



Material Requirement Planning in a Briquette Factory

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ABSTRACT

In this study, material requirement planning was carried out for a company that produces briquette, uses several main products and hundreds of raw materials and semi-finished products. The fact that material requirements planning is not applied at the moment is causing the production of customer complaints, causing disturbances and confusion in stocks. This situation, which resulted in poor performance on behalf of the company, made material requirement planning inevitable. For the study, the company's current situation was analyzed first. Using the data obtained afterwards, a regular MRP system was established with Akinsoft Wolvox ERP program and the resulting results were analyzed. The problems encountered are solved by the Akinsoft Wolvox ERP program, in which MRP production is made more efficient and faster than the normal structure, customer satisfaction is increased and inventory confusion is prevented.

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1. Introduction

Factors such as sustainability of production, management of orders, efficient use of time, equipment and financing are among the important factors of the companies. Companies have been competing in the marketing conditions on the market, causing the products to adopt the production system according to the usage requirement and the customer's order.

For this reason, for the product produced; material properties such as weight, shape, type, intermixing must be taken into consideration, although certain areas are used for storage of the required materials. The provision of such needs was made possible by the introduction of the first MRP (Material Requirements Planning) software in the 1960s with the spread of computers in businesses [1]. Since the 1990s, the calculation of material requirements with the help of softwares has brought to the service of the companies with today's advanced software with Enterprise

Resource Planning (ERP) software [2]. MRP application is the most basic application used by enterprises producing goods or services. MRP is a system that gives answers to questions such as when a product is produced, how much raw material is needed, and when is the right time to ensure continuity in business. However, each company has its own unique software options, the need to change the operating system factors such as MRP is done in a firm. In this study, we tried to determine the problems and determine the needs of the briquette product in order to prevent the problems in the material requirement planning and to analyze the current situation. The data obtained in the direction of the determined needs were processed into the computer program and the material requirement planning was done. In this context, it is aimed that the production system is specific in terms of employees and managers.

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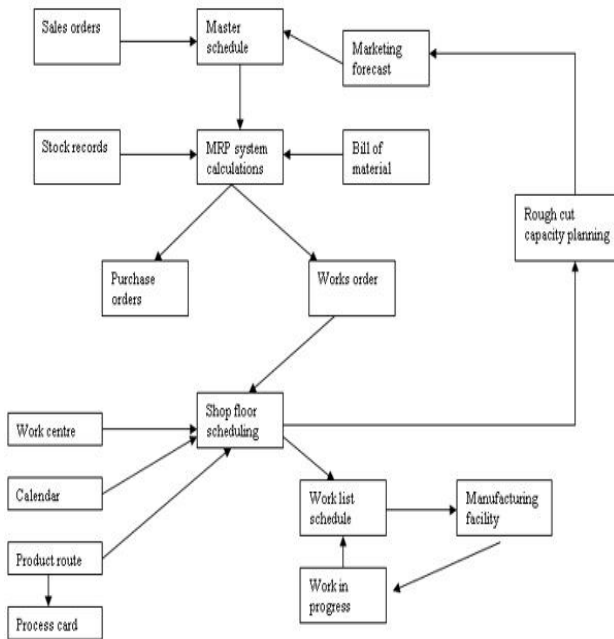


Figure 1. MRP System Structure [3]

As shown in Figure 1, MRP softwares consist of many modules that are systematically linked to each other and actively generated. All of the modules use a common database. In our operation, we first examined the existing production system, analyzed the operations that need to be done, and then arranged the system on the products so that the products and employees were made compatible with the system.

In the following sections of the study, firstly literature will be included and the application process will be explained step by step under the heading of material and method. In the material and method section, the problems that can be encountered in MRP software and explanations of solutions are given. In the final part of the study, the positive results obtained by the establishment of the MRP system in the enterprise are included and the forecasts for future production are stated.

2. Literature Review

In 2006, Bayraktar and Efe studied Enterprise Resource Planning software in their work. In the study, the critical factors related to the benefits and the selection process that the ERP system can provide, which can guide the managers who are considering adapting the ERP system to the institution, are emphasized. Turkey element in the current environment, and arranged in accordance with the foreign literature was brought to the attention of decision makers [4].

Çağlıyan explored the basic literature information about ERP in 2012 and explored the effect of the software on the operating performance of the software used by the site using ERP software and by examining the state before and

after application of this software. It is seen that the ERP software used as a result of the reviews and evaluations made has significant effects on the performance criteria of the operator [5].

Sudhaman and Thangavel used their Data Envelopment Analysis Fixed Income Scale (DEA CRS) model in 2015 to analyze the efficiency of ERP projects based on quality measures (defect counts) and to identify the most efficient ERP projects. Such projects can serve as potential role models, and the quality processes of these projects can be adopted by future ERP projects that will lead to successful implementation. Findings are both practical and the results are discussed for research and they have suggested the possible areas for future research [6].

In the study they conducted in 2016, Verma and Kumar considered the control system as two prospectively. The first is the interactive control system and the second is the diagnostic control system. These two control systems support the implementation of ERP. The interactive control system supports organizational change and increases employee motivation for ERP implementation while monitoring the results of the diagnostic control system. Based on the existing literature review, they investigated the role of the management control system (MCS) in implementing ERP projects in organizations that can improve organizational performance [7].

3. Materials and Methods

The main work of the study was carried out in an operation which is briquette. In addition to producing briquettes in all sizes, ponza stone, asmolin, key paving stone, pavement and refuge. The company has a drying area of about 1000 m² and has an area of 2500 m² in total together with the areas where the materials are placed [8]. Akinsoft Wolvox ERP program was used during the establishment phase of the MRP system after the analysis of the current situation in the operation. Program modules: Current, Current 2, Cashier, Inventory, Inventory 2, Invoice, Check-Bills, Waybill, Bid, Order, Exchange Tracking, Foreign Exchange Depot, Location, Bank, Cardotex (Barcode printing) Tracking, Installment Tracking, Serial Billing, Service, Production, Bonus System, Tube-Water Tracking, MRPII, CRM, Chain Marketing modules.

3.1. Problems Faced During Operation of MRP System

Among the main problems that can be encountered in MRP activities are the inability of users to use new systems, the inefficiency of staff to effectively use the program, the inconveniences that may arise in the software system, the lack of production and software on the same platform, user-inadequate knowledge of the field, and the weakness of communication among the staff. In order to solve the

problems arising from these reasons, the MRP system should be transferred.

The foresight in this system should be taken into consideration when facilitating the responsibilities of all the employees working in the company and by explaining the desired qualities more easily. Characteristics such as production system of companies, products produced, characteristics of employees, raw materials used in production, production processes, customer supply systems, customer profiles are different from each other. Therefore, the problems and constraints of each company are completely different from each other. It is extremely important that the ERP software used for this reason can be addressed to the sub-units within each company and company, and that the scope is broad.

The ERP software used in the company must be available to the user in a comfortable manner. Careful attention has been paid to the selection of programs in the study. The limitations in the system of the ERP software used can be changed by the user and this change can be monitored by the authorized user. For this reason, the arrangements and the process time of the production process can be done in a timely manner, and the firm can effectively be assigned under its own structure while creating the task distribution without need of the software company.

A brief training on the ERP software has been given to the staff who relates the program because of the mistakes the user may make. In order to avoid any mistakes that may occur, the trainings given should be regular and the system should be fully adopted by the employees.

3.2. Performing Definitions in the Software Program

In order for the operator to operate more safely and regularly, company information and briquette production flow must be transferred to the computer. It is necessary to create the company's record first when starting to apply. After defining our company, we have to define as stocks such as all main materials, materials to be produced from stock definitions so that we can do operations such as making production, getting products, selling products. The unit definitions of the raw materials to be used should not be forgotten. Unit definitions will benefit us in the field of accounting in transactions such as buying and selling raw materials. The storage area of the raw materials should be determined by adding to the different storage system in order to stock the raw materials to be used. Authorization will only be made for authorized persons to access the warehouse. In this way, the flow of products in the company will be monitored using different warehouses for raw materials and products.

After the current currency definitions have been made, the currencies we have defined will display the current TL conversion. At this stage, we can also incorporate the

information of the banks we work with in the system. After this process, we will have to create a current list of products for shopping. Entering your account information such as account information, photos, special discount application, etc. to the system in an up-to-date manner will facilitate us in product marketing. A sample screenshot of the current definitions is shown in Figure 2.

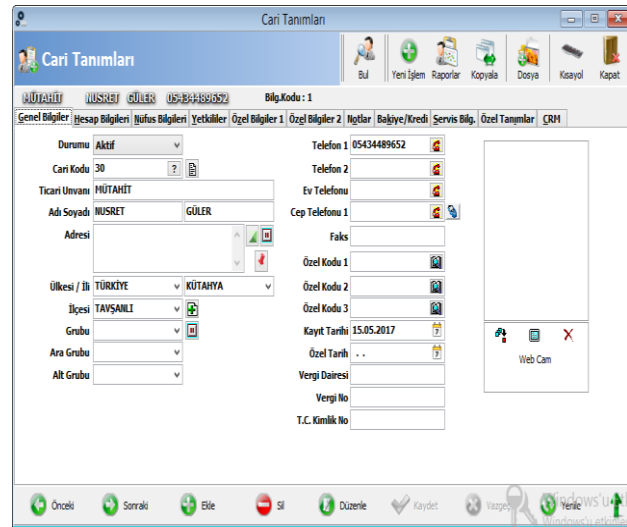


Figure2. Sample screenshot for current definitions

3.3. Production Process Phase

At this stage, the working periods of the machines are primarily determined. Calculations were made to calculate the amount of electricity consumed by the machines and to operate the machines in the most efficient and safe way. Official holidays, festivals are written in program and official holidays are worked for, automatic payment of overtime rates is provided, or the production schedule and order schedule are adjusted accordingly and warned before the holiday on the desired day. For the production of the briquette product, information such as the raw material requirement and the timing is recorded. In the same way, the break times of employees are determined and production planning can be provided in a more systematic way. As a result of the raw materials that make up the product, the product is in the system as a single product in which all the processes are performed. This new product can be used for purchase-sale operations without production. Following the quality reports, the quality of the new product was followed and customer satisfaction was increased in this way. Figure 3 shows a screenshot of the briquetting product tree created by entering related information in the software program. It is necessary to carry out the steps to produce one briquette to be clearly understood.

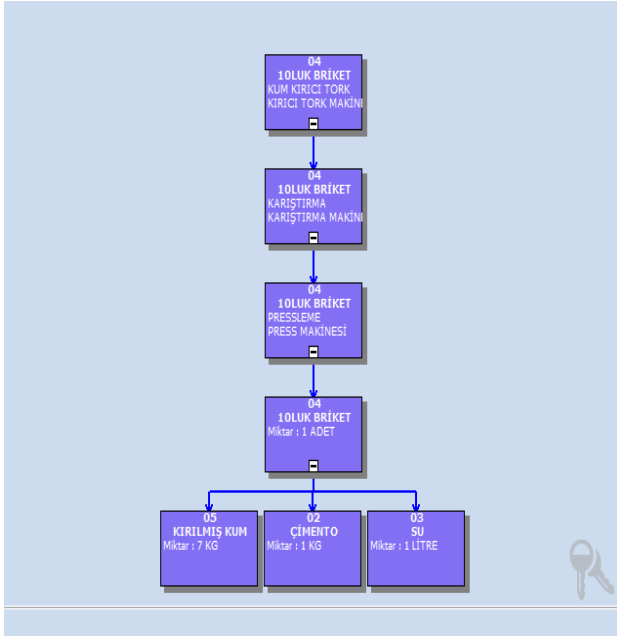


Figure 3. Product tree created in the software program for briquette production

3.4. Purchase / Sales Stage

We will use sand, cement, water stocks to purchase inventory added to inventory. The products we purchased are automatically added to our depot because the invoice is cut off. We registered DEPO1 because we registered the products we purchased as DEPO1.

The current order can be selected from the current list in order to make a sale. We will buy what we buy as stock and as stock amount, and order is taken after this. Figure 4 shows a screenshot of the warehouse movement report. A current list of orders received was created so that the sales process of the product can be realized as clearly understood.

Açıklama	Üyel	Sıra No	Stok Kodu	Stok Adı	Depo	Entegrasyon İşlem Tarihi	İşlem Miktarı	Birim	Temel Mik.	Temel Birim	Entegr. No	Üzel Kodu	Açıkl.
Fibrolama	Barketerler	03	SU	DEPO 1		15.5.2017 14:59:27	Gırs	100,000	LİTRE	100,000	LİTRE	SP0003	
		05	KIRILMIŞ KUM	DEPO 1		15.5.2017 15:01:27	Gırs	100,000	KG	100,000	KG	SP0004	
Stok Adı		04	10LUK BRIKET	DEPO 1		15.5.2017 16:10:38	Gırs	20,000	ADET	20,000	ADET	SP0005	
		06	10LUK BRIKET	DEPO 1		15.5.2017 16:12:07	Gırs	30,000	ADET	30,000	ADET	SP0006	
Stok Kodu		06	10LUK BRIKET	DEPO 1	Fatura	15.5.2017 16:37:16	(Ağ)	150	ADET	150	ADET	SP0001	19LU
		04	10LUK BRIKET	DEPO 1	Baskı Üretim	16.5.2017 22:43:40	(Ağ)	1	ADET	1	ADET	BUR0007	04 1
Çıktı		01	KUM	DEPO 1	Baskı Üretim	16.5.2017 22:43:40	(Ağ)	10	KG	10	KG	BUR0007	04 1
Ara Çıktı		02	ÇİMENTO	DEPO 1	Baskı Üretim	16.5.2017 22:43:40	(Ağ)	10	KG	10	KG	BUR0007	04 1
Alt Çıktı		03	SU	DEPO 1	Baskı Üretim	16.5.2017 22:43:40	(Ağ)	1	LİTRE	1	LİTRE	BUR0007	04 1
Üzel Kodu 1		06	10LUK BRIKET	DEPO 1	Baskı Üretim	16.5.2017 22:50:31	(Ağ)	20	ADET	20	ADET	BUR0009	06 1
Üzel Kodu 2		01	KUM	DEPO 1	Baskı Üretim	16.5.2017 22:50:31	(Ağ)	9	KG	9	KG	BUR0009	06 1
Üzel Kodu 3		02	ÇİMENTO	DEPO 1	Baskı Üretim	16.5.2017 22:50:31	(Ağ)	1	KG	1	KG	BUR0009	06 1
		03	SU	DEPO 1	Baskı Üretim	16.5.2017 22:50:31	(Ağ)	1	LİTRE	1	LİTRE	BUR0009	06 1
Parkezi		06	10LUK BRIKET	DEPO 1	Baskı Üretim	16.5.2017 13:35:18	(Ağ)	1	ADET	1	ADET	BUR0010	06 1
		01	KUM	DEPO 1	Baskı Üretim	16.5.2017 13:35:18	(Ağ)	9	KG	9	KG	BUR0010	06 1
Modeli		02	ÇİMENTO	DEPO 1	Baskı Üretim	16.5.2017 13:35:18	(Ağ)	1	KG	1	KG	BUR0010	06 1
		03	SU	DEPO 1	Baskı Üretim	16.5.2017 13:35:18	(Ağ)	1	LİTRE	1	LİTRE	BUR0010	06 1
Depo Adı: DEPO 1		01	KUM	DEPO 1	Fatura	21.5.2017 22:29:35	(Ağ)	10,000	KG	10,000	KG	AF0001	K0P1
		04	10LUK BRIKET	DEPO 1	Fatura	18.5.2017 14:29:36	(Ağ)	20,000	ADET	20,000	ADET	SP0003	10LU
		04	10LUK BRIKET	DEPO 1	Fatura	18.5.2017 13:47:03	(Ağ)	20	ADET	20	ADET	SP0002	10LU
		06	10LUK BRIKET	DEPO 1	Fatura	18.5.2017 13:47:03	(Ağ)	25	ADET	25	ADET	SP0002	10LU
		03	SU	DEPO 1	Fatura	18.5.2017 14:57:36	(Ağ)	1,000	LİTRE	1,000	LİTRE	SP0007	10LU
		06	10LUK BRIKET	DEPO 1	Fatura	18.5.2017 15:04:25	(Ağ)	150	ADET	150	ADET	SP0004	19LU
		06	10LUK BRIKET	DEPO 1	Fatura	18.5.2017 15:04:46	(Ağ)	150	ADET	150	ADET	SP0005	19LU
		01	KUM	DEPO 1	Fatura	23.5.2017 18:31:05	(Ağ)	50,000	KG	50,000	KG	AF0002	K0P1
		02	ÇİMENTO	DEPO 1	Fatura	23.5.2017 18:31:05	(Ağ)	50,000	KG	50,000	KG	AF0002	K0P1
		03	SU	DEPO 1	Fatura	23.5.2017 18:31:05	(Ağ)	50,000	LİTRE	50,000	LİTRE	AF0002	K0P1

Figure 4. Operator's warehouse movement report

3.5. The Process of Creating Work Orders

In order to make a new production, we need to be able to determine the structure of the product we will produce first. After setting the stock, we need to use the recipe list where the materials, machines, and personnel to be used in production are located. After selecting the appropriate prescription, the amount of production is determined. After the unit cost is calculated, the production status information should be entered. Figure 5 shows the work order screen of the program to produce 10 pieces of 10 briquettes.

Üretim Kodu	MRP00004	Üretim Adı	04 - 10LUK BRİKET	Üretim Miktarı	10	
Stok Adı	10LUK BRİKET					
Makine Adı	Operasyon	Personel	Parti No	Başlama Zamanı	Bitiş Zamanı	Üretim Miktarı
KIRICI TORK	KUM KIRICI TORK			1 24.5.2017 08:00:00	24.5.2017 08:01:40	10
KARIŞTIRMA	KARIŞTIRMA			1 24.5.2017 08:01:40	24.5.2017 08:01:42	10
PRESS MAKİNESİ	PRESSLEME			1 24.5.2017 08:01:42	24.5.2017 08:02:32	10

Figure 5. 10-inch briquette production work order screen display

4. Conclusions

In today's marketing environment, market share, high performances can be achieved by delivering the products and services that the enterprises produce in time, minimum cost, optimum order quantity and best service condition and in the most appropriate time period. In this case, companies should concentrate on the production chain in terms of product supply, production stage and after-sales service, and products should be carried out in a collective manner. By using the produced products in a systematic and timely manner in competitive marketing conditions, the planning and processing stages of the products are provided as advantages in the competitive system. Therefore, the use of MRP (Material Requirements Planning) software gains importance in terms of the selected company when performance of value chain activities is increased. The software that will be used to make the system profitable for the company needs to meet the needs of the company. The results of the studies related to the company using MRP (Material Requirements Planning) software are as follows.

- The company that produces briquettes produced the products produced until 2017 with complex methods.
- The manual complex method slows down the production steps and reduces the efficiency of the machines used.
- After the installation of MRP software; ordering of materials and approval period, knowing the

- amount of material in the shipment and working time of the machines.
- iv. With the software installed in the production plan, significant gains have been achieved in examining stock data, material ordering, route operations and production planning, and employee vacation times.

References

1. <http://www.erpzamani.com/erp.php>
2. Akaydin, M., ve Okşan, D. (2008). “Denizli’de Kurulu Tekstil Ve Konfeksiyon İşletmelerinde Kurumsal Kaynak Planlama Sistemleri ve Uygulanabilirliği Üzerine Bir Araştırma”. *Journal of Textile & Apparel/Tekstil ve Konfeksiyon*, 18(3), 229-235.
3. <https://www.robabdul.com/logistics/mrp-manufacturing-requirements-planning/>
4. Bayraktar, E. ve Efe, M. (2006) “Kurumsal Kaynak Planlaması (ERP) ve Yazılım Seçim Süreci”, *Selçuk Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*, 15, 689-710
5. Çağlıyan, V. (2012) “Kurumsal Kaynak Planlama Yazılımı Kullanımının İşletme Performansı Üzerine Etkisi: Örnek Olay Çalışması”, *Niğde Üniversitesi İİBF Dergisi*, 2012, 5(1), 159- 178.
6. Sudhaman ve Thangavel (2015) “Efficiency analysis of ERP projects—software quality perspective”, *International Journal of Project Management*, 33(4), 961-970
7. Verma P., Kumar V., (2016), “The Role of Management Control System in ERP Project Implementation “*Proceedings of the 2016 International Conference on Industrial Engineering and Operations Management Kuala Lumpur, Malaysia, March 8-10, 2016*
8. <http://www.sedainsaatpazarlama.com/seda-insaat-osmaniye-p-6.html>