Tarım Makinaları Bilimi Dergisi (Journal of Agricultural Machinery Science)
2010, 6 (3), 153 - 161

Industry of Pressurized Irrigation System Components and its Characteristics in West Mediterranean Region

Murad ÇANAKCI, Hakdan AYTEM, Davut KARAYEL, Mehmet TOPAKCI, İbrahim AKINCI
Akdeniz Üniversitesi Ziraat Fakültesi Tarım Makinaları Bölümü, Antalya
mcanakci@akdeniz.edu.tr

Received (Geliş Tarihi): 19.07.2010 Accepted (Kabul Tarihi): 17.08.2010

Abstract: The aim of this research was to determine industry of pressurized irrigation system components and its characteristics in West Mediterranean Region. For this purpose, a questionnaire study was conducted with 27 manufacturers, which are located in Antalya, Burdur and Isparta cities. According to research results, it was determined that while 48% of the manufacturers are unlimited company (individual manufacturer), 52% of the manufacturers are limited company. The production pattern can be divided into two groups as irrigation pipes and irrigation filters. There are export companies together with regional companies. The ratios of the irrigation pipe and filter manufacturers were 63% and 37%, respectively. Eleven percent of companies are manufacturing both of irrigation pipes and filters. Total amount of irrigation filters and pipes were 40301 unit and 12598 tons, respectively in 2009.
Keywords: Pressurized irrigation system, West Mediterranean Region

Batı Akdeniz Bölgesinde Basınçlı Sulama Sistemi Elemanları Üretim Sanayii ve Özellikleri

Özet: Bu araştırmada Batı Akdeniz Bölgesinde basınçlı sulama sistemi elemanları üretim sanayi ve özelliklerinin belirlenmesi amaçlanmıştır. Bu kapsamda, Antalya, Burdur ve Isparta illerinde üretim gerçekleştiren toplam 27 adet işletme ile anket çalışması yapılmıştır. Araştırma sonuçlarına göre; işletmelerin % 48'i şahıs, % 52'si şirket yapısındaki işletmelerdir. Ürün deseninin başlıca sulama boruları ve filtreler olmak üzere ikiye ayrıldığı belirlenmiştir. Bölgesel üretim yapan işletmelerin yanında ihracat yapan işletmeler de bulunmaktadır. Anket yapılan işletmelerin % 63'ü sulama borusu, % 37'si sulama filtresi üretmektedir. Hem sulama borusu hem de filtre üretimi yapılan işletme oranı %11'dir. İşletmelerde 2009 yılında toplam 40301 adet filtre üretilmiştir ve üretilen toplam sulama borusunun kütlesi 12598 ton'dur.
Anahtar Kelimeler: Basınçlı sulama sistemi, Batı Akdeniz Bölgesi

INTRODUCTION

Irrigation is one of the most important methods being used in order to get higher yield and quality in agricultural production. As a definition, irrigation could be explained as application of water needed by plants, which could not be supplied by natural inputs, in different plant growing stages in different methods. For a proper irrigation, application of water to the production area and spreading it roughly are not enough. Proper irrigation requires modern application techniques (Hakgören, 1996). Developing industry and increased human population has led to use of groundwater and surface water resources carefully and also to pollute those sources; therefore, utilization of those has become more important (Yürdem et al., 1999). Irrigation methods are divided into three groups. These are surface, pressurized and subsurface irrigation methods. Drip irrigation and sprinkler systems are used in pressurized irrigation methods (Hakgören, 1996).

In Turkey, 28.5 million hectares of 77.95 million hectares area has been described as agricultural land and 8.5 million ha of those areas are targeted to irrigate. 92% of those areas are surface irrigated, sprinkle and drip irrigation are nearly 7% and 2%, respectively. (Anonymous, 2008). Nowadays, utilization of water sources effectively has gained in popularity in

order to get higher irrigation efficiency and to provide water saving. The system that saves the water sources or another term the system that uses water more effectively and enables to irrigate more area has been perceived, but this will become true if it is approved by the farmers and also the financial situation of them (Yürdem et al., 1999). Last decades, pressurized irrigation has been used commonly which could be attributed to subsidies by ministry of agriculture for pressurized irrigation and to Ziraat Bank and Agricultural Cooperation those of which serve a credit for the farmers with a zero interest or discount rated interest. Total 60,841,131 Turkish Liras grant support have been provided between the years of 2007-2009 within machinery and equipment support to 4182 units individual drip irrigation and sprinkler systems. 4634 units of irrigation projects have been supported by total 111 158 000 TL grant support. Also The Ziraat Bank had given total 871 383 000 TL to 61 706 farmers for the irrigation of 193 640,6 hectare lands between the years of 2007-2009 (Anonymous, 2010a).

Many studies have been carried out about general structure of agricultural machinery manufacturers, production design, existing machinery, character of personnel, sale and marketing applications in Turkey. Previous studies indicate that the studies aimed to investigate regional conditions in particular. Arın et al., (1998) conducted a survey and searched 129 agricultural machinery manufacturers in Trakya and found that those manufacturers focused on seed drills and tillage machinery and its development possibilities, but they also reported that those manufacturers has no chance to improve them. Akıncı et al., (2001) conducted a questionnaire in 3 cities with 26 different manufacturers by searching its general structure, annual production, sale and marketing methods, energy sources etc. Moreover, Ergüneş et al., (1994) conducted a study in order to reveal the current situation of agricultural machinery and its manufacturers conditions in Tokat in 6 village in 41 different manufacturers and found that 42% of them reported to quit their production due to the out of date manufacturing, decrease in demand, financial situations and they also demanded to change their production area to iron frames manufacturing, repair and trading. Further Aybek et al., (2001) carried out a study in Kahramanmaraş with 30 different manufacturers and found that livestock sector is the most common but the livestock mechanization is not well-developed which may be a new sector for those areas. Ünal et al., (2007) contributed to agricultural fairs and discussed with 73 agricultural machinery manufacturers and found that 80% of manufacturers use computer based design and drawing and half of them have CNC workbenches.

Antalya is the centre of greenhouse production; therefore, drip irrigation system has been produced and been used in many years. Moreover, the concern about drip irrigation system has also increased and this caused to an increase in irrigation components manufacturing sector. This work aims to reveal the current status of the industry of pressurized irrigation system components in West Mediterranean region.

MATERIAL and METHOD

Antalya, Burdur, Isparta cities which are located in West Mediterranean region were considered in this research. A questionnaire study was conducted to determine the industry of pressurized irrigation system components and its characteristics in West Mediterranean region. All manufacturers are considered which are manufacturing in research region. Antalya is the manufacturing center of the region. For this purpose 19 manufacturers in Antalya 6 manufacturers in Burdur and 2 manufacturers in Isparta, totally 27 manufacturers were surveyed face to face. The geographic position of manufacturers is seen below at Figure 1. The data on the structural conditions of manufacturers, existence of machine-equipment, situation of production, manufacturing periods, situation of energy consumption, supply centers, sale and marketing methods, service possibilities, other jobs out of irrigation systems, problems and future perspective of manufacturers were collected and evaluated.

RESULTS and DISCUSSION

General Structure of Manufacturers

West Mediterranean Region Manufacturers' commercial structure is presented in Table 1. Personnel status of manufacturers is shown in Table 2.

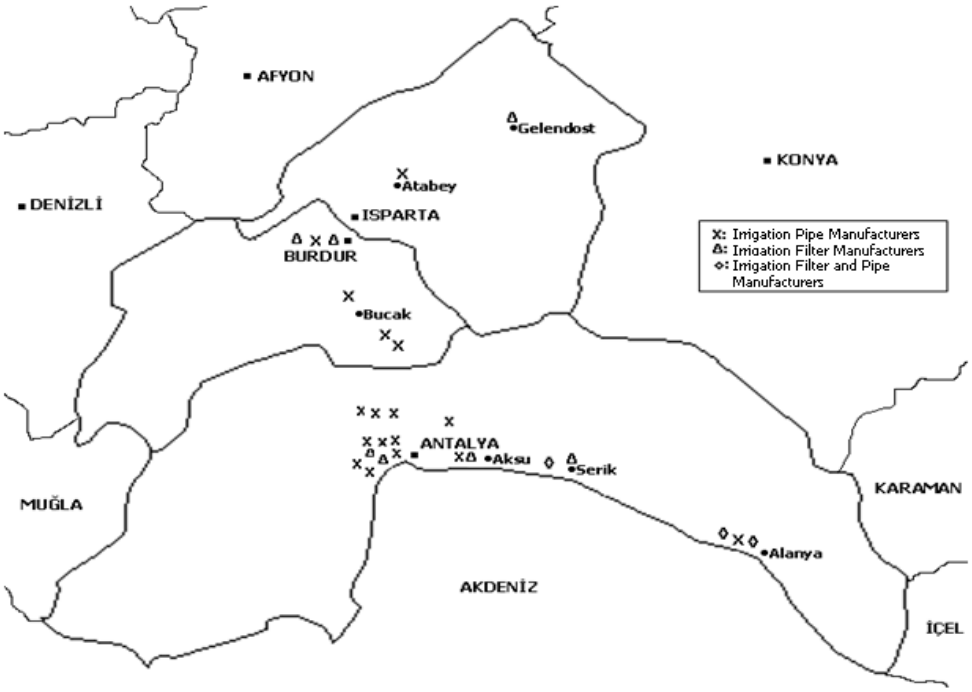

Figure 1. The geographic position of West Mediterranean Region and manufacturers

Table 1. The distribution of commercial status of manufacturers (unit)

Province	Unlimited Companies		Limited Companies		Total
	Single Proprietorship	Cooperation	Incorporated	Joint-Stock	
Antalya	6	4	7	2	19
Burdur	2	-	2	2	6
Isparta	1	-	1	-	2
Total	9	4	10	4	27
General (unit)	13		14		27
Total, (%)	48		52		100

Table 2. The distribution of personnel number

Number of Personnel		Number of Manufacturer-Personnel (unit)	Antalya	Burdur	Isparta	Total	
Unit	Average					(unit)	(%)
1-5	3.0±0.25	Num. of manufacturer	9	2	2	13	48.1
		Number of total per.	30	4	5	39	10.8
6-10	7.0±0.77	Num. of manufacturer	3	2	-	5	18.5
		Number of total per.	19	16	-	35	9.7
11-40	25.0±3.12	Num. of manufacturer	6	1	-	7	25.9
		Number of total per.	158	17	-	175	48.5
41+	56.0±9.0	Num. of manufacturer	1	1	-	2	7.4
		Number of total per.	47	65	-	112	31.0
General	13.3±3.10	Num. of manufacturer	19	6	2	27	100.0
		Number of total per.	254	102	5	361	100.0
		Average pers. number	13.3±3.2	17.0±9.8	2.5±0.5	13.3±3.1	-

It was determined that 48% of manufacturers are unlimited company, 52% of the manufacturers are limited company. Approximately 70% of unlimited companies owned by a person. 71% of corporations are limited company and 29% are joint-stock company. Company manufacturers are national and family companies except one manufacturer. A company which is operating in Burdur city has multinational company structure.

As it seen at Table 2, personnel situation is respectively, 254 personnel in Antalya, 102 personnel in Burdur and 5 personnel in Isparta provinces, total number of personnel is 361 in 27 manufacturers. Approximately half of manufacturers have between 1-5 workers. 18.5% of manufacturers have between 6-10 workers, 25.9% of manufacturers have between 11-40 workers, and 7.4% of manufacturers have more than 40 workers. The number of average personnel has been determined in Antalya, Burdur and Isparta 13, 17 and 3 respectively. Considering all the manufacturers, average number of employees was calculated as 13. According to the average results it can be said that most of the manufacturers are small sized manufacturers. As a result of this worker and owner of enterprise can work together in manufacturing stages. At the same time, depending on irrigation season, in intensive production periods, temporary workers are employed. Considering the employment of technical personnel, engineers are employed by 9 manufacturers and technicians are employed by 4 manufacturer. Moreover employees are employed apart from technical services. In this context personnel are employed in the 11 manufacturers for marketing, in the 7 manufacturers for accounting and in the 7 manufacturers for servicing. The distribution according to foundation years of manufacturers are shown in Table 3. The size of covered area is given in Table 4.

As it seen at Table 3 the production of pressurized irrigation system components have started from the 1980s. In total, 4 manufacturers had become active, between the years of 1980-1990 in Antalya and Burdur provinces.

It was determined that approximately 70% of manufacturers are founded after at the year of 2000. The rate between manufacturers which have started production in last five years to total manufacturers is 37%. In recent years providing of grants and appropriate credit terms for pressurized irrigation systems have affected on the establishment of manufacturers which is concentrated in Antalya. In this regard investors who are out of sector had invested in irrigation sector because of these supports. The average age of the manufacturers have been determined as 10 in the region. According to another research made for agricultural machinery, the average age of manufacturers have been determined as 22 by Akıncı et al., (2001). This values indicated that the industry of pressurized irrigation systems is a young sector compared to the industry of agricultural machinery in the region. Manufacturers have established an association which name is BASUSAD (Pressurized Irrigation Industrialists Association) in 2009. The aim of association is to provide high quality and standart in manufacturing, and develop pressurized irrigation industry (Anonymous, 2010b). It was determined that three manufacturers are member of association in the region. In addition two manufacturers are member of TARMAKBİR (The Turkish Association of Agricultural Machinery and Equipment Manufacturers) which is founded in 1978 (Anonymous, 2010c).

Table 3. The distribution of foundation years of manufacturers

Foundation Years	Number of Manufacturers			Total	
	Antalya	Burdur	Isparta	Number of Manufacturers	%
2006-2010	8	1	1	10	37.0
2001-2005	4	1	1	6	22.2
1991-2000	5	2	-	7	25.9
1981-1990	2	2	-	4	14.8
Total	19	6	2	27	100
Average Age of Manufacturers	9.4±1.9	16.8±3.9	3.5±2.5	9.9±1.7	-

Table 4. The size of covered area

The size of covered area of manufacturers (m^2)		Antalya		Burdur		Isparta		Total	
		Num. of Manufacturers		Num. of Manufacturers		Num. of Manufacturers		Num. of Manufacturers	
Change limits	Average	(unit)	(%)	(unit)	(%)	(unit)	(%)	(unit)	(%)
<200	111.4±16.2	4	21.1	2	33.3	1	50.0	7	25.9
201-500	362.5±31.5	9	47.4	1	16.7	-	-	10	37.0
501-2000	1125±228.6	3	15.8	-	-	1	50.0	4	14.8
>2001	4533.3±756.1	3	15.8	3	50.0	-	-	6	22.2
General	1337.2±376.2	19	100.0	6	100.0	2	100.0	27	100.0

Table 5. Workbench and Machinery Used in Production

Workbench-Machine	Change limits of production years of machinery	Antalya		Burdur		Isparta		Total	
		Num. of machines	Num. of Manufac.	Num. of machines	Num. of Manufac.	Num. of machines	Num. of Manufac.	Num. of machines	Num. of Manufac.
Plas.inj. Mac.	1980-2009	28	10	10	4	-	-	38	14
Compressor	1978-2009	29	19	10	6	2	2	41	27
Drying Cab.	1990-2008	6	5	2	1	-	-	8	6
Plas.Granu.	1990-2003	3	3	3	2	-	-	6	5
Plas. Crush mac.	1990-2008	15	12	6	3	1	1	22	16
Extruder	1982-2009	40	15	22	4	1	1	63	20
Weld mac.	1980-2009	60	19	18	5	2	1	80	25
Plasma arc weld. Mac.	2007-2009	4	4	2	2	-	-	6	6
Lathe	1978-2007	10	7	6	4	-	-	16	11
CNC Benchs	1999-2002	-	-	2	1	-	-	2	1
Drilling Mac.	1980-2009	17	11	6	3	1	1	24	15
Milling Mac.	1992-2000	1	1	2	1	-	-	3	2
Threading mac.	2000-2005	-	-	-	-	1	1	1	1
Sawhorse	1990-2009	15	14	5	5	1	1	21	20
Guillotine cutter.	1989-2008	4	2	1	1	-	-	5	3
Rotary Bender	1999-2008	4	3	1	1	1	1	6	5
Press	1980-2005	23	7	9	2	-	-	32	
Total	1980-2009	259	-	105	-	10	-	374	27

When the covered area is considered 201-500 m^2 group shows the highest intensity by the rate of 37% (Table 4). Under 200 m^2 group watchs this group by the rate of 26%. And 6 of the total 27 manufacturers have covered area which is more than 2000 m^2. 59% of manufacturers are operating in their own property and 41% of manufacturers are operating in rented places. 18% of manufacturers are located in organized industry zones, 52% of manufacturers are in industrial sites and 30% of manufacturers are located in out of industrial zones.

Existence of Workbench and Machinery

The distrubition of machinery and machine tools which is used in different stages of manufacturing was given at Table 5.

Seventeen different types of machines totally 374 units have been identified in total 27 manufacturers in the research region (Table 5). The production years of machinery vary between the years of 1980-2009. The most available machinery at manufacturers are 80 units welding machines, 63 units extruders which is called extrusion machine, 41 units compressors and

38 units plastic injection machines respectively. The types of machinery which is used in welding mostly; flux cored arc welding, submerged arc welding, inverter welding, arc welding and spot welding machines. Totally 20 manufacturers have extruders. Extruders are used in the manufacturing of drip irrigation pipes, irrigation and sprinkler irrigation pipes. Extrusion machines named as extruders that provides to produce plastic products at the same sector. The main parts of extrusion machines are hopper, screw, barrel, cooling and vacuuming unit and shrinkage unit (Anonymous, 2006).

The lowest amounts of machines are threading machine (1 unit), CNC bench (2 unit), milling machine (3 unit) and guillotine cutter (5 unit) in manufacturers. Total 14 manufacturers have plastic injection machines. This machines is used for dripper manufacturing. Some of manufacturers who have low capacity don't have plastic injection machines. Therefore instead of manufacturing, they buy their drippers.

Plastic crushing machines, plastic granulators, plastic injection machines and extruders are take place in irrigation pipe manufacturers. These machines are not found in conventional agricultural machinery manufacturers (Arın et al., 1998; Akıncı et al., 2001; Ergüneş et al., 1994; Aybek et al., 2001). Filter manufacturers buy some of metal parts processed and ready which is used in filter components. For this reason the number of CNC and milling machines that can be said to be low. The quantity of irrigation components production and annual production of 2009 was given at the Table 6 and 7. Manufacturers usually produce for single product group. The product groups consist of steel and plastic based materials. Seventeen of manufacturers produce irrigation pipes, 10 manufacturer produce irrigation filters. Three manufacturer produce both of filters and pipes. Hydrocyclones, tanks and filters are made of steel materials as it seen in Table 6. Total 40301 unit filters are manufactured in 2009. Disc filter manufacturing has the lead with the number of 13800 units. In addition three manufacturers produce irrigation pipe roller machine with the number of 975 units. Irrigation pipe roller machines are used for assembling and laying the pipes.

Irrigation pipes and drippers are manufactured from plastic materials. Irrigation pipes are manufactured at different thickness and diameters. The diameters of irrigation pipes; 16-125 mm, thickness of pipes; 1.14-7.45 mm, the diameters of sprinkler pipes; 75-160 mm and the thickness of pipes are vary between 2.30-6.54 mm. The diameter of drip irrigation pipes; 16-20mm and thickness are produced between 0.5-1.5 mm. Annual irrigation pipe production was given with the unit of mass (ton) instead of lenght (m). In this context total 20 manufacturers have manufactured 12598 ton irrigation pipes in 2009. Some manufacturers who have plastic injection machines produce their own drippers. The production quantities of drippers was not determined. But it was determined that 780 ton plastic material has been used for dripper production by 6 manufacturers. (Table 7).

Table 6. The Quantity of Hydrocyclone, Tank and Filter Production (2009).

Comp. of Pressurized Irrigation System	Antalya			Burdur			Isparta			General		
	Prod. (unit)	Num. of manuf. (unit)	unit/ manuf.	Prod. (unit)	Num. of manuf. (unit)	unit/ manuf.	Prod. (unit)	Num. of manuf. (unit)	unit/ manuf.	Prod. (unit)	Num. of manuf. (unit)	unit/ manuf.
Hydro cyclone	6505	7	929	220	2	110	30	1	30	6755	10	676
Fertilizer tank	7118	7	1017	240	2	120	100	1	100	7458	10	746
Media (moss) filter	2773	3	924	32	1	32	25	1	25	2830	5	566
Disc filter	13600	7	1943	200	1	200	-	-		13800	8	1725
Screen filter	9233	7	1319	25	1	25	200	1	200	9458	9	1051
Total	39229			717			355			40301		

Table 7. The Quantity of Irrigation Pipe Production (2009).

Comp. of Pressurized Irrigation System	Antalya			Burdur			Isparta			Genel		
	Prod. (ton)	Num. of manuf. (unit)	ton/ manuf.	Prod. (ton)	Num. of manuf. (unit)	ton/ manuf.	Prod. (ton)	Num. of manuf. (unit)	ton/ manuf.	Prod. (ton)	Num. of manuf. (unit)	ton/ manuf.
Irrigation Pipe*	5408	15	361	7170	4	1793	20	1	20	12598	20	630

Antalya province has the leader at filter manufacturing. And Burdur city has the highest production rate at irrigation pipes.

The largest manufacturer of drip irrigation pipes has been identified at Burdur city (Table 2). The high production capacity (6600 ton) of this manufacturer increases the quantity of production per manufacturer in Burdur city. It is determined that the manufacturers which have the lowest capacity is located in Isparta city.

Manufacturing Periods

Agricultural production has a close relationship with manufacturing periods. Manufacturing is increasing depending on demand in irrigation seasons. Pressurized irrigation systems are used frequently in greenhouses, open production fields and orchards. Manufacturing in spring and summer (March-July) is more intensive than the other seasons. Manufacturing periods are prolonged until the end of October at some manufacturers which are located in intensive greenhouse production areas.

Energy Consumption

Manufacturers's main energy resource is electricity. Annual electric consumptions are given at Table 8. Between 50.000-500.000 kWh energy are consumed by 63% of manufacturers in a year. Irrigation pipe manufacturers consume higher electric energy according to the irrigation filter manufacturers. The main reason of this high consumption is extruders. Extruder's heaters use electric energy to heat. Heating process, increases the energy consumption.

Supply Centers

Plastic and steel based materials are used in manufacturing depending on product design. Polyethylene (PE32, 63, 80, 100) is prefered intensively in irrigation pipe manufacturing. Flat sheet metal, certain diameter and thickness of pipes are the main materials which are used in irrigation filter manufacturing. St37 steel is frequently used in filters. 90% of raw material is met by domestic market. The main domestic suppliers are in Istanbul, Konya, Izmir, Antalya, Isparta and Burdur cities. A manufacturer which is located in Burdur meets the raw material requirement in Greece and European Union Countries by the percent of 70%. The remaining 30% of raw material are supplied by PETKİM (Petrochemical Industry). Seven percent of manufacturers prefer Iran and Arab Countries in material supply because of economical reasons.

Furthermore it is observed that recycled plastic named as waste plastics are widely used in irrigation pipe manufacturing by low-capacity manufacturers. Waste plastic material is preferred for lower costs in production.

Used greenhouse films, plastic bags, plastic cans, packaging residues, solid wastes etc. are collected and then processed into granules. This granules are mixed in certain ratios with high quality raw material or directly used in irrigation pipe manufacturing. Waste plastics are recycled by this method and the environmental pollution is prevented which is caused by plastic materials. But the use of recycling materials in production should be done in a controlled manner. The uncontrolled production may be caused quality problems and it was determined that this applications lead to unfair competition.

Sales and Marketing Methods

It is reported that manufacturers which is located in West Mediterranean region mostly (66%) manufacturing on order. Other manufacturers produce both stock and on order. There is an important potential in the region. Therefore the low-capacity manufacturers sale their products locally. Some of manufacturers which are located in Antalya perform production for outer countries. It is determined that total 3 manufacturers export their products to Cyprus, Azerbaijan, Turkish Republics and Arab countries.

Table 8. The usage of annual electric energy

Energy Consumption (kWh/years)	Average	Number of manufacturers				
		Antalya	Burdur	Isparta	Total	%
<50000	22000±6610	1	2	2	5	18.5
50000-500000	160228±31060	14	3	-	17	63.0
>500000	847777±81604	4	1		5	18.5
Total	261954±60579	19	6	2	27	100.0

Sales are performed with dealers. Nine manufacturers have employed salesman for marketing. A high capacity manufacturer has established regional offices for domestic marketing. Besides low-capacity 5 manufacturers sale their products directly to the farmers. Sales which are except dealers and direct sales are performed by agricultural cooperatives and municipalities etc. Furty four percent of manufacturers have test report about their products and it has been determined that 22% of manufacturers has applied for test report. Also 30% of manufacturers have TSE, ISO 9001 certificates. Furthermore it is determined that two manufacturers are working with universities and consultancy companies for product development in their R&D activities. 6 patent and 1 utility model has taken about irrigation systems by manufacturers.

After Sales Services

Thirty percent of manufacturers provides full support and warranty. Faulty manufactured products are changed with new ones. Warranty period was determined 2 years in irrigation filters and 5 years in irrigation pipes. The warranty period is similar with other manufacturers but the support is without bound to a document just with saying. If a defect or failure occurs during operation in irrigation systems, problem is solved by bringing the product to factory. High capacity three manufacturers have mobile services in the region at irrigation period.

Another activities out of irrigation systems

Sixty three percent of manufacturers produce only pressurized irrigation system components. In addition to the products of irrigation system, the main manufacturing is produce and repair of agricultural machinery, manufacture of auto lift, lpg tank and tractor mounted front loader. Thirty percent of irrigation pipe manufacturers also produce conduits.

Additionally PVC door and windows are produced and sold by one of manufacturers. Also irrigation project design and application consultancy service is provided.

Production, Sale and After Sale Problems

The major problems of manufacturers during production stages are listed as below.

The unconformity to the standards of materials which is used in production,

The lack of training institutions for plastic industry,

Financial deficiency for proper material supplying,

Supply problems of spare parts,

The inability of personnel which is trained for plastic manufacturing and

The high costs in transportation and delays in shipping.

Additionally electric shortages are a major problem for irrigation pipe manufacturers which are located out of industrial zones. In this case the capacities of extruders are decreasing and losses are increasing.

Manufacturers use their capital stock in production. Also bank credits, KOSGEB (Development Union of Small and Mid Sized Companies), TESKOMB (The Union of Credit and Guarantee Cooperatives For Tradesmen and Craftsmen of Turkey) credits have been used. It is determined that the usage rates of credits are respectively 22, 48 and 4%.

The term-sales, long term-payments and the use of waste plastic material are the main sales problems.

The use of waste plastic materials with inappropriate ratios and qualities lead to enter cheap and poor quality products to market. Instead of quality, price is mostly mentioned by farmers during sales. This causes unfair competitions. As a result of this poor quality products are increasing in market. The main after sales problems are; incorrect installation, the use of irrigation systems with improper pressures and inappropriate staff selection. Basis of the mentioned problems is inaccurate use of irrigation systems. In this context a training should be given to farmers which includes basic information about irrigation systems.

Future Perspectives

The targets of low-capacity manufacturers which are operating in the region are; to increase production capacity, enlarge the production area, exceed the local manufacturing, make sales to other regions and increase the market share. The high capacity manufacturers aim to increase national and international market share and production capacity. It is reported that manufacturers wanted to carry out projects with the related departments of universities according to product requirements of the market. And they also wanted to establish research laboratory for R&D activities.

CONCLUSIONS

The interest of farmers on pressurized irrigation systems instead of surface irrigation methods which is widely used in Turkey's agriculture have increased. Domestic products are widely used in pressurized irrigation systems. In this context, West Mediterraen Region is one of important manufacturing centers. A questionnaire study was conducted with totally 27 manufacturers in the region which covers Antalya, Burdur and Isparta provinces.

It was determined that nearly half of the manufacturers are unlimited company and other half is limited company. Seventy percent of manufacturers are located in Antalya. Total 361 personnel is employed in the region. Considering the employment of technical personnel, engineers are employed by 9 manufacturers and technicians are employed by 4 manufacturer. Total 374 units in 17 different types of machinery is used in manufacturing stages. Sixty three percent of production consist of irrigation pipes. Irrigation filters production rate was 37%. Eleven percent of companies are manufacturing both of irrigation pipes and filters. 40301 unit irrigation filters were manufactured in 2009. Total manufacturing of irrigation pipes were 12598 ton. Sixty three percent of manufacturers consume electric energy between 50,000-500,000 kWh annualy. Extruders which are used in irrigation pipe manufacturing use electricity in heating systems. It was determined that this is reason for the increase in energy consumption.

Fourty four percent of manufacturers have test report about their products and it has been determined that 22% of manufacturers has applied for test report. Also 30% of manufacturers have TSE, ISO 9001 certificates. Six patent and one utility model has taken about irrigation systems by manufacturers. Companies were aware of the importance of quality and patent issues but it was determined that because of the market conditions and competition they can compromise on quality.

Waste plastic material which is described as recycled plastics are widely used in manufacturing. In the uncontrolled manufacturing, quality problems are experienced. The use of waste materials have led to unfair competitions. Waste materials usage should bedone in a controlled ways. Improper use of products is one of the most common aftersales problems. In this regard the trainings which includes basic information about irrigation systems should be given to farmers.

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