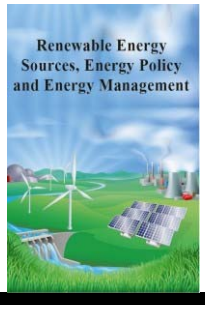
Renewable Energy Sources, Energy Policy and Energy Management

Issue: 1
June-2024
ISSN 2717-9583

e-ISSN: 2717-9583

Renewable Energy Sources Energy Policy and Energy Management

journal homepage: https://dergipark.org.tr/en/pub/resepem



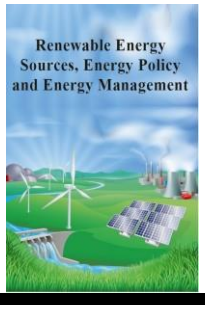
June, 2024

RESEPEM – EDITORIAL BOARD

e-ISSN: 2717-9583

Renewable Energy Sources Energy Policy and Energy Management

journal homepage: https://dergipark.org.tr/en/pub/resepem



CiteFactor
Academic Scientific Journals

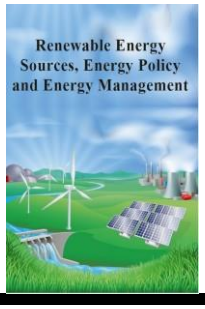
June, 2024

Contents

e-ISSN: 2717-9583

Renewable Energy Sources Energy Policy and Energy Management

journal homepage: https://dergipark.org.tr/en/pub/resepem



Research Article

IATF 16949 Certification of a Company in the Automotive Sector

Büşra Yılmaz[1*], Mustafa Acaroğlu[2]

[1] Selcuk University, Graduate School of Natural and Applied Science Institute Mechanical Engineering Department Kampüs Konya TURKIYE
[2] Selcuk University, Technology Faculty Mechanical Engineering Department Kampüs Konya TURKIYE

ARTICLE INFO

* Corresponding author
acaroglu@selcuk.edu.trr
Received 06 June 2024
Received in revised form
16 June 2024
Accepted 21 June 2024

Published by Editorial Board
Members of RESEPEM

ABSTRACT

The concept of quality, which we encounter in many areas in today's world, is also emerging due to the increasing market competition in the automotive sector. Manufacturers in the automotive industry are struggling with the ISO 9001 standard, which is not sufficient in a growing competitive environment, and different quality management systems of more than one country. IATF 16949 standard is a standard that covers processes such as production, design, improvement, assembly and service in the automotive industry with ISO 9001 standard of many leading automobile manufacturers.
The aim of this study is to complete the installation stages of the IATF 16949 standard by examining its technical requirements considering its importance. By examining the articles of the IATF 16949 standard, an application that will be an example for companies has been made.

Keywords: IATF 16949, ISO 9001, quality process, internal process, customer

1. Introduction

In today's conditions, the main focus of companies is a market where they can compete and customers whose demands are increasing. Customers are also interested in the quality of the product, the life cycle from the source of the raw material to its delivery and recycling conditions. Quality management systems have made it a goal to continuously improve product quality depending on customer needs. Quality management systems are proof that both improvements are made, and demands are met.

The automotive sector has to follow developing technologies. With developing technologies, it is looking for management systems to reduce costs, increase profitability and achieve perfection. Quality management system standards are written guidelines.

IATF 16949 Quality management system is a system established in the automotive sector to meet customer demands for products manufactured. It is an internationally accepted quality management system in the automotive sector.[1]

The quality management system (QMS) is a long-standing issue in automotive main and sub-industry relations. Continuous efforts are being made to create a quality management system that will be accepted by all stakeholders in the automotive sector. The lack of an international QMS for the automotive sector has led each country's automotive industry to create its own QMS. Germany created a Quality Management System with VDA 6.1, while General Motors, Ford and Chrysler later created the QS 9000 system. Again, Italy's AVSQ and France's EAQF quality management systems can be given as examples.[2]

With quality management systems belonging to more than one country, especially automotive sub-industry companies have been undecided for a long time about what kind of certification they should have in their businesses or which quality management system should be established in their companies. Sub-industry

companies that try to organize their company certifications according to main industry companies have applied for QS 9000 and VDA 6.1 certification after obtaining the ISO 9001 certificate, which forms the sub-base.

More than one certificate and too much variety of inspections have forced sub-industry companies to incur large expenses, and at the same time, companies have been forced to deal with constant different inspections and paperwork. This issue, which carries a great burden on companies, has been voiced on various platforms by all companies operating in the automotive sub-industry, and the demand for unification in certifications and reduction of inspections has been adopted as a common idea.

In the automotive sector, it must be proven with various quality management system documents that the production of parts and services used on vehicles meets quality requirements and customer special requests in all sectors.

There was a disagreement between Europe and America on the establishment of a common main standard, Germany (VDA) did not accept QS 9000, which was valid in the Americas, and insisted that German standards should be the basis of the common standard to be established. Again, upon the joint decisions of the sub-industry companies, working groups were established and the establishment of a technical standard that could be accepted by all countries in the world in the automotive industry began. Later, both countries accepted ISO/TS 16949.[3-6]

The automotive main industry has had many expectations from sub-industry companies. In particular, expectations include important demands such as full compliance with existing features, product delivery in the shortest time, and costs that need to be reduced over time. In order to implement all these demands, production can be carried out in a planned and simple manner, and all risks can be evaluated by taking into account all stages of the supply chain. At this point, it has become necessary to create a quality management system with a systematic structure in the design, production, and quality stages.[3-6]

1.2. IATF 16949 Standard Basic Titles

IATF 16949 was created to meet the special requirements of automobile manufacturers. This standard is generally compatible with the ISO 9001:2015 standard.[7, 8]

Article 1 – Scope: This section of the standard includes additional requirements for the automotive sector in addition to ISO 9001:2015. It covers the requirements of a quality management system specifically related to the automotive sector. It is seen that it includes additional information about the necessary annexes for the automotive industry; customer-specific requests, and processes from product design to service.

Article 2 – Normative and Informative References: References are made to the ISO 9001:2015 Quality Management System in the standard.

Article 3 – Terms and Definitions: Terms and definitions used within the scope of the standard are explained. Terms specific to the automotive sector that differ from ISO 9001:2015 are defined in this section.

Article 4 – Context of the Organization: In this section, the organization's purpose, current customer potential and production, targets and policies are clearly determined. Topics such as understanding the organization's context, understanding the expectations and needs of relevant parties, determining the scope of the quality management system, the organization's processes and process conformity, product safety and customer-specific requests are examined in detail.

Article 5 – Leadership: Institutional roles, responsibilities and authorities, process owners' mastery of their processes and process owners' competencies, and issues related to quality policies are examined in detail. The duties of management regarding making necessary appointments for product requirements and corrective actions are mentioned.

Article 6 – Planning: Risk analyses, activities determining risks and opportunities, contingency plans, determining the company's quality targets and making the necessary planning to achieve these targets, defining the resources and responsibilities required to achieve the targets are examined in detail in this section.

Article 7 – Support: The support item is generally the section where the determination of the resources required in the processes from the establishment of the Quality Management System to its continuous improvement is examined in detail. It is the section where human, infrastructure, workshop, facility and equipment planning is made, and whether the processes are carried out in suitable environments and with equipment is monitored and recorded. Measurement System Analysis (MSA) is the stage where calibration accuracies and traceability, internal and external laboratory conditions are determined. Special definitions for the automotive sector such as on-the-job training, internal auditor competence, second-party auditor competence are in this section. Important issues such as employee motivation and authorizations, personnel awareness, documented information, internal record keeping policies, specifications and internal company

communication are comprehensively examined in the support article.

Article 8 – Operation: operational planning and control to meet the necessary conditions for the provision of products and services, determination of conditions for products and services, communication with the customer, customer special requests, the organization's manufacturing feasibility, requirements for products and services, design and development of products and services, control, presentation, market launch and control of non-conforming outputs, supplier evaluation are examined in this section.

Article 9 – Performance Evaluation: This section consists of three basic articles. Monitoring, measurement, analysis and evaluation form the basis of this section. The methods that the organization should follow in accordance with advanced product quality planning, the determination of appropriate statistical tools for analysis and evaluations and the creation of risk analyses, customer satisfaction and management review are examined in detail in this section.

Article 10 – Improvement: In this section, continuous improvement issues such as nonconformity and corrective action, problem solving, error prevention, and analysis of customer complaints are examined in detail.

The basis of the IATF 16949 standard is based on ISO 9001:2015. Organizations that produce for the automotive main industry and sub-industry must be established in an integrated manner with the ISO 9001 standard. Compared to ISO 9001, the IATF 16949 standard is more difficult.[9]

The IATF 16949 quality management system standard is a standard that aims to meet the expectations of customers in the sector and eliminate redundant documentation. IATF evaluated IATF 16949:2016 certification data in the automotive sector by country and reported that there were 94,286 certified businesses in the world as of 20.03.2024. The highest certification certificate belongs to Asian countries with a rate of 77.28%. Turkey ranks 1st in the Middle East region with 1180 certified businesses. The highest number of certified businesses is in China. The number of companies with IATF 16949:2016 certification by country worldwide is shown in Figure 1.[8, 10-13]

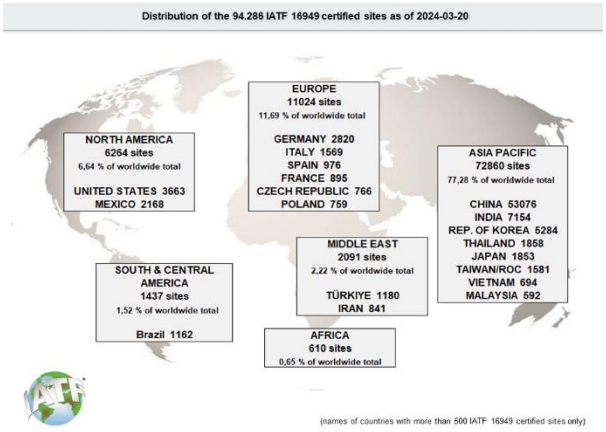


Figure 1: Number of Certificates by Continent and Country [8]

2. Introduction of the Organization

The company is a 55-year-old business located in Konya. After a journey of many years, today it has the experience, knowledge and technological power to work with world giants. Starting with the production of engine spare parts (for example: washers and gaskets), today it has become capable of producing many parts of commercial vehicles and continues to grow by adding new products and product groups to its production portfolio every year. In the last 5 years, it has also established sales points, warehouses and logistics centers in Bursa and Istanbul, the heart of the automotive sector.

With its modern facilities, wide and technological machine park, hundreds of employees and a facility covering a large area exceeding 120,000 m2, it manufactures in different locations and produces the products needed by the automotive industry. As of 2018, it has been among the top 1000 export companies and among the top 1000 manufacturing companies in sales from production. The system titles produced are.

- Clutch System and Subsystems
- Steering System and Subsystems
- Exhaust System and Subsystems
- Electrical System
- Brake Caliper
- Brake System and Subsystems
- Air Brake Compressor System and Subsystems
- Engine System and Subsystems
- Hub System and Subsystems
- Cooling System and Subsystems
- Suspension System and Subsystems
- Transmission System and Subsystems
- Chassis System and Subsystems
- Fuel System and Subsystems

3. Research Results And Discussion

The purpose of this thesis is to explain the importance and articles of the IATF 16949 Quality Management System standard, to check the additional requirements that come with the revisions and to implement the quality management system in the company with the implementation stages.

The first step of the IATF 16949 Automotive Quality Management System is to establish and implement a suitable system with additional requirements based on the ISO 9001 Quality Management Standard, and to try to achieve continuous improvement in the light of this first step.

As the second stage, the fulfillment of the additional requirements of the IATF 16949 Automotive Quality Management System, the implementation of the process, and the aim of continuous improvement at the end of sustainability, and third-party audits were carried out by an approved certification body authorized by IATF in order to ensure institutionality for the IATF 16949 certificate.

The major non-conforming results obtained in the important certification studies conducted to date were published on the official website of IATF on May 2, 2024. This information is provided below.

Table 1: Major Nonconformances

Item	Description	**percentage**
10.2.3	Problem Solving	10.04
10.2.1	Nonconformance and Corrective Action	6.22
8.3.5.2	Production Process Design Output	4.24
8.5.1.1	Control Plan	3.23
8.5.1	Control of Production and Service	3.05
6.1.2.3	Contingency Plans	3.01
7.1.5.1.1	Measurement Systems Analysis	2.87
9.1.1.1	Monitoring and Measuring the Production Process	2.82
8.5.1.5	Total Productive Maintenance	2.79
9.2.1.2	Customer Satisfaction	2.52

Minor non-conformances were published on the IATF official website based on statistical data from third-party audits updated on May 2, 2024. This information has been translated and taken below.[8]

Table 2: Minor Nonconformances

Item	Description	**percentage**
8.5.1.5	Total productive maintenance	4.16
8.3.5.2	Production Process Design Output	8.04
8.5.1.1	Control Plan	3.97
6.1.2.3	Emergency Plans	3.92
10.2.4	Non-fault transmission	3.27
8.5.1.3	Verification of work setups	3.18
8.5.1.2	Standardized work - operator instructions and visuals	3.17
7.1.5.1.1	Measurement Systems Analysis	3.04
8.5.1	Control of Production and Service	2.91

The analysis and data collection processes related to the business were carried out in parallel. All requested data regarding the process were collected and 20 interviews were conducted until the missing points in theory were completed. Since the identity of the participants and the name of the business are not reflected in the report, there is no identity information in the evaluation forms given below.

Table 3: Feasibility and Risk Analysis Form

FİZİBİLİTE VE RİSK ANALİZİ FORMU

FR-024-00/

Fizibilite ve Risk Analizi değerlendirmesiyle ilgili olarak tüm soruları kapsamamakla beraber, ekibimiz aşağıdaki konuları da dikkate alarak Fizibilite ve Risk Analizi çalışmasını yapmıştır. Mevcut çizim ve spesifikasyon dokümanları belirlemiş tüm spesifikasyonların karşılanabilmesi açılarından ele alınmıştır. Tüm " HAYIR " cevapları, spesifikasyonları karşılayabilmek için çözüm önerilerimizle beraber ilgili dokümanlarla desteklenmiştir.

Müşteri Adı/ Müşteri Kodu	:				
Müşteri Adresi / Tel / Fax / E-mail	:				
Müşteri Teklif No	:				
Müşteri Muhatapları	:				
Sevkiyat Adresi ve Şartları	:				
ÜRÜN BİLGİLERİ					
Parça No / Parça Adı	:	Müşteri Kodu	:		
Malzemeler	:	Orijinal Kodu	:		
Talep Miktarı	Ön Görü Talep Miktarı	Üretim Programı	Müşteri Talebi	Planlanan	
Günlük Üretim (Adet)	:	İlk Numune Tarihi	:	:	
Haftalık Üretim (Adet)	:	Ön Seri Üretim Tarihi	:	:	
Aylık Üretim (Adet)	:	Seri Üretim Tarihi	:	:	
Toplantı Yeri	:	Tarih /	:	Saat	:
ÜRETİM PROSES İHTİYAÇLARI					
☐ Isıl İşlem ☐ Soğuk Dövme ☐ Sıcak Dövme					
☐ Yüzey Kaplama ☐ Boya ☐ Kaynak ☐ Diğer :					
KALİTE ŞARTLARI					

TEKNİK VERİ İHTİYAÇLARI

Model	Kalıp / Aparat	Numune Parça	Ölçme / Kontrol Cihazı	Teknik Resim	Teknik Spesifikasyonlar	Şartnameler	Diğer

FİZİBİLİTE DEĞERLENDİRİLMESİ

	Konu	Evet	Hayır	Açıklamalar
1	Mevcut projeler ile benzer mi? Hangi Ürün Üretim Prosesleri Açısından Benzer			
2	Ürün, fizibilite değerlendirmesi için, yeterince tanımlanmış mı ?			
3	Mühendislik Performans Spesifikasyonları karşılanabilir mi ?			
4	Ürün, resimde belirlenen toleranslarda üretilebilir mi ?			
5	Ürün, gerekli şartları karşılayan Cpk değerleri ile üretilebilir mi ?			
6	Ürünü üretmek için yeterli kapasite var mı ?			
7	Ek yatırım gerekiyor mu?			
8	- Makine			
9	- Kalıp / Aparat			
10	- Ölçme / Kontrol Cihazı			
11	- Yardımcı Tesisler (Trafo, Bilgisayar vb)			
12	- Alan			
13	Müşterinin istediği özel şartlar mevcut mu ? Karşılanabiliyor mu?			
14	Ürün üzerinde veya prosesinde çevreye zarar verecek etki mevcut mu?			
15	Malzeme ve yan ürünleri temin edebilme imkanı var mı?			
16	Sevkiyat ve teslimat şartları belirlenmiş mi? (Ambalajlama dahil)			
17	Kalite Güvence gereklilikleri belirlenmiş mi?			
18	Gerekli teknik dökümanlar ve standartlar temin edilmiş mi?			
19	Personel ihtiyacı var mı?			
20	Personel eğitim ihtiyaçı var mı?			

Table 4: Measurement System Analysis Form

MSA
ÖLÇÜM SİSTEMİ ANALİZİ FORMU

FR.101.01/07.10.2023

Bu program kullanılırken kesinlikle sadece siyah fontlu hücrelere bilgi girişi yapınız

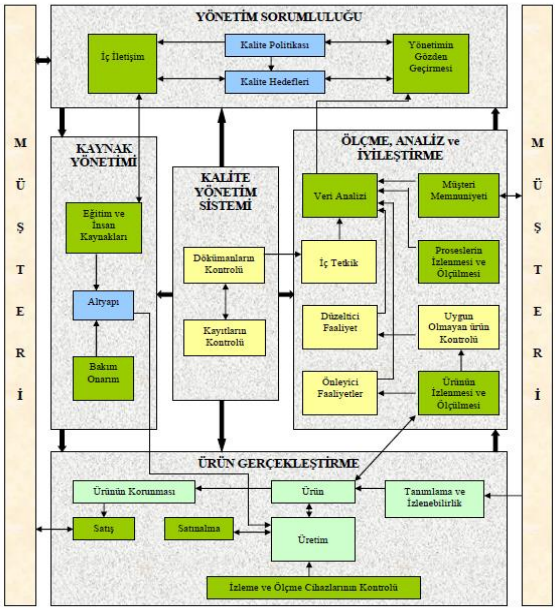
Operatör A	**AÇIKLAMA**	Üst Spesifikasyon :
Operatör B		Alt Spesifikasyon :
Operatör C		Toplam Tolerans :

Operatör/ölçüm		PARÇALAR										ORTALAMA	
		1	2	3	4	5	6	7	8	9	10		
1 A	1											0,000	
2	2											0,000	
3	3											0,000	
4 Ortalama		0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	Xort	0,000
5 Aralık		0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	Rort.a	0,000
6 B	1											0,000	
7	2											0,000	
8	3											0,000	
9 Ortalama		0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	Xort	0,000
10 Aralık		0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	Rort.b	0,000
11 C	1											0,000	
12	2											0,000	
13	3											0,000	
14 Ortalama		0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	Xort	0,000
15 Aralık		0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	Rort.c	0,000
16 Tüm parçalar ort.	%0	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	(Xort)ort 0,00	Rp 0,000
17 (Rort.a **0,000** (+) Rort.b **0,000** (+) Rort.c **0,000**) / Operatör sayısı **3**												(Rort.)ort	0,0000
18 (Xort)fark												0,000	
19 ÜKLR = (Rort.)ort x D_4												0,000	
20 AKLR = (Rort.)ort x D_3												0	

Ölçüm Ünitesi Analizi	Toplam % Varyans (TV) Proses Varyansına Göre	Toplam % Varyans (TV) Toplam Toleransa Göre
Tekrarlanabilirlik-Cihaz varyansı (EV) EV = (Rort)ort x K1 EV = 0,000	%EV = #SAYI/0!	#SAYI/0!
Yeniden üretilebilirlik-Operatör Varyansı (AV) AV = 0,000	%AV = #SAYI/0!	#SAYI/0!
Tekrar edilebilirlik ve yeniden üretilebilirlik (R&R) R&R = 0,000	% R&R = #SAYI/0!	#SAYI/0!
Parça varyansı (PV) PV = 0,000	% PV = #SAYI/0!	#SAYI/0!
Toplam varyans (TV) TV = 0,000	% R&R Değeri: %10 nun altı KABUL; %10 - %30 SARTLI KABUL; %30 nun üstü RED	
	ndc=1.41(PV/GRR)	ndc= ####

Table 5: Process Interaction Diagram

	KALİTE EL KİTABI	Doküman No	K.06
		Revizyon No	00
	PROSESLERİN ETKİLEŞİMİ ŞEMASI	İlk Tarihi	
		Sayfa No	1/1



HAZIRLAYAN	ONAY
Yönetimin Kalite Temsilcisi	Genel Müdür

Table 6: Annual Customer Visit Plan (Overseas)

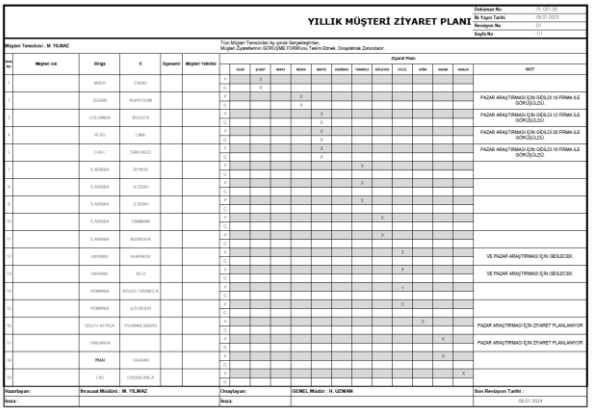


Table 7: Company Indicators

	INDICATORS	*Goal*
FINANCIAL INDICATOR	Approach to strategic plan, budget and sales forecasts	*> 90%*
	The place of poor-quality costs in production turnover	*<3%*
	Stock turnover	*< 0,7*
CUSTOMER INDICATOR	Sample delivery performance	*100%*
	Compliance with project plan	*> 90%*
	On-time delivery performance	*> 85%*
	Customer Satisfaction Index	*> 75%*
PRODUCTION AND INTERNAL PROCESS	Compliance with strategic plan	*85%*
	Compliance with audit plan	*> 95%*
	Corrective action closing performance	*> 90%*
	Time between errors	<
	Compliance with MSA Plan (Measurement System Analysis)	*>90%*
	Compliance with calibration plan	*95%*
	Productivity performance	*> 85%*
	Scrap	*< 5%*
LEARNING AND DEVELOPMENT	Staff turnover rate (Blue Collar)	*< 10%*
	Staff turnover rate (White Collar)	*< 5%*
	Effectiveness degree of trainings	*>80%*

During this application, additional requirements for the IATF 16949 Automotive Quality Management System were taken into consideration, and in the light of the tables mentioned above, special attention was paid to the most common minor and major items and lessons were learned from them.

The certificate obtained with the implementation of the IATF 16949 standard together with the existing ISO 9001 Quality Management System standard and the documents created with it and with a successful audit

process and third-party audit; created excitement and a source of reputation and trust in the company.

Management of documents: With the installation of the IATF 16949 Automotive Quality Management System in the company, all transactions and processes related to the documents related to the QMS were taken under control, and the effectiveness of the system was ensured, while confusion and errors arising from the documents were prevented.

Management of records: By determining the records created within the scope of the Management System, ensuring their easy accessibility, determining the conditions and periods related to the storage of data, protecting them and implementing the practices in the repeal of them, timely access to the correct records, accessing them and presenting them as evidence were ensured.

Audits: In order to verify the implementation and effectiveness of the audits conducted within the scope of the Management System with planned, systematic and objective methods, the management of the operations and responsibilities related to the planning, implementation of internal audits, execution and finalization of necessary correction/corrective activities have been ensured. Thus, the internalization of the implemented Management System has been ensured.

Non-Conformities: Within the scope of the Management System, in the production/service areas, materials/manufactures and services that do not meet the requirements of the customer, contract and all legislative conditions and company policies and targets are excluded from use and not delivered to the customer, and decisions are made regarding these materials, manufacturing and services, and the practices to be carried out are determined, and non-conformities are brought to a manageable state with the protection of waste rates, rework costs and brand image.

Correction and improvement activities: A framework has been established for the planning, implementation of the necessary activities, monitoring of the results, evaluation and determination of the principles and responsibilities in order to eliminate a non-conformity detected in the materials/manufactures and services within the scope of the Management System so that it will not reoccur.

Design and design development activities: Plans have been created to produce solutions for new designs in the application of the Management System and/or change requests from customers, to ensure ease of assembly, to ensure that the product we produce has a longer life, to ensure that customer demands are met completely, and a method has been determined to reduce manufacturing costs, to increase capacity and quality, and to ensure that product design and development activities are planned to produce new products and to keep these activities under control, and the cost of poor quality arising from design has been secured. A framework has been created for design processes in the company.

Production and service management: Within the scope of Management Systems, receiving orders, purchasing activities, external processes, production and controls, storage, shipment and business plans are secured in the company.

Quality control activities: Within the scope of Management Systems; all kinds of materials and services procured from outside to be used in production, production operations carried out in the factory, processes and intermediate processes, final inspection approvals before assembly during the production of products and parts, all control activities in the implementation are determined and the provision of control and customer conditions are secured in the company.

Communication: In the context of maintaining the Management System, communication tools and methods between individuals and units are determined. When and with whom individuals and units will communicate and how are determined and managed. The framework of internal and external communication management is provided.

Measurement tools: Within the scope of Management Systems, checking whether the measurement devices used in production and quality control processes have the defined sensitivity, analyzing them and MSA processes are defined. Acceptance criteria and methods are determined considering the great impact of the devices used in decision-making on making the right decision.

Supplier selection and purchasing: Within the scope of the Management System, the activities to be carried out in determining the suppliers and then evaluating their performances to ensure that the inputs of the materials, services and construction works to be provided by the suppliers are following our company's policy and objectives have been determined and the possible nonconformities that will arise from this have been radically resolved.

Machine and Equipment Management: Within the scope of the Management System, the operation related to the maintenance and repair activities carried out to ensure the continuous expected performance of the machines and equipment used in production and affecting the quality of the products have been explained and the duties and responsibilities related to this have been determined and the prevention activities have been activated.

Risk Management: The methods and principles related to the prediction of potential hazards that may be encountered during the Management System process and the expected or possible risks related to them, to control them or to reduce the risks have been systematically defined and the ability to detect and take precautions before possible hazards arise in relation to the processes has been provided.

Human resources and training management: Within the scope of the Management System, the operation related to the provision of permanent or temporary labor needed for the continuous improvement of the current system in order to be able to manufacture in accordance with customer and legal conditions and the continuous improvement of the current system has been explained and the duties and responsibilities have been determined and the management conditions and processes have been determined for providing this competence and sustainability by creating competence matrices. With the Management System, the definition, planning and execution of trainings to be carried out for the use of human power in all levels of operations and the development of knowledge and skills have been realized.

Customer management: A system has been established to determine the work to be done to ensure customer satisfaction, which is one of the cornerstones of the Management System, and to explain the responsibilities. Previously unmet targets have been defined and the customer satisfaction rate has been determined as 93%.

Review of management: System management has been planned to ensure that the Management System is maintained effectively and continuously and to review and evaluate the compliance of this system with the company's policy and targets, its adequacy, development and continuous improvement opportunities in planned periods or when needed. Targets have been established for the effective and continuous maintenance of the Management System and:

Table 8: Targets and measurement periods-rate relationships [11]

Targets	Measurement Period	Rate
Making decisions taken in YGG	Annual	Min. 90%
Turnover increase	Annual	Min. 22%
Customer satisfaction	6 Months	Min. 93%
Customer complaints originating from sales process	Monthly	Max. 17%
Downtime	Monthly	Max. 21 Days
Customer complaints originating from production	Monthly	Max. 23%
Loss rate	Annual	Max. 7%
Working without any work accidents	Annual	Max. 2%
Compliance with periodic maintenance plan	Annual	Min. 90%
Supplier score	Annual	Min. 82%
Training hours per person	Annual	Min. 8 Hours
Participation in mass training	6 Months	Min. 73%
Employee satisfaction	Annual	Min. %75
Number of customer complaints	Monthly	Max. 11
Number of opened nonconformities	Monthly	Max. 14
Number of Corrective and Preventive Activities	Monthly	Min. 6

Plans were made to implement the decisions taken in YGG, to make efforts to measure and reach them in the annual period, and to achieve betterment by ensuring the participation of all personnel.

Table 9: IATF 16949 Post-Transition Evaluations [11]

Indicators	Comprehensive scoring dimension	Performance change after transition
Strategic plan budget, sales target achievement	Financial	Positive impact
Stock turnover	Financial	Positive
Compliance with project plan – performance change	Customer	Positive impact
On-time shipment performance	Customer	Positive impact
Customer satisfaction index	Customer	Positive
Compliance with strategic plan	Production	Positive impact
Compliance with audit plan	Production	Positive
Corrective action closing performance	Production	Positive impact
Time between errors	Production	Positive
Fault removal time	Production	Positive
Compliance with calibration plan	Production	Positive impact
Productivity change	Production	Positive
Scrap output	Education	Positive
Effectiveness of training	Education	Positive impact
Corrective Remedial practices	Education	Positive impact
Staff rotation rate (Blue Collar)	Education	Positive impact
Staff rotation rate (White Collar)	Comprehensive scoring	Performance change after

When the results obtained are examined in terms of financial, customer, production and internal processes.

From a financial perspective: Increasing sales and profitability is the most important criterion. The increase in sales positively affects the increase in stock turnover and contributes to continuous circulation. The budget targets created within the framework of the strategic plan positively affect the budget amount after the transition to IATF 16949 and the continuity of the increase in sales is observed. The achievement of the targeted financial dimension is an indication of the improvements in other relevant issues that triggered this and the prevention of previously occurring errors.

From a customer perspective, with the improvements made in all processes of the company, the number of faulty product outputs and customer complaints experienced in raw material and production processes has decreased, the number of renewed transactions has decreased thanks to quality raw material and qualified labor, and these situations have increased the trust in the company for all current and potential customers.

In terms of internal processes and production, time losses caused by reasons such as poor quality raw material, repairs in production processes, and possible machinery and equipment maintenance can be reduced or eliminated with training and improvements. For these reasons, it was aimed to primarily reduce errors or unexpected situations in production, increase labor efficiency, raw material quality, reduce scrap and improve production costs. It is seen that the indicators of compliance with strategic plans and processes have reached the target after the transition. Similar results were also emphasized by Kesici and Yıldız (2022)[14].

4. Results and Conclusions

The purpose of this study is to explain the importance and articles of the IATF 16949 Quality Management System standard, to check the additional requirements that come with the revisions and to implement the quality management system to the company with the implementation stages.

In the light of the evaluation and the results obtained.

1. The company needs to seriously focus on internal processes in order to increase its market share in the automotive sector by implementing the IATF 16949 standard together with the existing ISO 9001 Quality Management System standard and the documents created with it.
2. The satisfaction survey process should be continuously improved in order to take precautions against possible customer loss risks with the improved product and process quality company customer satisfaction evaluations.
3. It is important for the institutional structure to continue in order to create an extra trust environment for global resources.
4. In order to improve the quality of supplier resources, they should be re-evaluated, their consistency and a common quality system approach should be provided in the supply chain.
5. Since the decrease in variation and the increase in efficiency cause a decrease in 2nd party system audits, it is important to create a common language for a better understanding of quality requirements, in terms of removing the extra documentation burden on the company and thus, confusion can be prevented.
6. IATF 16949 is one of the biggest factors in increasing the number of business connections. It will also increase the competitiveness of the company in the market by increasing its prestige.
7. Along with all these, the awareness and consciousness of the existing personnel on the company should be increased.
8. The foundations created for a controlled and disciplined product management should also be supported by internal and external trainings that have been done and will be done.

References

[1] Kiran DR. ISO 9000 Quality Systems. Total Quality Management. 2017, p. 471-86.

[2] Ballingall S, Sarvi M, Sweatman P. Standards relevant to automated driving system safety: A systematic assessment. Transportation Engineering 2023;13.

[3] Noergaard T. Middleware and Standards in Embedded Systems. Demystifying Embedded Systems Middleware. 2010, p. 59-92.

[4] Noergaard T. Know Your Standards. Embedded Systems Architecture. 2013, p. 21-85.

[5] Safran DP. Otomotiv Endüstrisinde ISO / TS 16949:2002 Gerekliliklerine Göre Tedarikçi Seçme ve Değerlendirme Sistemi Geliştirilmesi.YL.Master Tezi. T.C. Uludağ Üniversitesi Fen Bilimleri Enstitüsü; 2006:158.

[6] Toker MA. Otomotiv Tedarik Zincirine Yönelik ISO/TS 16949:2002 Kalite Yönetim Sistemi ve Hayes Lemmerz İnci Alüminyum Jant Fabrikasında Uygulanması. Sosyal Bilimler Enstitüsü İşletme Anabilim Dalı Uluslararası Kalite Yönetimi Bilim Dalı. Master. T.C. Marmara Üniversitesi; 2007:375.

[7] New ISO rating for Hoeganaes. Metal Powder Report 2004;59(3).

[8] https://www.iatfglobaloversight.org/statistics/.

[9] Laskurain IA, I.; Heras-Saizarbitoria, L.G. How does IATF 16949 add value to ISO 9001? An emprical study. Total Quality Management and Business Excellence 2020;1(1):1-18.

[10] Boissie K, Addouche,S., Zolghadri, M., Richard, D. Obsolescence Mitigation in Automotive Industry using Long Term Storage Feasibility Mode. Procedia Manufacturing 2018;16.

[11] Clougherty JA, Grajek M. Decertification in quality-management standards by incrementally and radically innovative organizations. Research Policy 2023;52(1).

[12] Fonseca LM, Domingues JP. Reliable and Flexible Quality Management Systems in the Automotive Industry: Monitor the Context and Change Effectively. Procedia Manufacturing 2017;11:1200-6.

[13] Gün Ö. SO/TS 16949 Teknik Spesifikasyonunun İncelenmesi ve Otomotiv Yansanayinde Uygulaması. T.C. İstanbul Üniversitesi Sosyal Bilimler Enstitüsü Üretim Anabilim Dalı. Master. T.C. İstanbul Üniversitesi; 2005:147.

[14] Kesici BY, M.S. Bir otomotiv yan sanayisinde IATF 16949: 2016 kalite yönetim sistemi standardının balanced scorecard modeli ile performans değerlendirmesi. Trends in Business and Economics 2022;36(2):203-14.