100 per cent grant on equipments in case of cooperative societies and institutions is provided 70 industries set up by cooperative societies and institutions managerial grants on sliding scale are also given in the first and second years.

Till very recently, the workers engaged in cottage sector of the match industry continued to be the victims of exploitation so far as wage structure and marketing of finished products were concerned. For example since 1960 wage rate for making gross matches was only 90 paise enabling one worker to earn Rs. 2.25 daily (keeping in view productivity of an average worker is around 2.5 gross in terms of completed match boxes). And this remained unchanged till October 1972. It is only at the Commission's instance and that too by extending marketing coverage to its industries the wage rate of workers was increased by 80 percent. First in October 1977 and by another 30 percent in April 1979, thus making it possible for a female worker with an average productivity to earn Rs.5 a day of the same family work in a Match to over two lakhs workers engaged by around Sivakasi who had to following coverage extended by the Match manufacturing

process economically viable which prevented the long practice of exploitation by traders sating even the prime cost of production. With this the prospects of survival of industries located in the neighbouring states and elsewhere improved considerably.

These industries were exposed to unhealthy competition on account of the ability of Tamilnadu traders to offer Matches at uneconomic rates, because of the ability to exploit Tamilnadu producers with these developments. The resultant sharp increase in production of the existing industries camp up are spectacular by preventing exploitation of large number of small producers by the traders. The scope of speedy development of this industry under cottage sector has ensured economical viability to the existing industries. The commission has been assigned by the government to meet the country's annual incremental growth in demand which is about 6 percent there by requiring the khadhi and village industries commission to set up annually about 600 new industries. This will need a total investment of about Rs. 66.10 crores during the 6th five year plan inclusive of other requirements like training, technical support, marketing coverage and would provide yearly additional job opportunities to over 15000 persons (full time). However success in this venture would largely depend on the ability to provide necessary inputs like training, effective technical guidance, quality control facilities, raw materials / chemicals besides finance and marketing coverage. Left to the traders as they were since some time past, the industries would not be in a

position to overcome all the constraints, many of which are man made. The past failures were mostly on account of inadequacy of essential supports/inputs rather than favourable fiscal policy, which is also necessary but not the only solution. The following figures strengthen this view (It is to be noted that the decision to strengthen technical base was taken only in 1976-77 which started yielding results from 1977 to 1978).

As on September 1980 the total number of working industries financial through state boards or direct institutions, as per pattern of assistance came to the extent of 540.

The share of cottage match industry of Khadi and Village Industries Commission in the country's annual total production was around 27 percent in 1979-80. And also the prices of essential commodities like pulses sugar, gur, edible oil, soap, foot wear manufactured or processed in Khadi and Village Industries Commission units (despite considerable slump in international market) increased between 25 percentage to 600 percentage. The price of Matches remained almost static even though the cost of basic inputs increased by about 30 percentage. The Khadi and Village Industries Commission's meaningful involvement in cottage Match industry has certainly helped in such improvement and in the progress of the industry.

3.5 Origin and Growth of the Match Industry in India

During the 19th century, the match industry developed various experiments to discover a low cost and safe way of making matches. The growth of the Match industry of Sivakasi owes its origin to the Match industries of Sweden. But Sweden had firmly established its match industry through a net work of agencies scattered throughout the world. Wooden Match production in India is split into three sectoral categories: the mechanized large scale sector; the handmade small scale sector and the cottage sector. 82 per cent of total Match production is in the handmade small scale (67 per cent) and cottage (15 per cent) sectors, where technology has remained relatively simple. These non-mechanised sectors of the Match industry are distinguished primarily by output size. Officially, the cottage industry in Match making is defined as any manual production unit producing less than 75,000 cases of Match boxes per year.

The industry as a whole directly employs an estimated 2,50,000 people with only 6,000 of these in the mechanized sector. The cottage sector, which involves totally, manual operations and produces less than 75 millions match sticks per year and is often household based, accounts for about 50,000 workers. Thus, small scale, industry based match production units employ by far the largest number of people (1,95,000 workers) involved in the Match sector. The production of wooden matches is highly suited to handmade. Household-based

production. For every 6 workers employed in the mechanized sector. 22 can be employed in the non-mechanized sector. Men, women, children, the elderly and partially handicapped persons can all be employed. Match making by hand is labour intensive. It required low levels of technology and relatively small capital investments. A number of operations in the production process can be easily undertaken at home. These factors clearly demonstrate the significant socio economic value of small scale Match production. Recognizing this, Indian government policies have consistently favoured the handmade sector. All future expansion of the Match industry is reserved for this sector, with particular emphasis on the cottage sector. Only one industry represents the mechanized sector, namely MS WIMCO (Western India Match Company) limited. WIMCO contributes about 18 per cent of current Match production with five industries situated in Ambarnath (near Bombay, Maharashtra), Bareilly (Uttar Pradesh), Calcutta (west Bengal), Dhubri (Assam) and Madras (later Chennai), Tamilnadu.

The strongholds of the small scale, non-mechanised sector are in the Ramanathapuram (1985 after the trifurcation of erstwhile Ramanathapuram district into Ramanathapuram, Pasumpon Muthuramalinga Thevar Thirumagan (now renamed Sivaganga) and Kamarajar district (now renamed Virudhunagar) and Tirunelveli districts of Tamilnadu in south India, where 67 per cent of India's Matches are produced. These districts are in a very dry, unirrigated area where the rural population has traditionally been extremely poor. The cottage sector,

responsible for the remaining 15 per cent of Match production is distributed all over the country in small production industries, although a large proportion of these are also in south India.⁷

The origin of the safety match industry in India goes back to the beginning of this century. Around 1,910 immigrant Japanese families who settled in Calcutta began making matches with simple hand and power operated machines. Local people, soon learned the necessary skills and a number of small match industries sprang up in and around Calcutta.

These small match industries could meet the total requirements of the country however and India began to import matches from Sweden and Japan. During the first world war, when Swedish matches could not be imported, the Indian market was fed mainly by imported matches from Japan and by the locally made ones which followed the Japanese pattern introduced in Calcutta.

After the war, industries in Calcutta were unable to compete with imports and hand made match production shifted to southern India, especially in Ramanathapuram (1985 after the trifurcation of erstwhile Ramanathapuram district into Ramanathapuram, Pasumpon Muthuramalinga Thevar Thirumagan (now renamed Sivaganga) Kamarajar (now renamed Virudhunagar district) and

⁷www.yahoo.co.in.

Tirunelveli districts of Tamilnadu state. Thus shift was due to the pioneering efforts off. P. Iya Nadar and A. Shanmuga Nadar who went to Calcutta to learn the process from Purna Chandra Ray, a local business man, who had learned the trade in Germany. The Nadars set up a number of manual match production industries in extremely poor regions of Tamilnau, where a combination of the dry climate, cheap labour and availability of raw materials from nearby Kerala created ideal conditions for match production. The first sulphur Match that would bum when brought into contact with a rough surface was produced in south India in 1923. In Calcutta, Match industries were started under the auspices of the Indian Swedeshi movement of 1905 to 06 in which Bengal took the lead. The smaller match industries in India faced stiff competition from the imports of Sweden and Japan. During the 1910s some entrepreneurs brought Japanese families to Calcutta to teach the skills in match production to the people employed in these small industries.⁸

The Swedish Match Company also seized this opportunity and while its imports of Matches in India were dwindling, it kept its hold over the Indian Match market by starting industries in India. It began putting up industries as early as 1924 and had one each in 1925, 1926 and 1929. In 1930 it bought out the working match industry at Bareilly in the then united provinces (now Uttar Pradesh)

⁸Smith Kottari: "There is blood on those match sticks child labour in Sivakasi", *Economic and Political Weekly*, Vol.18, December 1983, Pp. 1171-1199.

equipped with modern appliances. The establishment of these industries by the Swedish cartel resulted in competition between Indian industries and even then repeated complaints were made to the Government of India about the malpractices and unfair competition by the Swedish match company which also offered to purchase the larger match industry that threatened it.

In 1926, finding imports dwindling and a foreign giant in the domestic field, the government of India directed the Tariff board to take up the match industry for investigation to find out, how far protection was necessary for the home match industry and also to find out if the loss of revenue in imports could be recouped by levy of excise duty on home production. An enquiry board with Sir. P.P. Ginwala as president was appointed and began work in 1927. During the enquiry complaints were received against the method of operation of the Swedish Match Company in India. The president of the board observed that, "Allegations have been made practically by every Indian company that the Swedish Company is operating in the country with the intention of either acquiring monopoly or a dominant interest in the match industry". The operations of the Swedish Company in other parts of the world suggest that its general policy is either to get, if it can, a monopoly by arrangement with the government of the country in which it operates or to get a dominant interest by controlling the capital and by controlling the manufacture in that country or by making what are called working arrangements

between itself and domestic manufactures in that country (Report of the Government of India Tariff board Enquiry of 1927-28). Thus the activity of WIMCO (the name and style in which the Swedish Match Company operates in India) from its very beginning has been against national interest, motivated by an insatiable thirst to monopolies the industry. ⁹

The industry, after this trying period, emerged not only successful in its bid to survive but also in winning the Government's approval by falling in line with the declared policy of decentralization. The Government converted the existing import duty into a protective duty. In 1934, the Government of India raised the duty on imported Matches and prohibited imports of Matchboxes containing more than 80 sticks. In the same year, excise duty was first levied on Match as mainly as a revenue mobilization measure. In the subsequent years excise duty was increased.¹⁰

Upto 1961, a Match box in India contained only 10 Match sticks. In 1961, the number of sticks per match box was standardized at 50 per box. The excise

⁹Hand made safety Matches industry in India: (Booklets issued by the All India chamber of Match industries), P.1.

¹⁰John Thomas Chirayath: "A study of Match industry in Kerala", p.23.

duty on Matches was further revised and restructured in 1964 and 1966.¹¹ ¹³ In the year 2005 Match box contained 40 Match sticks.

The All India chamber of Match industries has demanded that the duty Entitlement passbook incentive of 12 percent on export matches be restored to safeguard the Match industry and to facilitate the export of Matches. In a memorandum submitted to the Minister of State for Industries and commerce, the Minister E.V.K.S Elangovan told Hindu, the association said that the incentive, which was reduced to 8 percent, was the only protection the exporters enjoyed. The Indian exporters could not compete in the global market because of the increased cost of raw materials and lower government subsidies, compared to their counterparts in Pakistan, China and Indonesia.

It also used the Government to bring down the 16 percent excise duty imported on the Matches produced by semi-mechanised and mechanized industries.¹²

The Central Excise Tariff Act 1985, numbered 3,605 Matches (other than Bengal lights is 12 per cent excise duty). And also numbered 36050010 or 36050090 has notified that Matches in or in relation to the manufacture of which

¹¹Velmurugan M. and Mukerjee D.K.: Modernization guide on safety matches, Small Industries Service Institute, 1987, p.6.

¹²*The Hindu*: daily news paper, September 14, 2004, p.10.

none of the following processes is ordinarily carried on with the aid of power, namely

- i. The process of giving the veneer flats or strips, the configuration of a Match box including the outer slide or the inner slide with the use of match paper.
- ii. Frame filling
- iii. Dipping of splints in the composition for Match heads.
- iv. Filling of boxes with Matches.
- v. Pasting of labels on Matchboxes or veneers or card boards.
- vi. Packaging.¹³

Of the pioneer industries installed at the time, the Amrit Match Industry in Kotah, Bilaspur, and Gujarat Islam Match Industry in Ahmedabad which were founded in 1894-95 are still maintaining their existence struggling against various odds for about the last 48 years and deserve a special mention in any historical accounts of the match industry in India. The outturn capacity of the former Industry was at that time 500 to 600 gross and that of the latter 600 to 800 gross a day. Since this initiative was taken in 1894 till 1910 many industries have been established in different parts of India. Among these mention may be made of (1). Bombay Match Manufacturing company limited in New Seri Road, Bombay (2).

¹³Budget Bulletin – 2006: central Excise and service, Tax, Directorate of publicity and public Relations, Custom and central Excise, Delhi.

The Berar Match Manufacturing company limited in Ellichpur, Berar, (3). Ranbir Match Manufacturing company in Jammu, (4). Belgaum match manufacturing company limited in Belgaum, (5). Dhoru Match Factory in Dhoru satara, (6). The vyara Match works in Vyara station, Tapti valley railway (7). Oriental Match Manufacturing company limited Calcutta, and (8). The Bonde Mataram Match Industry, Calcutta. The last two industries connect the memory of the first Swedish agitation of 1905-1906 in which Bengal took the lead and which can be said as the fore runner of the political thoughts of India.

Those efforts to manufacture Matches in the country were after Match of Swadeshi movement and were inaugurated under its auspices.

The output in each of the above industries varied from 300 to 500 gross a day. A few industries on a very small scale were also established during the said period but they hardly deserve the name.¹⁴

3.6 State-wise Distribution of the Match Industry in India

The non-mechanised match industries in India are concentrated in the states of Tamilnadu, Kerala, Andhra Pradesh, Orissa, Bihar, Maharashtra, Assam and Haryana. The details are presented in Table 3.1.

¹⁴Notes on Lessons on cottage Match industry: “*Khadi Gramodyog Vidyalaya for Extension Officers (Industries)*”, Gandhiniketan Ashram, T. Kallupatti, Madurai District, P.6.

TABLE 3.1**STATE-WISE DISTRIBUTION OF MATCH MANUFACTURING INDUSTRIES IN INDIA DURING THE YEAR 2004-2005**

S.No	Name of the State	Number of Match Industries	Percentage to Total
1	Tamilnadu	7,846	90.78
2	Kerala	720	8.33
3	Andhra Pradesh	28	0.32
4	Orissa	17	0.20
5	Bihar	11	0.13
6	Maharashtra	8	0.09
7	Assam	6	0.07
8	Haryana	6	0.07
	Total	8,642	100.00

Source: Compiled from the records of the Directorate of Industries and Commerce, Government of Tamilnadu, Chennai.

It is inferred from Table 3.1 that Tamilnadu state stands first with 90.79 percent of the Match Manufacturing Industries, followed by Kerala with 8.33 percent and also the above table reveals that Assam and Haryana are having the lowest Match Manufacturing industries, which is 0.07 percent.

3.7 Match Industries in Tamilnadu

Tamilnadu produces a major share of the total all India production. In Tamilnadu, Virudhunagar district is the leading Match producing centre. Really it is Sivakasi, which is the birth place of match industry in Tamilnadu.¹⁵

In 1920s, a number of small and semi-automatic industries were established in south India.¹⁶

Of them, the small scale hand made match industries are mainly concentrated in Tamilnadu state in south India.¹⁷

The enthusiasm, tenacity, ingenuity entrepreneurship and foresight of Mr.P. Iyya Nadar and Mr. A. Shanmuga Nadar of Sivakasi town in Virudhunagar district (in Tamilnadu state) culminated in the gradual growth and organized development of this industry in the southern districts of Tamilnadu especially in Virudhunagar, Tirunelveli and Tuticorin districts to a large extent and to a certain extent in other districts of Tamilnadu.

¹⁵Suresh Babu M.: “What Ails the hand made match industry”, *Southern Economist*, Vol.22, No.1, 1983, p.19.

¹⁶The Kothari’s Industrial Discovery of India: “Miscellaneous Match Industry”, *Kothari Enterprises*, Madras, 1986, pp. 10-11.

¹⁷*Ibid*

The hand made match industry as a whole registered an increase in market share from 50 percent in 1968 to 82 percent in 1984. Within this sector a 'middle level' of small scale match production industries has emerged as the dominant production centre in the country. Located in Tamilnadu state this middle level is the product of the first industries begun here by the Nadar family. This sector accounts for 67 per cent of the match market and it continues to be dominated by 18 closely related families, often referred to as the "Match kings of south India". These families each own more than one industry and control a number of cottage level industries through sub contracting. They have a virtual monopoly over more than two thirds of the match industry.

The ascendancy of the "Match kings" was clearly not the intended outcome of the central government's 1979 policy introducing massive relief in excise duties to the cottage and small scale sector. The benefits were intended to go to smaller scale, village level entrepreneurs and cooperatives registered with the Khadi and Village Industries Commission. Although this continues to be the policy goal, it is now obvious that the major benefits and opportunities for future growth of the match industry, much to the dismay of government policy makers, will go to these 18 families.

Irrespective of the beneficiaries, this middle sector is a force to reckon with in the industry. It has helped the growth of ancillary industries for the manufacture of splints and veneers. Potassium chlorate, and industries producing glue and

paper. The hand made sector also produces non-glowing deluxe matches, book or strip matches and wax matches. It has taken the lead in adopting Indian standards specifications for matches and is just beginning to develop overseas markets. Table 3.2 shows the “Match kings” and their number of industries owned by them.

TABLE 3.2
MATCH KINGS AND THEIR NUMBER OF INDUSTRIES

S.No	Name of Group	Number of Industries
1	Pioneer group	17
2	Arasan group	25
3	Ayyanadar group	17
4	Sundaravel group	10
5	Hind/standard group	10
6	Pope the King / East India group	7
7	New Jyothi group	5
8	St. Joseph group	6
9	Neenakshi group	3
10	Comorin group	5
11	National group	8
12	Modern group	3
13	Jupiter group	4
14	Premier group	6
15	Anja group	3
16	Kadiriya group	3
17	Coronation group	5
18	Everest group	4
	Total	141

Source: www.thehindu.com

The handmade, middle sector is presently confident that the entire requirement of safety Matches for the nation can be met by them in the near future. They lobby vigorously for the total exclusion of WIMCO from match production and complain about excises duties levied on cottage level industries. The sector asserts that its technology of using labour is as good as WIMCO's, if not better. Since the development of major fireworks industry in the Sivakasi region, labour is presently not as easily available as it once was. Moreover thirty percent of these middle level industries now use card board boxes, so these are actually semi-mechanized relying on power driven machinery to form these boxes.

Finally, operating in an extremely poor region, the "Match kings" are frequently accused of exploiting women and child labourers, paying extremely low wages under poor working conditions.¹⁸

In general, though agriculture is the main occupation of the people, due to failure of monsoon, people have turned to non-agricultural sectors in almost all the blocks of the Virudhunagar district. Virudhunagar District is naturally having dry climate and such a climate is essential for the production of safety matches. Easy availability of labour and cheap availability of lands facilitate the growth of this industry.

¹⁸www.thehindu.com

In the match industry of India, the market share of Sivakasi match industry, which stood at 40 percent in 1971-72 has increased to 55 percent in 1976-77.

Sivakasi town alone produces 1.25 lakh gross Match boxes per day. Out of India's total turnover of Matches of Rs. 160 crores, the share of turnover of Matches of Sivakasi and the small and tiny sector accounted for Rs. 105 crores in 1978-79.

At the end of March 1998, Tamilnadu accounted for 90 percent of the Matches production in India.¹⁹

The large quantities of the Match boxes that light the rural kitchens come from Madurai and Virudhunagar districts of Tamilnadu. It has become a traditional household industry in the rural homes of Sivakasi, Sattur and Kovilpatti taluks of Tamilnadu.²⁰

The growth of Match industries is a boon from the blue sky for the dejected population of Virudhunagar district. The match industry concentrated in the 2 blocks of Virudhunagar district namely Sattur and Vembakottai provide means and ways of employment for the rural masses who are dejected by the failure of agriculture in the drought prone area of Virudhunagar district.

¹⁹Directorate of industries and commerce: Government of Tamilnadu.

²⁰Match makers of Metta malai, "*Yojana*" December 16-31, P.35.

3.8 Match Industry in Virudhunagar District

Virudhunagar District is a drought prone area. It has no cultivation for six months in a year. The remaining half of the year does not have good cultivation. So they could not earn their daily bread very easily. At that time, two business enthusiastic men Mr. P. Ayya Nadar and Mr. A. Shanmuga Nadar went to Calcutta to study the production techniques of the match industries.

After that, they set up a few match industries in Sivakasi. They were successful in running their business. Their successes have helped to spread match industries in Virudhunagar, Sattur, Vembakottai, Kovilpatti and Srivilliputhur and the like.

A family venture has been behind the genesis and growth of the match industry in this district. Mr.P. Ayya Nadar and A. Shanmuga Nadar are pioneers of the match industry. During the year 2005, there were 2,982 non-mechanized match industries functioning in this district.²¹ ²³Virudhunagar District occupies the highest position in Match production. It is worth mentioning here that, 60 per cent of the total production of non-mechanized sectors is from this district.

Table 3.3 pictures that the taluk wise district of Match industries in Virudhunagar.

²¹Compiled from the records of the offices of the Arms Act Section: Virudhunagar District, Virudhunagar, 2005.

TABLE 3.3
TALUK-WISE DISTRIBUTION OF THE MATCH MANUFACTURING
INDUSTRIES IN VIRUDHUNAGAR DISTRICT 2004-05

S.No	Name of the Taluk	Number of Industries	Percentage to Total
1	Sattur	1693	56.77
2	Sivakasi	717	24.04
3	Virudhunagar	243	8.14
4	Rajapalayam	156	5.23
5	Srivilliputhur	112	3.75
6	Arupukottai	43	1.44
7	Kariapatti	12	0.40
8	Tiruchuli	6	0.20
	Total	2982	100.00

Source: Compiled from the Records of Arms Act Section, Virudhunagar District, Virudhunagar 2004-2005.

Table 3.3 shows that 2,982 match industries function in all the 8 taluks of Virudhunagar district. Out of these, 1,693 (56.77 per cent) were located in Sattur taluk, followed by Sivakasi 717 (24.04 per cent). The lowest level of industries located was in Trichuli taluk, the number being 6 (0.20 per cent).

During the year 2005 there were 1,693 match industries are functioning in Sattur taluk. Out of these 1,083 (63.96 per cent) match industries are in Sattur block, 576 (34.02 per cent) in Vembakottai block and the remaining 34 (2.00 per cent) located in Virudhunagar block. The position is stated in Table 3.4.

TABLE 3.4
BLOCK-WISE DISTRIBUTION OF MATCH MANUFACTURING
INDUSTRY IN SATTUR TALUK OF VIRUDHUNAGAR DISTRICT
DURING 2005.

S.No	Name of the Block	Number of Industries	Percentage to Total
1	Sattur	1,083	63.96
2	Sivakasi	576	34.02
3	Virudhunagar	34	2.00
	Total	1,693	100.00

Source: Compiled from the office of special Thasildar of Matches, Sivakasi 2005.

Out of the 3 blocks 2 blocks namely Sattur and Vembakottai were selected for research study.

3.9 Co-operative Match Societies in Sattur Taluk

A cooperative match society is one which follows the principles of cooperation in match production. With a view to overcome the difficulties in procuring raw materials, arranging finance and marketing of matches, co-operative societies were formed and registered under the Department of Industries and Commerce, Chennai.²²

²²Joint Directors Office, Sattur J.D office for small match cooperative societies, Sattur.

During the study period there are 2 cooperative Match societies functioning in Sattur taluk. Both are located in Sattur town. Namely Sattur Small Match Producers Service Industrial Co-operative Society limited and the Venkatachalapuram small Match Producers Service Industrial Cooperative Society limited Sattur. For the study purpose the Sattur Small Match Producers Service Industrial Co-operative Society Limited has been taken as the study unit of cooperative society, because the above said cooperative society is a well functioning co-operative society as compared to the second one.

3.10 Raw material required for manufacturing the Match products

The major raw materials used in the production of safety Matches are soft woods used to make the Match sticks (also known as “splints”) and boxes, and chemicals for the Match heads and the friction surface of the boxes. With the exception of sulphur, all the basic raw materials are produced within India. A full appreciation of the employment potential of the Match industry should also consider the workers involved in the production of all of these raw materials.

Raw materials used for manufacturing of safety Matches include splints, veneers, wax, chlorate, sulphur, Bichromate of potassium, rosin, Manganese (red/black), glass powder, glue, phosphorous, copper sulphate, carbon black, gelatine, antimony, topioca flour, blue match paper, khraft paper, bundle sheet and fuel.

3.10.1 Splints and Veneers

These are the Match sticks, which are used for holding purpose. It is made out of soft wood. Normally the trees used for the splints are i). Aspheria, ii). Matti, iii). Pala, iv). Rubber and v). Aspin.

The veneers are used for producing Matchboxes. This is also made out of soft trees. The soft wood is procured from near by states namely Kerala and Karnataka.

3.10.2 Wax

Wax is a by product from the petroleum refining industry. The different types of wax include.

- 1) Match wax
- 2) R.D wax I quality
- 3) Yellow wax
- 4) Refined wax I grade
- 5) Refined wax II grade and
- 6) Hard wax

Wax is used to impregnate Match splints so that the flame of the burning Match head can ignite the splint. It has also been used to a limited extent as a

component of head composition. The quality of Match is based on the quality and quality of wax used.

3.10.3 Chlorate of Potassium

This chemical is a white powder made from potassium chloride. It is now made in India and is also imported. The imported chemical is costlier. The chlorate must be commercially pure which means that it should not contain more than the slightest quantity of impurities. It is apt to contain some chloride which is very injurious to Match manufacture. Only the best quality of potash chlorate should be used.

Potash chlorate has a store of oxygen, which can be easily released. It is used in the manufacture of explosives. It comes under the Explosives Act. A police permit is necessary for storing it for use. The permit is obtainable on application to the collector of the district. Sometimes it is issued by Revenue Divisional Officer stating the license number of the holder of Match license. The sanction of chlorate is based on the production of the previous year.

3.10.4 Sulphur

This is another important basic raw material for Match manufacturing process. It can be had from licensed dealers in a finely powdered form and this is to be used as a match chemical. Sulphur like potash chlorate, needs license for

storing and transport. It is supplied by both local manufactures and foreign companies chiefly from Spain.

3.10.5 Bi-chromate of Potassium

Bi-chromate is used as an oxidizing agent to produce flame in a trice. It is used to lower the decomposition temperature of potassium, which a Match needs. It speeds up the burning reaction. It is procured from Bombay and other places of North India.

3.10.6 Rosin

Rosin is used to control the velocity of propagation of flame in the Match head and is supplied by the chemical units from Maharastra state.

3.10.7 Manganese (Red / Black)

This raw material is a powerful catalyst. It is used for the release of oxygen of chlorate. Two types of manganese are used by the Match industry. The industries that want to produce Matches of black colour flame will use black manganese and the industry that want to produce red colour flame Matches will use red manganese. This material is available in local areas like Tuticorin and Bodinayakanur.

3.10.8 Glue

It is the binding agent, which plays a vital role in Match production. It is available in different qualities like i). Sunlight glue sheets ii). Bawa glue sheets, iii). Tiger brand technical glue, iv). Shaw Wallace technical glue, v). shawallace crocodile, vi). Bundle brand packing glue, vii). Technical brand Match special, viii). Eagle brand II quality glue, ix). Eagle brand I quality glue, x). capsule glue and xi). Tiger brand I quality glue and the like.

The glue must be strong enough to bind the powdered ingredients into a firm bulb, but the amount of glue present must be enough to permit easy abrasion, which proceeds ignition. The amount of binder is also limited by its function as fuel. The preparation of its solution and quality and type of glue used play an important role in quality determination and the price fixation of Matches.

3.10.9 Glass powder

Glass powder is used in head composition and side coating compound. Generally, this is obtained by grinding selected glass factory wastes or from broken sheet of glass sheet or colourless glass. This glass powder softens at the burning temperature and acts as a binder for the other molten head components, giving a compact and strong ash structure. The sharp edged needles contribute to the friction properties of both the match head and side coating of Match boxes.

3.10.10 Antimony

It is used in coating chemical compound on sides. It helps the Match stick to burn immediately after striking.

3.10.11 Phosphorus

Phosphorus is one of the fundamental components of the head composition and the striking surface for the safety Match stick, namely the surface of the Match box. There are different grades of phosphorous namely red phosphorous, excel phosphorous, and kalpataru phosphorus and so forth which are different from one another in quality.

3.10.12 Copper Sulphate

It is used for mixing with topiaca flour while preparing paste for outer and inner box making. Mainly, it is used to prevent the box makers from using the flour for their personal consumption.

3.10.13 Carbon Black

It is only a colouring agent used for preparing side coating chemical component. By adding more of this material, the side coating chemical will be dark black.

3.10.14 Gelatine

It is an explosive item of chemical and it is used inside coating chemical compound. It helps the stick to burn immediately.

3.10.15 Fuel

It is used for preparing glue solution. According to the nature of raw materials used, the quality and the cost of production vary.

3.10.16 Topiaca

This refers to the paste used for preparing Match boxes.

3.11 Classification of Match Industries

On the basis of production processes, the whole match industries in India are classified into a). mechanized sector and b). non-mechanized sector or handmade sector. The mechanized sector is classified into two, fully mechanized and semi-mechanised. Of the total production of Matches in India, 27 percent is shared by the mechanized sector and the remaining 73 percent is shared by the hand made or non-mechanised sector.²³

²³Madasamy V.: *“A study of the problem of production in College Match Industrial Units in Kamarajar District”*, Unpublished research thesis, Madurai Kamaraj University, Madurai, 1994.

3.12 Types of Matches

A variety of Matches are being made now a days throughout the world.

The various types of Matches produced are given below.²⁴

1. Book Matches
2. Household or Kitchen or standard Matches
3. Pyrotechnic Matches.
4. Vesta Matches
5. Wind proof matches
6. Wax Matches
7. Double dip or Bird's eye Matches.
8. Water proof Matches

3.12.1 Book Matches

This type of matches was made by stapling a comb of wood or card board Matches inside a cardboard cover. The method of burning is same as in the standard Match. Wooden combs are more popular in European Countries while card board combs are used in united Kingdom. Book Matches are used as an advertising Medium, especially in United States and the Popularity of the book Match stems entirely due to its suitability for this purpose.

²⁴Dattarreyulu M. and Gandhi S.P: "Study on Safety Match Industry in India", 1979, p.24.

3.12.2 Household or Kitchen or Standard Matches

This type of Matches is very popular and widely usable for the household consumption. It consists of the ignition head, tinder and a handle.

The splints are usually treated with some retardant, such as ammonium phosphate, to prevent after glow when the Match is extinguished. These Matches are made in a wide range of boxes and splint sizes.

3.12.3 Pyrotechnic Matches

These Matches are commonly called “Bengals”. This type of Matches has a tinder substance below the head that is designed to burn with a bright flame tinted with one of the characteristic colours of metallic salts. The splint serves as a handle only.

3.12.4 Vesta Matches

These have short sticks. Originally made from wax and are mainly used for making smokers Matches.

3.12.5 Wind Proof Matches

These are alien to the Bengals. Matches of this type have the tinder substance spread along the splint below the head which produces a more positive

reaction than the combustion of wood and Paraffin wax, with the result that it cannot be extinguished by wind or water spray. Such Matches may be subdivided into fuses in which the tinder substance burns strongly without flame.

3.12.6 Wax Matches

This type of matches is popular in European countries. It has ignition head at the end of a short length of wax paper formed from paper or cotton filaments.

3.12.7 Double Dip or Birds Eye Match

This belongs to the type of strike anywhere Matches. However these types are restricted to the quality market only. In this type, a bulb of combustible material is interposed between a fast ignition head and the tinder of the stick. These combine high sensitivity with safety in transport. The construction enables a smaller quantity of igniters to be used. In this type, the safety is high since the igniters are kept away from contracting the adjoining tips by the insensitive bulb below it.

3.12.8 Water Proof Matches

As both the common Match and the striking material are hygroscopic, many attempts have been made to make them waterproof. However the higher cost and

difficult ignition prohibit the manufacture of such Matches on a commercial basis.

These are therefore restricted for use in the armed forces.

3.13 Production of Matches

3.13.0 Introduction

Making of matchsticks is easy, but needs careful handling of materials. Production of matches is not a single process itself. Normally in the Match industry (both on the mechanized and non-mechanised) the various works involved are

1. Box making
2. Frame filing
3. Wax dipping
4. Chemical dipping
5. Box filing
6. Label and Band roll pasting
7. Bundle packing

The process involved in match industries is carried out with the help of the labour because the technique required in Match production is very simple.

A brief discussion in the process of manufacturing is attempted below.

3.13.1 Box making

The box making is the first process of production of Matches. The box is the container of Match sticks and also used for stick striking. This work can be done in sitting nature. The box making is done by the female workers, children, the aged and even physically handicapped persons. Naturally it is suited to the above class of workers. These workers are paid on piece rate system. Therefore, there is no discrimination in payment of wages between the adult workers and children or the aged. The box making process can be divided into two types.

- a. Outer boxes and
- b. Inner boxes or Drawer which carries match stick called splints.

3.13.2 Outer box making

The outer box is made of different materials. First one is the wooden veneers skillets, grooved for folding wrapped by blue Match paper, with a trade label pasted on top. The materials required are i). Veneers ii). Wrapping paper, cut to size iii). Tapioca flower paste iv). Trade label readily printed and cut to size. The second type of outer box is made from card board skillets, readily printed with label, creased for folding over band rolls and glued at high speed. The veneer skillets should not be allowed to dry for a long time because they may break in the process of box making. Moreover, care should be taken that there is be no moisture.

3.13.3 Inner box making

The process of inner box making requires four types of raw materials namely i). Veneer skillets ii). Veneer skillet piece, iii). Wrapping paper and iv). Paste. The veneer skillets both rims and pieces are treated separately as in the case of the outer box veneer skillets. The wrapper paper is also cut to the required size. The topiaca flour paste is also prepared as in the outer box making. An inner box is made by

- 1) Folding veneer skillet rims.
- 2) Pasting the wrapping paper with paste and
- 3) Veneer skillet piece is placed at the centre of the veneer skillet rims to make the inner box. The finished outer and inner boxes are to be dried. Drying of card board boxes is unnecessary but wooden boxes are to be dried well, since Match heads inside will otherwise become damp and useless. The outer and inner boxes have to be dried under controlled conditions. Usually outer boxes are dried at 50°C and inner boxes at 60°C to maintain good condition. Virudhunagar district is naturally endowed with dry climatic condition which facilitates the drying function easier.

3.13.4 Frame Filling

The frame filling process involves filling up of splints into the frames. This work is also done by female workers, children and aged persons and the like. They are paid at piece rate system. The splints are filled manually into frames. This frame consists of a number of long flat pieces of wood, well rounded at edges and polished called “lathes”. Each lath is about 350 millimetre long and 20 millimetre wide with a thickness of 5-7 millimetre. Usually 52 laths containing 52 slots form a frame in Virudhunagar district. Two solid wooden pieces of 350 millimetre length, 20 millimetre width and 20 millimetre thick are placed at each end of the column of the laths, with 2 steel rods to hold all the wooden blocks and the first and is free for clamping devices to hold the second wooden blocks and the other to the wooden laths. To assemble the frame, the bottom wooden block with the steel rod jutting out, is held in vertical position. The laths are placed over it by sliding through the rods one by one using the guide holes at the two ends of the laths.

A frame filler takes a bundle of straightened splints from the leveled splints tray and runs them over the slots among the length of the frame. So splints fall into position inside the slots. Similarly all the laths at the top wooden block is slide on to the frame which is clamped tight, using spring steel pieces over the rod. This frame is taken to leveler. The frame is now ready for wax dipping.

3.13.5 Wax Dipping

It requires hard work and physical stamina. Generally, male adult workers are employed. The payment may be either time rate or piece rate. The wax dipping helps the splints to retain the flame for some time that is to say, the wax coated splints retain the frame till the wax is blown completely. For the purpose of the wax dipping, wax is generally supplied by the government in large scale. Slag wax is brought in the open market in small scale. These are mixed in equal proportion. This mixture is melted and heat is maintained between 135°C and 150°C. It is adequate to dip splints only to a depth of about 15 millimetre for about five to seven seconds depending on the quality of the timber used for splints. Hard and resinous wood require a longer dipping time of seven seconds, while good soft wood needs only five seconds and if the splints are very dry even three seconds are enough. Normally the first 2 seconds of dipping help to boil off the moisture in the wood.

So that actual absorption of the wax starts only after the moisture is dried. Splints are dipped first in molten wax and then they are placed in a hot plate or in a chamber kept at 60°C for at least 10 seconds and again the frame is sent for chemical dipping,, the next stage in production process.

3.13.6 Chemical Dipping

Just like the wax dipping process, this process is also of hard work in nature and it requires more stamina. Therefore, male adult workers are naturally fit to do this work. There are three types of employees working in this process namely, foreman, assistant foreman and helper. This process begins with preparation of a mixture of various chemicals with different ratios. The chemical mixture is prepared in two types. The first type is for the head of the matchsticks and second is for the sides of match boxes used for striking match sticks. The manufacturers mix various grades of chemical based on their requirements. The preparation of glue solution is very important because it is used as a binding agent in match production. Glue is mixed with cold water in the ratio 1:3. While adding glue water, the mixture is to be stirred and the mixture is to be soaked for four to eight hours or until glue dissolves in water and it becomes a soft mass or jelly. Then the prepared jelly mass is transferred to a jacketed melting pot and is heated by indirect steaming. While heating, the contents should be stirred. The temperature should not exceed 60°C (140°F) at any time. Overheating will result in the loss of the original property of glue. When glue is melted and formed into homogenous liquid, it is ready for use. Being an organic product, it is important that the utensils used for solutions should be kept clean. The solution prepared should be sufficient only for the particular day's requirement, because the solution cannot be used the next day. Likewise, it should not be less than the actual

requirement because if it is less, the deficit cannot be prepared immediately. Therefore, the entrepreneurs have to stop their production for want of the solution.

After preparing the glue solution, the mass jelly is poured into the rest of the chemicals and it is grinded and now the head composition for chemical dipping process is ready. The head composition is spread over a hot plate leveled to an exact depth of 5 millimetre depending on the size of the splints used. The plate should be at 34°C to 36°C. The composition temperature should be that of the temperature of the plate. Then the splints filled frame is dipped at a particular level of wax coated part. The chemical dipped frames are placed in racks in a separate room called “Drier Room” until the chemical is completely dried off, because fast drying will result in a brattled head. The Match head should be dried under controlled condition of temperature. Table below gives the details of quantity of chemicals required for manufacturing 100 bundles of good quality Matches.

TABLE 3.5
QUANTITY OF CHEMICALS MAINLY REQUIRED FOR
MANUFACTURING 100 BUNDLES OF GOOD QUALITY MATCHES

S.No	Name of the Chemical	Required Head Composition	Quantity in Kilograms	
			Side Coating	Total
1	Phosphorus	2.500	0.100	2.600
2	Glass powder	0.500	0.050	0.550
3	Bi-chromate	0.100	0.100	0.200
4	Antimony	-	0.025	0.025
5	Glue	1.200	-	1.200
6	Black manganese / Red manganese	2.000	-	2.000
7	Rosin	0.050	-	0.050
8	Sulphur	0.600	-	0.600
9	Carbon black	-	0.100	0.100
10	Wax	4.500	-	4.500
11	Potassium chlorate	5.500	-	5.500
12	Gelatin	-	0.100	0.100
13	Copper sulphate	0.100	-	0.100

Source: Compiled from oral interviews held with experts of safety match in match industries manufacturing in the study area of Sattur Taluk.

3.13.7 Box filling

Box filling is the process by which the dried Match sticks are i). Taken away from the frames, ii). Filled in the inner box and iii). inserted along with the inner box into the outer box. The box filling process is very easy. As the number of boxes to be filled is more, it is done by sitting in a particular place for hours together. The female workers are mainly doing box filling work and are paid at piece rate. The standard number of sticks that are to be filled in a match box is normally 40 sticks.

3.13.8 Side Chemical Coating

The side chemical coating in the Match boxes helps the Match sticks to burn immediately after striking against the surface of the outer side of the match box. For this purpose, the sides of the match boxes after box filling are first arranged in the specially designed frames. Each frame contains four wooden pieces, rectangularly structured by clips, to accommodate 100 matchboxes. The arranged boxes will be brushed with side coating chemicals on both sides. After this process, again these boxes are allowed to dry and then they are ready for band rolling and labeling the next process. Since a Match box side is coated with chemicals, it is also done by the chemical dipping workers while they are paid mainly on time rate, in certain industries, piece rate is also adopted.

3.13.9 Band rolling and labeling

Band rolling and labeling are the two activities made simultaneously. They give the finishing touch to the Match manufacturing. The labeling is done immediately after band rolling, which follows box filling and side chemical coating.

The match industry is obliged to wrap a band roll strip over each match box, across its open end, labeling is a process by which the trade labels are pasted over the ends of the band roll, which makes it is necessary to tear off the bandroll

to open the match box. The trade labels are printed piece of paper containing the name and emblem of the brand, producer, place of production and the like to identify the manufactures of the Matches.

Since band rolling and labeling are very simple activities. This process is done by women labourers. They are paid wages on piece rate system.

3.13.10 Bundle Packing

It is the final process involved in Match production. In order to market the match products manufactured by the Match industry, it is highly necessary that the Match boxes to be well packed. There are three types of packing namely, one dozen packing, gross packing and bundle packing. After the packaging the products are sent to different places for marketing. Generally there are 2 kinds of Match industries based on its productions namely machanised sector and non mechanized sector.

The details of the pattern of bundle packing in non-mechanised match industries in Sattur taluk of Virudhunagar District are shown below.

TABLE 3.6
PATTERN OF BUNDLE PACKING IN SATTUR TALUK OF
VIRUDHUNAGAR DISTRICT

S.No	Name of Packing	Details of Item
1	Match box	40 match sticks
2	Dozen packing or mini bundle	10 match boxes
3	Gross packing or one unit	10 mini bundles or 100 boxes
4	Wooden case or bundle packing	60 gross packing or 600 boxes

Source: Compiled from oral interviews with experts of safety match manufacturing in the study area.