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# DESIGN STANDARDIZATION IN VACUUM FURNACES

Furkan Yasin Canıgeniş - Mechanical Design Engineer
Ozan Yılmaz - Mechanical Design Manager

In today's competitive industrial furnace industry, design standardization is critical to ensure high performance, reliability, short production time and continuity. For this reason, as Sistem Teknik Industrial Furnaces, we have standardized the designs of vacuum furnaces that we produce with our long-term vacuum furnace design and production experience. Thanks to the design standardization we have made, we have reduced the delivery times of the furnaces to 4 months. In this standardization process, we have determined a roadmap based on international industry standards (TS EN 746-1), general customer requirements and the latest engineering practices.


When starting the design standardization process, we proceeded through key factors such as the useful volume of the furnace for furnace sizing and the process temperature values for the type of process. These key factors are very important in determining in advance what the furnace heating cabinet, its overall inside-outside dimensions and critical ordering items are. Thanks to these standardization efforts, we can easily plan and determine the duration of the project. In the light of these studies, we standardized our vacuum furnaces with 4x6x4, 6x9x6 and 9x12x9 useful volumes from Vacuum Gas Quench and Vacuum Tempering Furnaces included in Sistem Teknik's inventory. Figure 1 shows the visuals of vacuum furnaces.

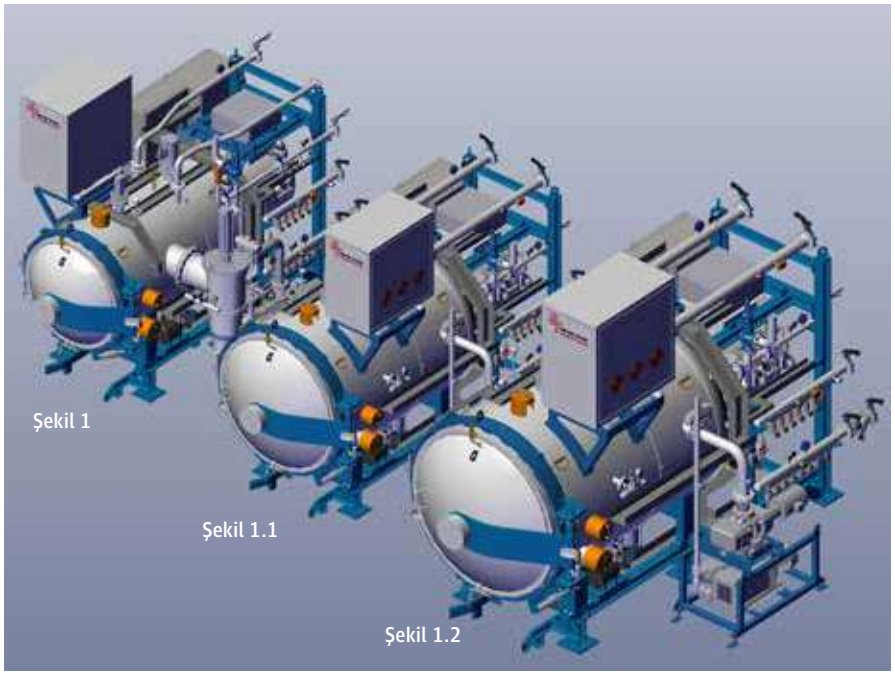



Figure 1: VF-1D-A-464 Figure 1.1: VF-1D-A-696 Figure 1.2: VF-1D-A-9129

VQ-1D-A-696: Vacuum Quench,1 Dimentional, Annealing, 600mmx900mmx600mm)
The next step in design standardization is the determination of process parameters. These parameters can be listed as processing time, heating profile, cooling profile, vacuum levels, pressure levels. One of our most important parameters is the design of the vacuum system suitable for vacuum levels. It is very important to determine the vacuum system of 10-2 - 10-2 mbar in order to reduce the furnace volumes that we standardize to the desired vacuum values in accordance with the process. Appropriate vacuum pumps must be selected to ensure the vacuum level, gas flow must be controlled and the furnace must be sealed. Air flow test, vacuum leakage test, hydrostatic test are very important for tightness and gas control. Standardization in the design also allows the standardization of these tests and test equipment. In addition, we have increased our quality in terms of furnace sealing with the special vacuum leak detection devices of our company. After the production of the furnace is standardized with the appropriate parameters, another important step is to establish the control and automation structure of the furnace. A standardized, stable design requires accurate monitoring and control of parameters such as temperature, pressure, vacuum levels and treatment times. In this part, the SCADA system, which works integrated with the furnaces, is used. In this way, continuous monitoring, data collection, data storage and automatic management of the transaction process are provided. Thus, the automation of the standardized design becomes standardized indirectly. This also speeds up the furnace commissioning process. As a result of our standardization efforts, we reduced the commissioning time to 1 to 2 days. Figure 2 shows the control screen of the Vacuum Quench furnace. Finally, standardization of the design of vacuum furnaces in compliance with safety standards plays an important role in operator use, maintenance and general process management. In this way, a service opportunity with a fast solution is provided for any service request. Thus, with the determination of the operating, maintenance and emergency instructions in the furnace manual, all the parameters of our vacuum furnace, whose design is standardized, are determined. As a result, we aimed to increase process repeatability, shorten project lead time, reliability of heat treatment outputs and increase customer satisfaction with the design standardization we made in vacuum furnaces. Our aim is to ensure that the standard vacuum furnaces we manufacture become the leader in the industry.


Figure 2: Vacuum Quench Oven Control Screen

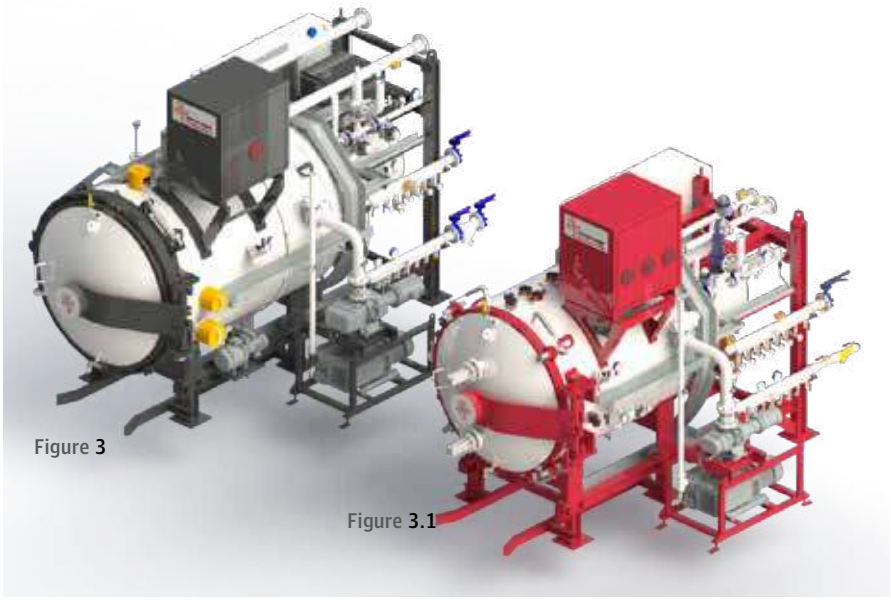


Figure 3

Figure 3.1

Figure 3: VQ-1D-A-696

Figure 3.1: VTF-DC-696

# OIL QUENCHING UNDER VACUUM

Elif Yenilmez Demirel - Technology Development and Innovation Engineer

## 1. Vacuum Oil Hardening Furnaces

Recently, together with the need for vacuum furnaces, oil hardening furnaces under vacuum, which is a sub-branch of vacuum furnaces, have started to become the focus of attention. These furnaces are compact design furnaces that contain both the heating chamber and the oil tank at the same time, reach temperatures as high as 1300°C, perform the heat treatment and holding process under vacuum according to the appropriate recipe, and then apply the oil immersion process under vacuum or without vacuum. As Sistem Teknik, we started the production of these furnaces with the success we received as a result of our R&D studies, and we are aware that they will make enough noise in the sector with the upcoming projects.

### 1.1. Vacuum Oil Hardening Process

The material placed in the furnace is first heated in the heating chamber on the desired ramp. Here, certain holding times are applied according to the prescription. Then, without the need to take the material out of the furnace, it is taken from the heating chamber by an automatic system and transferred into the oil tank, and the oil quenching process takes place in the tank. The oil tank can be kept at the desired temperature and pressure and mixed with the desired mixing speed. In the heating process in the heating chamber, it can be applied in these furnaces regardless of the number of steps of the recipes prepared for the process needs.

### 1.2. Advantages

The furnace's compact design, energy saving, environmentalist approach and its minimum effect on carbon emissions are among the reasons why it is preferred.

## 2. Low Pressure Carburizing (LPC) Furnaces

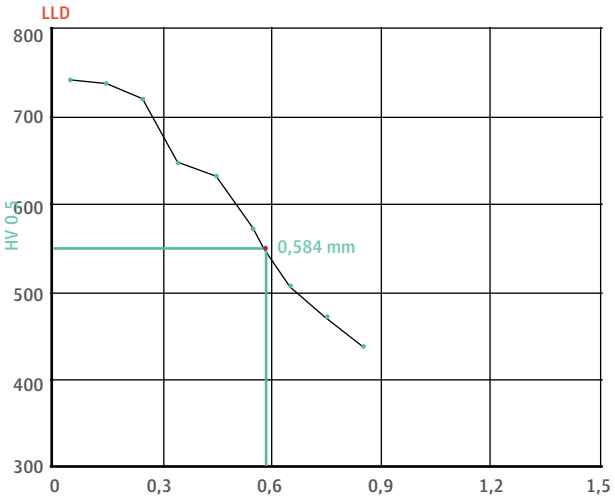
LPC furnaces, which is another furnace type that is increasing in popularity today and has started to become a favorite of the heat treatment sector, has become an innovative option with its technical advantages compared to traditional and known furnaces. LPC (Low Pressure Carburizing) process is performed in these furnaces. LPC process is a carburization process performed under vacuum, at low pressures, with the help of a carburizing gas, at a temperature above the austenitization temperature and by applying a pre-prepared recipe. Gases such as propane and acetylene can be used as carburizing gas in the system. In our LPC furnace, which we have produced as a result of our R&D studies, together with our innovative changes on our oil-hardening furnaces under vacuum, oil-hardening quench can be performed under vacuum, while carburization can be performed at low pressure at the same time. The good results we obtained as a result of the experimental processes we carried out with our team, to observe the operation of our furnace and the changes in the carburized material during the process, showed us that our LPC furnaces are promising for the future.

### 2.1.Process

Before starting the process, the material to be carburized first is taken into the heating chamber and the process recipe is entered into the automation system that controls the furnace. In the prepared recipe, heating under vacuum and keeping at this temperature (keeping step can be canceled if preferred), followed by boost (carburizing) and diffusion steps are included. These steps may consist of one step or they may be many. (For example, 10 boost, 10 diffusion or 7 boost, 7 diffusion steps.)

Figure 1.Pre-process sample images

Figure 2.Post-process sample images




Result: CHD 550 HV 0.5 = 0,584 mm

Test Points:

| No. | Value | Method | X pos.(mm) | Y pos. (mm) |
|---|---|---|---|---|
| 1 | 74 | HV 0,5 | 0,05 | 0,10 |
| 2 | 738 | HV 0,5 | 0,15 | -0,10 |
| 3 | 720 | HV 0,5 | 0,25 | 0,10 |
| 4 | 646 | HV 0,5 | 0,35 | -0,10 |
| 5 | 632 | HV 0,5 | 0,45 | 0,10 |
| 6 | 572 | HV 0,5 | 0,55 | -0,10 |
| 7 | 507 | HV 0,5 | 0,65 | 0,10 |
| 8 | 472 | HV 0,5 | 0,75 | -0,10 |
| 9 | 439 | HV 0,5 | 0,85 | 0,10 |

Figure 3. Hardness values taken at different depths after the process

The duration of the boost and diffusion steps and the flow rate of the carbonizing gas fed to the system are predetermined and added to the recipe. The furnace first preheats according to the recipe, if desired, and this heating step may also consist of several steps according to the recipe. Then, the furnace is brought to a temperature above the austenitization temperature of the treated material, again in accordance with the recipe, and if desired, a keeping step at a constant temperature is applied for the specified time. After these steps, Boost and Diffusion steps are taken. In the boost step, the carburizing gas is supplied to the system at a predetermined flow rate and time. The diffusion step consists of the time allowed for the material to absorb the carbon after being exposed to the carburizing gas. During this time, nitrogen is supplied to the system at partial pressure. After the carburizing step, the material can be quenched either under gas or in oil. In LPC furnaces with compact design, if the oil quench is to be processed, the material can be immersed directly in the oil from the heating chamber, without taking the material out of the furnace, thanks to the furnace's special system. The oil tank can be kept at the desired pressure and temperature, and circulation in the tank can be achieved with the requested mixing speed. The LPC process can be used on all types of carbon-impregnable steel. In particular, thanks to this process, medium and low carbon steels can be easily carburized. LPC process can also be applied to low or high alloy steels with changes to be made on the recipe. LPC is an application that is preferred especially in shafts and gears, alloy steels used in

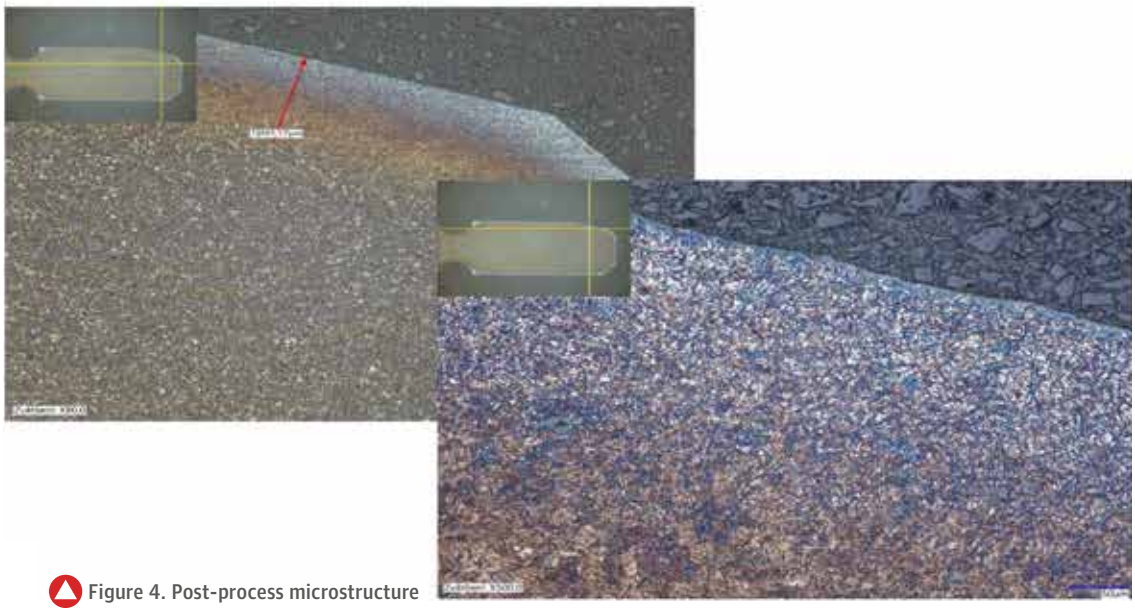


Figure 4. Post-process microstructure

aerospace and defense industries, where hardness and wear resistance are required.

### 2.2. Advantages

As a result of the LPC process, smooth surfaces with a more homogeneously dispersed carbide structure are obtained, which provides the desired carbon ratio compared to the carbide process performed in the atmospheric environment. In this way, it is observed that in parallel with the equal carbide distribution at every point of the treated surfaces, equal phase structure and the desired hardness value are at the same level in all portions. In addition, the advantages of the system are that LPC is realized in a shorter time, at lower temperatures and more controlled thanks to the prepared recipe compared to the heat treatments in atmospheric environment, and the losses of the gases used are minimized. And also, depending on the results of these, it was concluded that more energy savings were achieved compared to other processes.

## 3. Some of the Results of Our Experimental Studies

As Sistem Teknik R&D team, we carried out LPC tests by applying our own recipe in our own furnace. In our experimental studies, we quenched 16MnCr5 steel in oil immediately after carburizing at low pressure. After the process, we prepared our samples metallographically and analyzed them. And we observed that we were able to achieve the results we aimed with the data we obtained. In Figure 1 and 2, there are color differences before and after the process for the samples that we want a carbon depth of 0.55 mm, the hardness values in Figure 3, and the microstructure image of the sample in Figures 4 and 5. After LPC treatment, the material hardness value was 68 HRC at the surface and 550 HV at 0.584 mm depth.

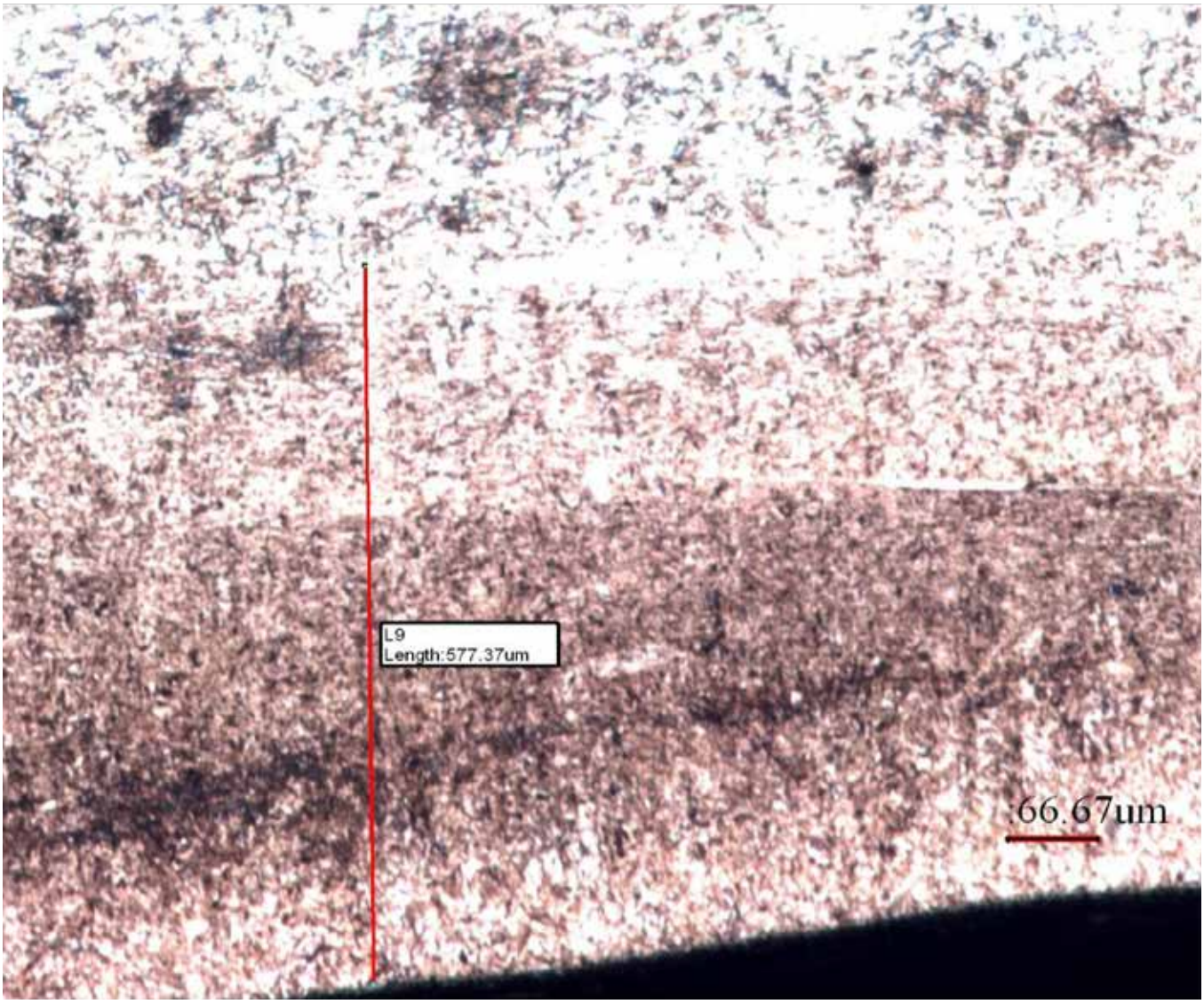



Figure 5. Post-process microstructure and carbon depth


# Satış sonrasında hiç eksilmeyen teknik destek

ROTA TEKNİK A.Ş. ile küçük-büyük herhangibir işbirliğine girmiş tüm müşterilerimizin gereksinimini; her zaman ilk hamlede, tam doğru ve arzu ettiği biçimde istediği sürede ve optimum fiyatlarla, en yeni teknolojiyi kullanarak karşılamak; satış sonrasında da hiç eksilmeyen teknik destekle bu tatminin sürekliliğini sağlamak, en önemli ilkemizdir. Bu ilkenin gerçekleşmesi ancak; bilgi, deneyim, heyecan, dinamizm ve sistem bilincinin birarada olmasının yaratacağı sinerji ile mümkündür. Güvendiğimiz ve bu unsurların tamamına sahip profesyonellerden oluşan güçlü ekibimizle; İşletmenizin, saydığımız konulardaki ihtiyaçlarını ve sorunlarını iyi biliyoruz ! Tam ve kesin çözümlerini de...

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# CARBON FOOTPRINT

Alper KELEŞOĞLU, Technology Development and Innovation Department Manager
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Greenhouse gases; are characterized as gases that increase the greenhouse effect, are the most abundant in the atmosphere, and have heat retention properties. Thus, as the amount of some gases in the atmosphere such as water vapor, carbon dioxide (CO2), and methane (CH 4) in the atmosphere increases, the earth gets warmer. Although there is an effect of human activities, greenhouse gases, directly and indirectly, cause this warming. As a result of factors such as heating, vehicle use, lighting, electrical energy consumption, livestock activities, industrial processes, and industrial use, the carbon dioxide equivalent of gases released into the atmosphere increases.

Carbon footprint is known as the damage caused by human activities to the environment in terms of the amount of greenhouse gas produced, measured in units of carbon dioxide. When it comes to human activities, we come across as an individual, a country, or an organization.

As a result of the increase in carbon dioxide equivalent, studies are increasing rapidly in the world, including our country, to balance the effect of greenhouse gases in the natural process. It was accepted as a convention on the protection of the ozone layer in the Vienna Convention, which took place in March 1985. The Montreal Protocol was adopted in September 1987 to control the use and production of substances that deplete the ozone layer. In the Montreal Protocol, reduction commitments have been delayed over time. The Montreal Protocol, to which 196 countries are parties, has been a successful agreement by most countries' parties. Turkey became a party by signing the Montreal Protocol on 19 December 1991 and accepted all the changes in the protocol. In this context, although Turkey is among the developing countries, it is among the most successful countries to implement the protocol.

Studies to calculate greenhouse gases in services such as business, production, and transportation, determined by the Kyoto protocol, which took place in Kyoto, Japan in 1997, entered into force in 2005. Turkey became a party to this agreement, which sets legally binding limits for 37 industrialized countries for the first time, on 26 August 2009. However, since our country was not a party to the protocol, it was included in the Annex-B list. Therefore, there is no commitment to reduce or limit emission values. Greenhouse gases are included in the inventory as greenhouse gases according to the Kyoto protocol and their global warming potentials are given in Table 1. Global warming potential (GWP) is known as the defining factor of the radiative factor effect of given greenhouse gas in terms of equivalent carbon dioxide over a given time (usually 100 years). Carbon dioxide

| Greenhouse Gas | Retention Time in Atmosphere (years) | Global Warming Potential (CO2 e) |
|---|---|---|
| Carbon dioxide (CO2) | 5-200 | 1 |
| Methane (CH4) | 12 | 28 |
| Di azote monoxide (N2O) | 114 | 265 |
| Sulfur Hexafluoride (SF6) | 3200 | 22500 |
| Perfluorocarbons (PFCs) | | 6630-17400 |
| Hydro Fluoride Carbons (HFCs) | | 4-8060 |
| Nitrogen Trifluoride (NF3) | 500 | 17200 |

Table 1. Greenhouse Gases and GMP Values

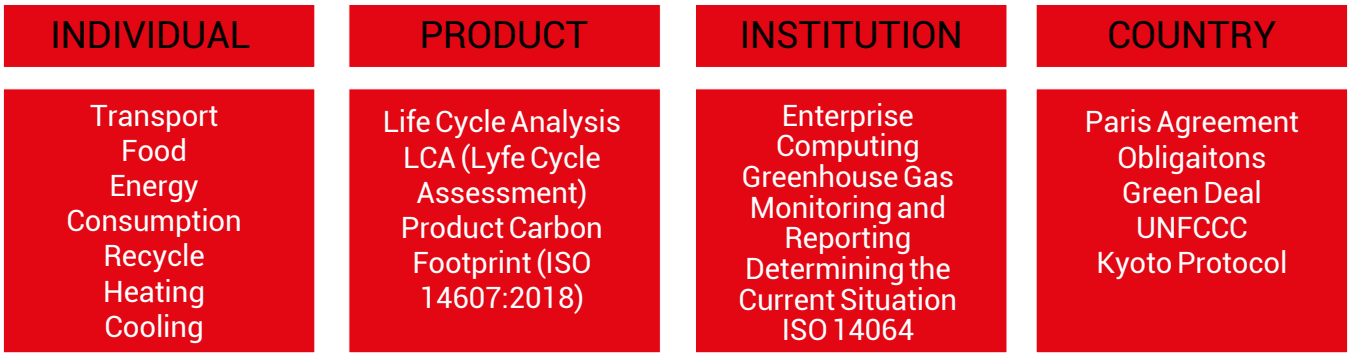


Figure 1. Carbon Footprint in Scaled Category

equivalent (CO 2 e) is known as the unit used to compare the radiant power of greenhouse gas with carbon dioxide.

The United Nations Framework Convention on Climate Change (UNFCCC) was adopted at the 21st Conference of the Parties held in Paris in 2015. The Paris Agreement, which entered into force in 2016, proposes a system to be created with the contributions of all countries. Studies have been started without determining any criteria, without classifying developed and developing countries in the functioning of the system. The goal of the Paris agreement is to keep the global temperature rise below 2°C compared to the pre-industrial period. Turkey signed with the representatives of 175 countries at the signing ceremony held in New York on April 22, 2016. The "Law on Approval of the Paris Agreement" by the Turkish Grand National Assembly (TBMM) was published in the Official Gazette on 7 October 2021 and entered into force.

Although countries such as China, America, and India are known as the countries with the largest carbon footprints, studies have been initiated in many countries such as Turkey, Germany, Spain, and Italy. It is known that the annual carbon footprint per capita in the USA is 16 tons of CO2-e, and the annual carbon footprint per capita in Turkey is approximately 7 tons of CO2-e greenhouse gas emissions. But globally, the annual carbon footprint per capita is about 4 tons of CO2 known as.

The carbon footprint, which is important in terms of understanding the damage to the atmosphere and the environment, and which is the result of human activities, consists of two main parts. Gases released to the atmosphere as a result of direct and indirect activities are expressed in terms of carbon dioxide equivalent. It refers to greenhouse gases such as energy and fuel consumption consumed as a result of needs directly within the scope of activities. The scope of indirect activities, on the other hand, refers to the emission of greenhouse gases in the life cycle of the products used, from their manufacture to their disposal. In this context, to prevent carbon dioxide emissions, it is necessary to accurately measure, calculate and take precautions. Especially recently, the calculation of corporate carbon footprint has been important all over the world and many studies have been carried out on this. In this context, a company needs to calculate all its activities from production to the end user, including all its fields. The system that measures these carbon dioxide emissions is known as carbon footprint calculation. In the corporate **carbon footprint calculation,** there is the ISO 14064 standard, which is taken as a reference. Although there is no single reference document or standard for carbon footprint, it is known to be calculated in terms of individual, product, institution/facility, and country. Recently, there are individual and institutional calculations. Although it is usually calculated on a product basis and based on actions when calculating the carbon footprint, the scaled category is given in Figure 1.

They have developed different methods for carbon footprint calculation involving industrial enterprises. These calculations have their origins in the IPCC National GHG Inventory Guidelines and GHG Protocols. At the scale of the institution/organization, the International Organization Standardization (ISO), which includes International Standardizations, is generally taken as a basis. The measurement and evaluation techniques that can be used in the ISO 1406x series, developed by ISO within the scope of climate change reduction targets and the relationship between the process are given in Figure 2.
ïISO 14064-1: 2018 Guidance and Specifications Standard for Establishment Level Calculation and Reporting of Greenhouse Gas Emissions and Removal
ïISO 14064-2: 2019 Guidance and Specifications Standard for Calcula-

ting, Monitoring, and Reporting GHG Emission Reductions or Mitigation Improvements at Project Level
ïISO 14064-3: 2019 Guidance and Specifications Standard for the Verification of Greenhouse Gas Claims
ïISO 14065: 2013 Guidance and Specifications Standard for the Accreditation of GHG Verification Bodies
ïISO 14066: 2011 Guidance and Specifications Standard for GHG Lead Verifiers and Verification Team Qualifications
ïISO 14067: 2018 Guidelines and Specifications for Carbon Footprint

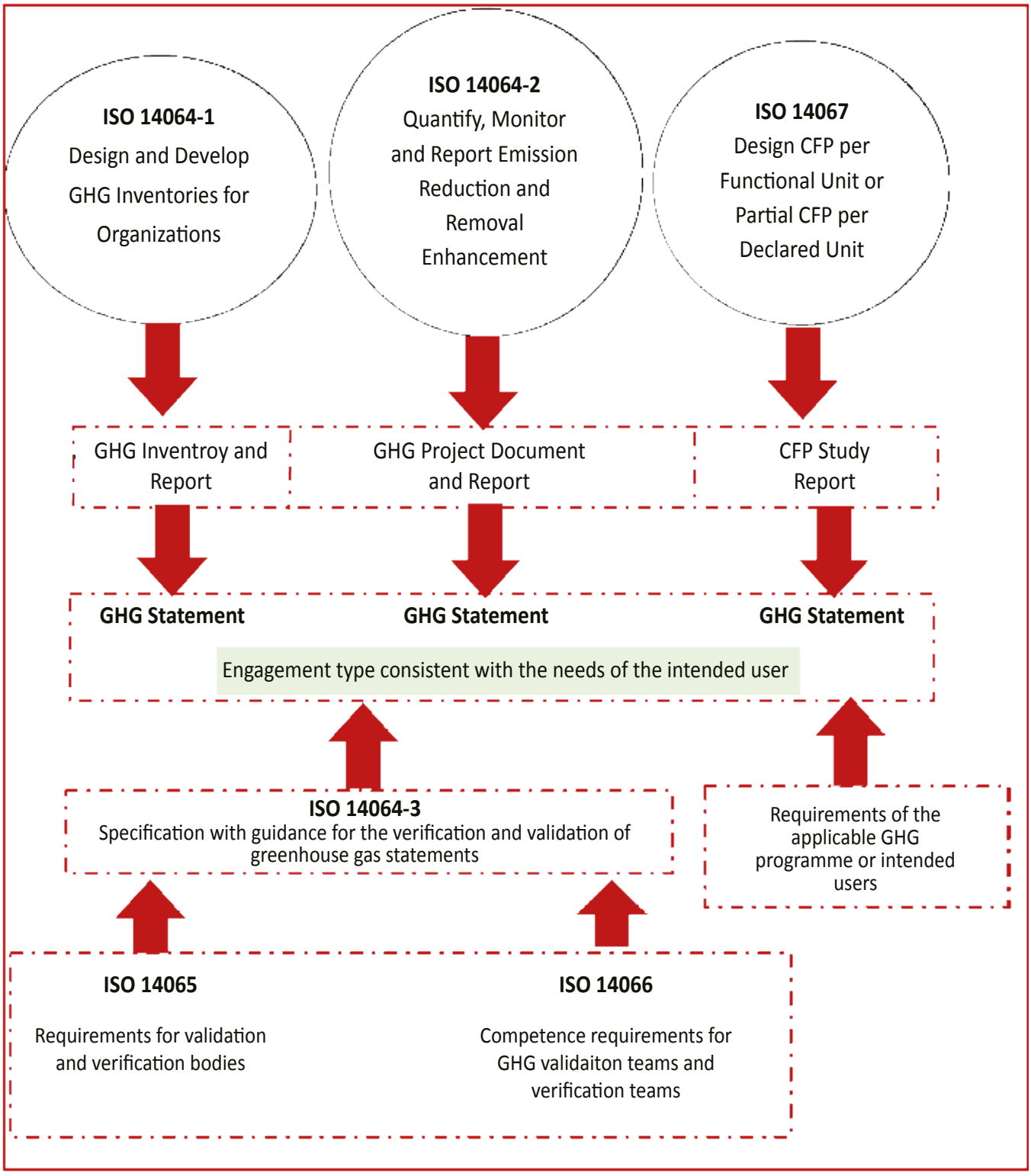


Figure 2. ISO 1406X Standard Application Series

Measurement of Products

As is known, the ISO 14064 standard guides businesses to measure and report greenhouse gas emissions and removals. Regardless of the field of activity, every institution has to regularly measure and inventory the greenhouse gas emissions they release into the atmosphere by using ISO 14064 standards. ISO 14064-1, ISO 14064-2, and ISO 14064-3 standards describe the requirements that companies need in this context. However, corporate carbon footprint studies do not end at this point. For the calculated values to be valid and to be accepted as a reference by the stakeholders, they must go through a verification process. Carbon footprint verification studies are also carried out by independent organizations accredited by TURKAK by the ISO 14065 standard.

A carbon footprint verification certificate is made according to ISO 14065 and ISO 14064-3 standards. ISO 14064-3, which contains the requirements for the verification and validation of greenhouse gas statements, and the ISO 14065 standard, which includes general principles and requirements for organizations that approve and verify environmental information, are the most important documents at this point. In addition, the ISO 14066 standard, which explains the qualification requirements for carbon footprint verification teams, is another reference document in this process. While calculating the corporate carbon footprint, it should be evaluated in 5 stages. These steps are briefly;

**Purpose Setting:** It provides the determination of the objectives to be achieved as a result of the carbon footprint calculation. The establishment of a green management system, sustainable energy management system, waste management system, water management system, environmentally friendly transportation systems, climate change, and green structuring can be cited as examples.

**Defining Boundaries:** It is considered as determining the boundaries of the research, provided that it stays between the lines by creating certain lines after the purpose is determined. Setting limits on an institution basis, on a product basis, and on an activity basis, can be given as examples. The collected data is classified according to the nature of the scope and calculation is started.

**Collection of Data:** Invoices, meters, and data should be collected at certain time intervals in certain periods. The collected data are evaluated under 3 scopes according to the GHG

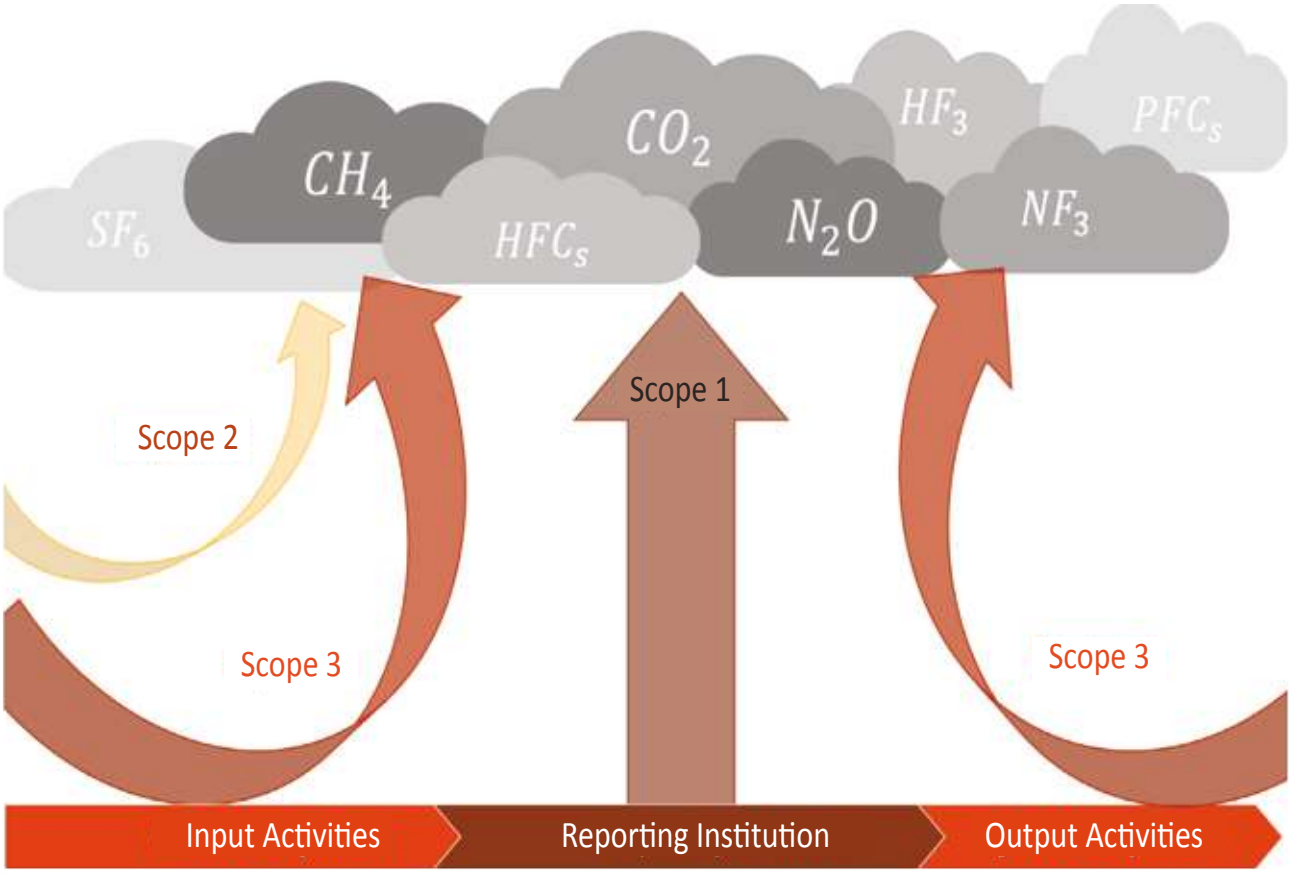


Figure 3. Classification of Scopes According to Activities

Protocol. These scopes are classified as direct and indirect scopes.

**Scope 1** gives the measurement result of greenhouse gases directly from establishment activities or under control. Combustion of fossil fuels directly owned or controlled by the company; fuels of vehicles can be given as examples. In addition, the emission factors change according to the segments, fuel types, and sizes of the vehicles.

**Scope 2** includes energy indirect greenhouse gases such as electrical energy purchased and used by the organization. Energy consumption such as purchased electricity, heating, and cooling can be given as examples.

**Scope 3** covers other greenhouse gases not included in scopes 1 and 2 of the greenhouse gases from establishment activities or under control. Waste, Business travel, purchasing, transportation, and distribution processes are examples of scope 3. Scope 2 and scope 3 are evaluated in input activities in calculating the corporate carbon footprint. While the reporting institution/organization/company activities are considered as scope 1, it is evaluated as scope 3 for output activities. The institutional evaluation of scope 1, scope 2, and scope 3 is shown in Figure 3. At the same time, it has increased the number of scopes when calculating the corporate carbon footprint according to the ISO 14064:2018 standard. The number of scopes is 6 according to the ISO 14064:2018 standard. These;

- **Scope 1 Direct Emissions and Removals**
- **Scope 2 Emissions from Imported Energy (Purchased energy)**
- **Scope 3 Indirect Emissions from Transportation (Transportation)**
- **Scope 4 Indirect Emissions from the Product/Service Used (Products/Services Purchased)**
- **Scope 5 Indirect Emissions Associated with the Use of Products (Use of the manufactured product)**
- **Scope 6 Other Indirect Emissions**

**Calculation:** It is known as the step in which both emission factors and global warming potential are calculated. At this stage, there are 3 calculation methods recommended by the IPCC.

**TIER 1 Approach:** In this approach, calculations are made using the amount of each fuel type and the assumed emission factors for these fuel types.

**TIER 2 Approach:** In this approach, the amount of each fuel type is calculated using the specific emission factors and combustion technology information determined depending on the fuel characteristics of the countries or regions.

**TIER 3 Approach:** Calculations are made using more detailed data such as emission factors determined according to fuel data and combustion technology, thermal power of combustion plants, and feeding types.

**Reporting: Reporting of** calculated values should be transparent. Because transparency is at the forefront, all assumptions and options should be clearly stated.

In reporting the carbon footprint; Facility, office, institution, and resource-based monthly and annual reports can be noticed quickly and effectively. Thus, resource-based monthly reports and carbon footprint reduction activities will be active. The advantages of carbon footprint reporting can be listed as follows;

- Identification and management of responsibilities, assets, and risks related to greenhouse gas
- Trading greenhouse gas permits and credits
- Support the design, development, and implementation of similar and identical greenhouse gas schemes or programs
- Developing robust internal mechanisms for rate determination, management, and reporting of greenhouse gas emissions
- Build trusting relationships with stakeholders
- The company enables the development and implementation of greenhouse gas management strategies and the creation of plans for the future.
- It provides the opportunity to mo-

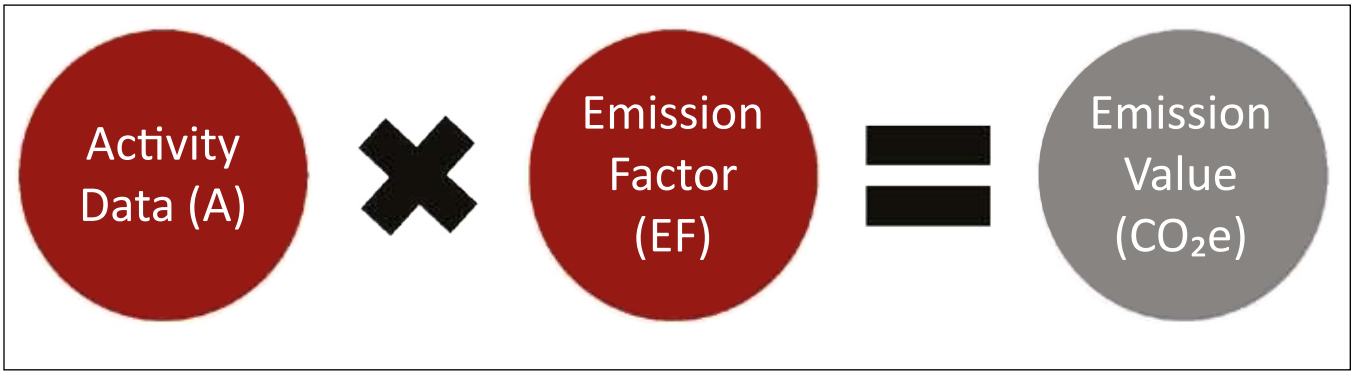


Figure 4. Carbon Footprint Calculation

nitor the performance and process of GHG emission reduction and GHG emission destruction.

As a result, after determining the purpose in the calculation of the carbon footprint, the system limits will be determined. Then the data will be collected and the calculation step will be performed. When all calculations are finished, they should be reported transparently. According to the results of the report, individual and institutional measures can be taken to reduce the carbon footprint as a result of the carbon footprint calculation. When we try to make the actions in our lives sustainable without leaving our comfort zone, the carbon dioxide footprint will decrease. Individually, we can make the following changes in our lives to reduce carbon values:
- Preferring public transport
-Making a habit of cycling
- Using energy-efficient appliances in our homes
- Reducing red meat consumption
-Using recyclables / reducing plastic use
- Such as avoiding unnecessary water and electricity consumption / turning off empty lights, running the dishwasher at full capacity...
- Keeping the combi temperatures as low as possible / even lowering 1 o C reduces environmental effects and saves money.
- Trying to reduce our waste as much as possible, and even to zero, especially in food.
- Paying maximum attention to environmental cleanliness / protecting green areas
- Trying to consume organic foods / It will be a much healthier and more environmentally friendly approach to consume less of the foods that are a little high in price but with organic content, rather than consuming a lot of cheap but non-organic foods.

In the industrial process, trying to make production activities sustainable without decreasing production will reduce the corporate carbon footprint. When the concept of sustainability is adopted throughout all processes, not only in production activities but institutionally, its carbon footprint will be reduced over time. Thus, institutions can take more effective and comprehensive steps to reduce their carbon footprint. For example;
- Developing corporate sustainability policies and constantly measuring sustainability performance and publishing reports
- Establishing an effective waste and energy management system
- To provide training to its employees on carbon footprint reduction, to increase their awareness of sustainability
- Carrying out efforts to balance the carbon footprint by obtaining carbon credits
- Meeting energy needs from renewable energy sources
- Auditing the environmental performance of their suppliers
- Attract investments from responsible investors
- Integrating waste reduction, reuse, and recycling approach into all its processes
- Turning to electric vehicles in the purchase/rental of company vehicles

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## HİDROLİK ÖLÇME SİSTEMLERİ-1

# HİDROLİK POMPALARINIZI ÇALIŞMA YERİNDE TEST EDİN!

Hidrolik sistemlerin kalbi olan hidrolik pompalar, sistemdeki herhangi bir arızada her zaman ilk şüphe duyulan ekipmanlar sınıfına girerler.
Küçük ölçekli hidrolik sistemlerde pompanın ölçüm değerlerinin tespiti nedeniyle yerinden sökülmesi, kontrolü ve testi kolay olmasına karşın, büyük ölçekli sistemlerde ve mobil uygulamalarda çalışma yeri olan arazide pompanın aynı maksatla sökülmesi büyük zaman, iş, üretim kayıplarına ve işçilik maliyetlerine neden olur.
Bu noktada hidrolik ölçüm sistemleri (Hydrotechnik) mobil uygulamaları ve basit kurulumları ile birlikte gelişen elektronik teknolojinin bizlere sunduğu faydalardan biri olarak karşımıza çıkar.

**Ölçüm Setleri :**
Darbelere karşı etkin bir koruma sağlayan özel çantası ile birlikte teslim edilen Hydrotechnik ölçüm setleri temel olarak sensör, veri iletim kablosu ve ölçüm cihazı gibi üç temel bileşenden oluşmaktadır.
1kHz'den 10 kHz'e kadar örnek alabilen debi, basınç, sıcaklık, devir ve kirlilik ölçümü yapabilen sensörler, harici dış enerji beslemesine ihti-

Ölçüm Seti

Debimetre

Ara Bağlantı Kablosu

Ölçüm Cihazı


Yağ Kirlilik Ölçüm Sensörü

Basınç Sensörü

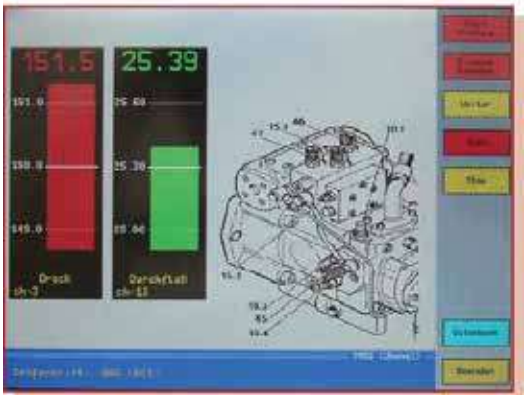
Devir Ölçüm Sensörü

Sıcaklık Sensörü

Debimetre

yaç duymadan, dahili pil ile çalışan ölçüm cihazlarından beslenerek ürettikleri analog ve dijital sinyaller ile ölçümü geçekleştirirler.
Sensörlerden gelen analog sinyaller ölçüm cihazlarının çeviricilerinde işlenerek, 1ms'lik çevrim süreleri içinde ölçüm cihazının üzerindeki ekrana yansıtılırlar. Bu değerler istenirse hafızaya alınabilir. Hafızadaki ölçüm değerleri ölçüm setleri ile birlikte teslim edilen Hydrocom Sys programı ile işlenerek grafik, tablo ve analiz şeklinde sunumlar da hazırlanabilir.
Hydrocom Sys ile hazırlanan sunumlar , işletmelerin bakım ekipleri için programlı duruşlarda pompaların verimini takip etmeleri yönünde fayda sağlanmasının yanı sıra programsız arıza duruşlarında da arıza aramada çok büyük kolaylık sağlamaktadır.


Öte yandan iş makinası servisi veren firmalar içinde özellikle arazideki pompa kontröllerin de
bu yöntem büyük kolaylık sağlamaktadır ayrıca yapılan ölçümlerin görsel sunumlarının P-Q diyagramı gibi araç kataloğunda verilen grafikler ile kullanıcıya sunulması, uygulayıcılara ayrı bir kalite ve prestij sağlamaktadır.




## Sensör Tipleri :

Hidrolik pompaların testinde temel olarak kullanılan üç tip sensör bulunmaktadır. Bunlar flowmetre grubu içinde yer alan debi sensörü, basınç sensörü ve sıcaklık sensöründen oluşur.
Flowmetre grubu pompa basınç hattına takılarak 630 bar'a kadar pompa tarafından sisteme gönderilen yağın lt/dak veya GPM cinsinden ölçümü yapılabilmektedir.
Basınç ve sıcaklık sensörleri ise sistemin herhangi bir hattına müdahale etmeden flow metre grubunun üzerindeki minimess noktalarına takılabilmektedir.
İhtiyaca bağlı olarak 2-3 veya daha fazla basınç sensörü de kullanılarak gerek pompa sızıntı hattı gerekse emiş hattı vakum değeri gibi özel farklı noktalardan da basınç hattı ölçümüne imkan veren bu sistemle olası arıza tahminleri basit ve kolayca yapılabilmektedir.

# COLLABORATION DEFYING FLAMES: DBI AND SISTEM TEKNIK

**One of the guests of our new issue was Anders Drustrup, Fire Resistance Engineer of DBI company. The successful name talked about the cooperation we made with the DBI company and said: "Sistem Teknik furnace meets the criteria very well. It has many good features that make the fire testing process reliable and easy".**

Thank you very much for accepting our interview request. Could you please first introduce yourself to our readers?

My name is Anders Drustrup, and I have been working at DBI as a Resistance to Fire Testing Engineer for almost 20 years. I have the technical responsibility for the test furnaces and testing equipment at DBI. In addition, I am involved in development and implementation of new test methods and equipment (e.g. equipment for conducting EN1366-1 and EN 1366-2 testing, and establishment of a system for measuring the emission from our fire tests).

We know that as an Institute DBI has an important role in Fire Resistance in the Scandinavian countries and also in Europe. Could you please tell us about DBI activities and laboratories importance in Fire Resistance Test industry?

DBI is a modern fire laboratory which is at the forefront of the latest development. We perform almost all types of fire tests of materials, components and constructions. Our focus areas are the maritime industry, building constructions, and trains.

At DBI, we have also specialized in conducting small scaled fire tests, which can give an indication of the fire safety properties of products and materials already in the stages of concept and development. This method increases the chances of passing a fullscale fire test and reduces the product's Time to Market.

**Anders Drustrup**
DBI Yangına Karşı Dayanım Test Mühendisi

How many furnaces do you have at DBI laboratory, and what kind of tests can you perform?

We have four 'large' furnaces where we can perform all standard fire tests. Besides, we have a new facility for testing full size facade systems, as well as a highly specialized test

equipment for conducting fire tests on ducts and dampers.

Customers can install test specimen away from the furnace. Not having to work inside a furnace when installing a duct system gives a far better installation, which in the end leads to a better test result.

**How did DBI meet with Sistem Teknik and decide to buy a Sistem Teknik brand furnace?**

I first heard of Sistem Teknik at an EGOLF meeting in Istanbul in 2015, while DBI was in the process of outlining the technical specifications for a new furnace. One of our big customers had also just bought a furnace from Sistem Teknik and they were very pleased with the result, so we went to their facility and checked out their furnace. When we started getting offers from furnace manufactures, it was therefore natural for us to contact Sistem Teknik.

**How would you evaluate Sistem Teknik furnace in terms of its function, capability and novelties?**

We are satisfied with our Sistem Teknik furnace, and it fulfills the function criteria very well. It has a good design and many good features that make the process of fire testing reliable and easy, e.g. a good control interface, good visibility to the inside of the furnace during testing, and a robust furnace lining.

**Could you please briefly evaluate the cooperation and service of Sistem Teknik?**

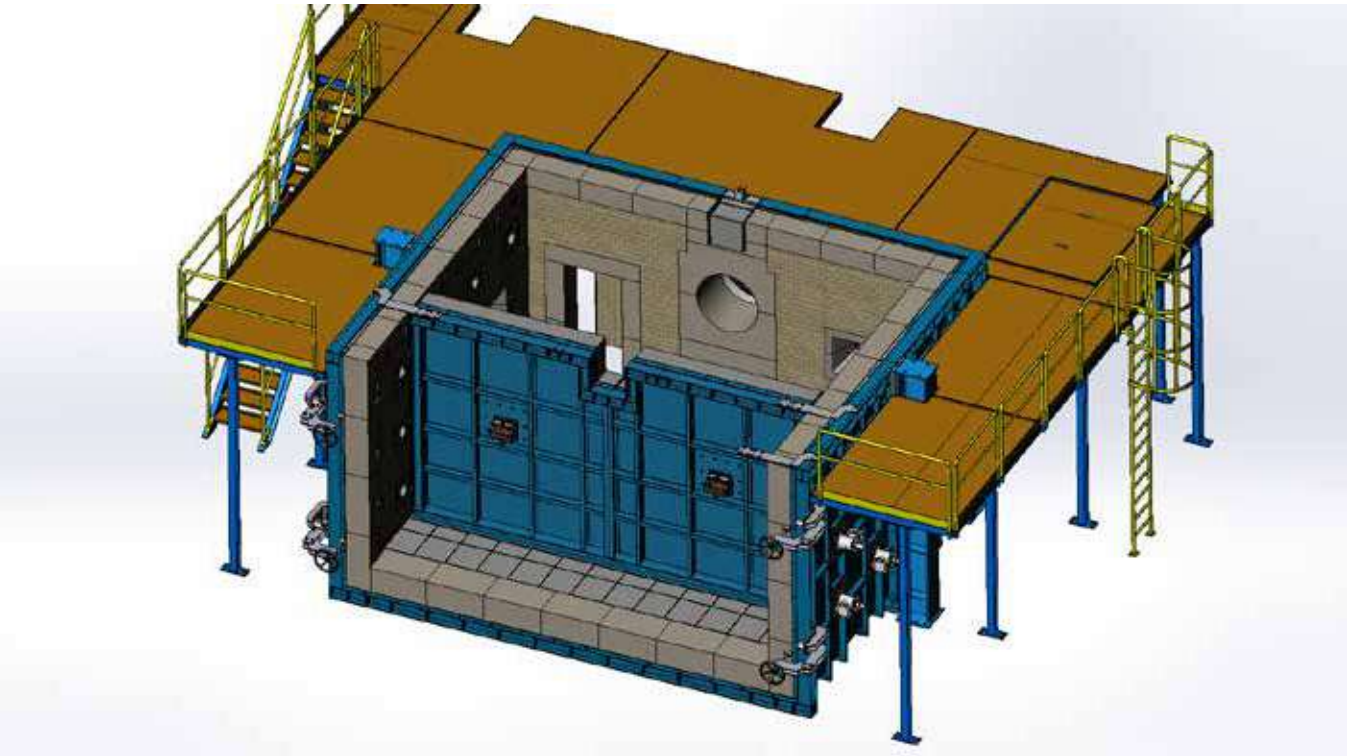
The dialog with Sistem Teknik in the design face was good, and it was most helpful for us that we could come and see the furnace at the Sistem Teknik's facility. That solved many problems that otherwise would have had to be solved during the installation. During the installation fase, we were able to solve the technical issues that naturally occurred.

Whenever we have had a problem with the furnace control, we have called and received help. They have always been able to help us right away and continue until the problem has been solved. It has also never been a problem that Sistem Teknik is located in Istanbul while DBI is located in Denmark.

## Who is Anders Drustrup?

Would you like to get to know Anders Drustrup briefly, Fire Resistance Test Engineer of The Danish Institute of Fire and Security Technology? Working as a Fire Resistance Test Engineer at DBI for almost 20 years, Drustrup is also involved in the development and implementation of new test methods and equipment in the successful company. For example, he is responsible for setting up a system to measure emissions from fire tests and equipment to perform EN1366-1 and EN 1366-2 tests.

Due to all the Covid19 travel restrictions, we have not been able to have any service and maintenance control on the physical furnace components, but we hope to get this done by the end of 2022.

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# THE GREAT MEETING WAS HELD

**As Sistem Teknik, we took our place in THERM PROCESS, GIFA, METEC and NEWCAST fair, which is one of the most anticipated events of our industry and brings together many companies.**


As Sistem Teknik, we took our place in THERM PROCESS, GIFA, METEC and NEWCAST fair, which was held on 12-16 June this year and held every four years. We are very happy that we participated in this fair, which is one of the most important and fundamental events for our industry with the number of visitors exceeding 60 thousand, and that we had the opportunity to meet with our industry stakeholders.

**Endless thanks!**
We would like to thank everyone who visited us at our stand and hosted us at their stand. Hoping to meet again at next events!

# HOW DO WE ENSURE THE HIGH ENERGY EFFICIENCY IN OUR FURNACES?

- Furnace energy and exergy balance detail calculations,
- Simulations made to ensure temperature homogeneity,
- Protective atmosphere flow rates determined according to needs and,
- Using top quality insulating materials, combustion equipment and resistors.

SİSTEM TEKNİK
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# BRIGHT FACES OF THE FUTURE, OUR YOUTH

"Educate the youth. Give them positive ideas of science and culture. You will have the light of the future with them. When free ideas are put into practice, the Turkish nation will rise."

Mustafa Kemal ATATÜRK


We met with the successful students of Hatice Bayraktar Vocational and Technical Anatolian High School with the participation of Mehmet Özdeşlik, CEO of Sistem Teknik Sanayi Fırınları Inc. In the event organized within our company, we first made our promotional presentation to give information about our industry and to raise awareness of our youth. Then, we had the opportunity to talk about the importance of heat treatment, its usage areas, and that it actually takes place at an important point in our lives. Afterwards, we listened to the ideals and goals of our young people and talked about the internship and job opportunities they could have at Sistem Teknik. After the tour we made in our production area, we ended this pleasant day. At the end of the day, we understood once again that our hope is in youth. We would like to thank everyone who contributed and wish the success of our young people, the bright faces of the future, to be permanent.

# DC Serisi Vakum Temperleme Fırınları

# VAKİT NAKİTTİR

## HIZLI ISINMA HIZLI SOĞUMA

## VF-TE-DC SERİSİ VAKUM TEMPERLEME FIRINI

| Model Numarası | Ebatlar | Şarj Kapasitesi (kg) | Isıtma Gücü (kWh) |
|---|---|---|---|
| VF-T-E-DC-696 | 600x900x600 | 1000 | 140 |
| VF-T-E-DC-9129 | 900x1200x900 | 1500 | 220 |
| VF-T-E-DC-101510 | 1000x1500x1000 | 2000 | 260 |

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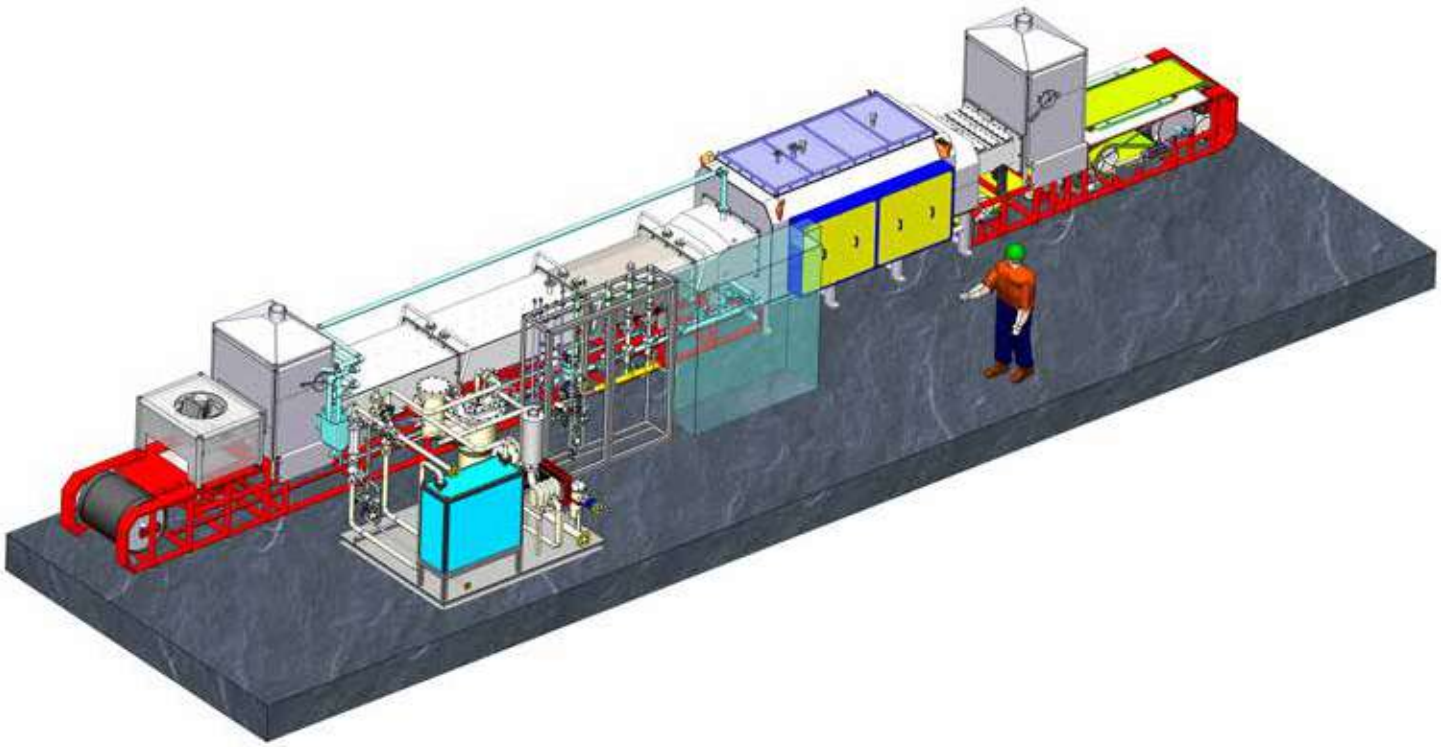
SİSTEM TEKNİK
SANAYİ FIRINLARI A.Ş

# SISTEM TEKNIK DIFFERENCE IN ENERGY SECTOR

Sistem Teknik continues to make a difference in the energy sector. The production of two new Vacuum Drying Ovens for the Turkey and Bulgaria facilities of our customer, one of the major players in the transformer drying sector, continues. It is planned that the furnaces with a capacity of 2 tons/charge will be completed in June, all tests will be carried out, shipped to customer sites and commissioned in July. We once again congratulate all our teammates who contributed to the projects and wish them success in their work.

# NO MEXICAN PASSENGERS LEFT!

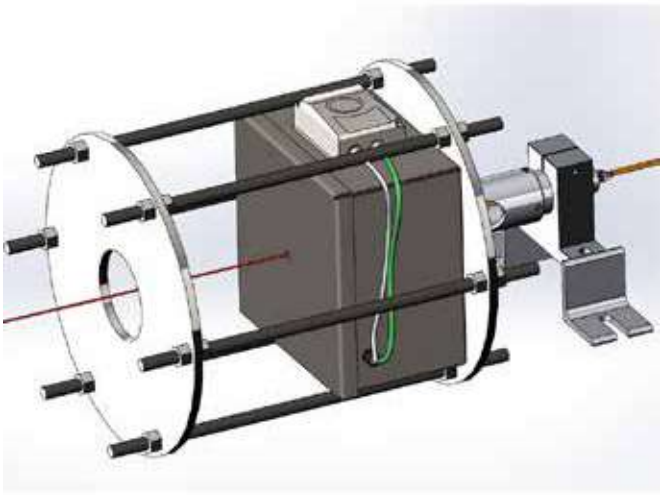

Our 18-meter-long Electrically Heated Mesh Belt Conveyor Bright Annealing Plant, which we designed and produced for ABB Mexico, has successfully completed all pre-acceptance tests. It is aimed to carry out the heat treatment of copper pipes in the furnace, which provides a Protective Atmosphere environment with the exhaust gas system. After two pleasant days with ABB Mexico officials, the installation and commissioning of the project, for which preliminary acceptance documents were signed, is planned to be completed in July. We would like to thank our teammates and ABB Mexico officials who took part in the project for their efforts, and we wish our cooperation to continue.

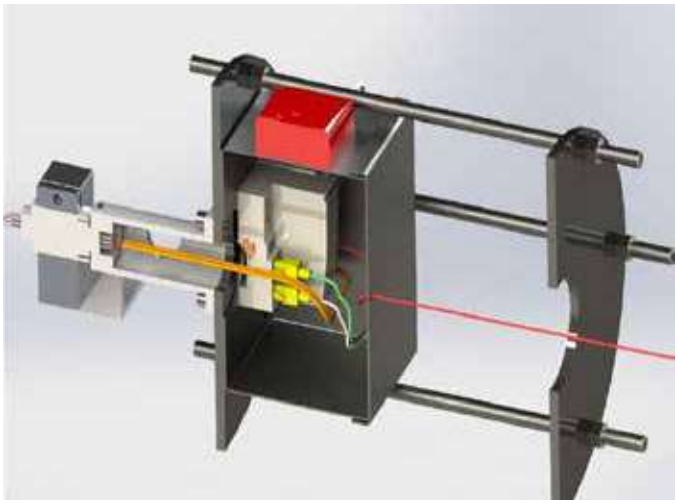


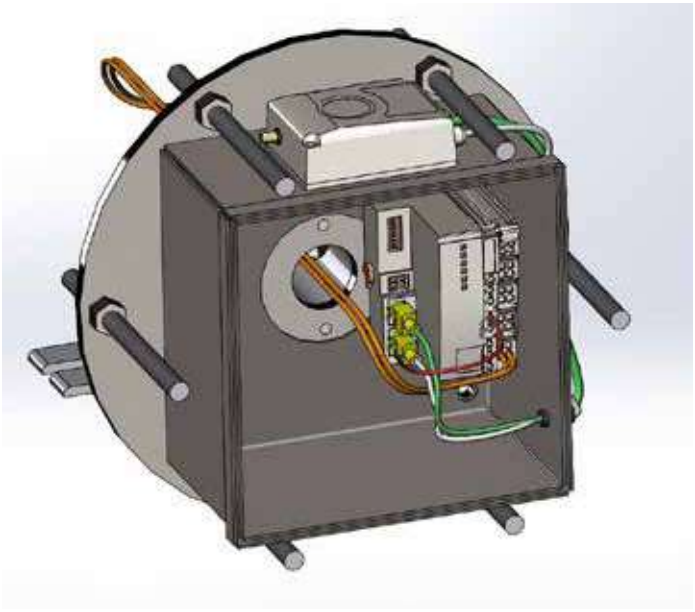
# THREE MORE OF OUR NEW DESIGNS HAVE BEEN REGISTERED BY THE TURKISH PATENT AND TRADEMARK OFFICE

**Sistem Teknik R&D Center continues its activities without slowing down. Our three new designs, which we have applied for in different fields, have been registered by the Turkish Patent Institute. After all, technology, innovation and improvement are in our nature.**

Three more of our new designs have been registered by the Turkish Patent Institute. We will continue to invest in technology and innovation with our full speed and increasing determination. Once again, we congratulate our friends through our magazine.
The design that capable of temperature measurement: “Measurement System with Thermocouple in Rotary Hearth Furnaces”
The first of our awarded designs was our work called “Measurrement System with Thermocouple in Rotary Hearth Furnaces”. Our design was purposed to take temperature measurements in rotary systems. It ensures that the thermocouple and energy supply cables connected on the rotary system continue to work without interference, thanks to the slipring and bluetooth data transfer devices within the system. Thermocouple wire or wires coming from the







Thermocouple Measurement System in Rotary Ovens

Fabric thickness adjusting machine

rotating part are connected to the analog input thermocouple module on the system. The data coming from this module is transferred to the bluetooth data sharing device on the system via an ethernet cable in real time via a profinet IO communication device. This data is transferred to another bluetooth device on the panel and from there to the PLC. Energy supply to the system is provided by slipring equipment. An energy cable from the main line that will feed the communication devices is connected to the fixed output of the slipring, and energy is transferred to the supply module on the rotating system with the energy cable connected to the other output.

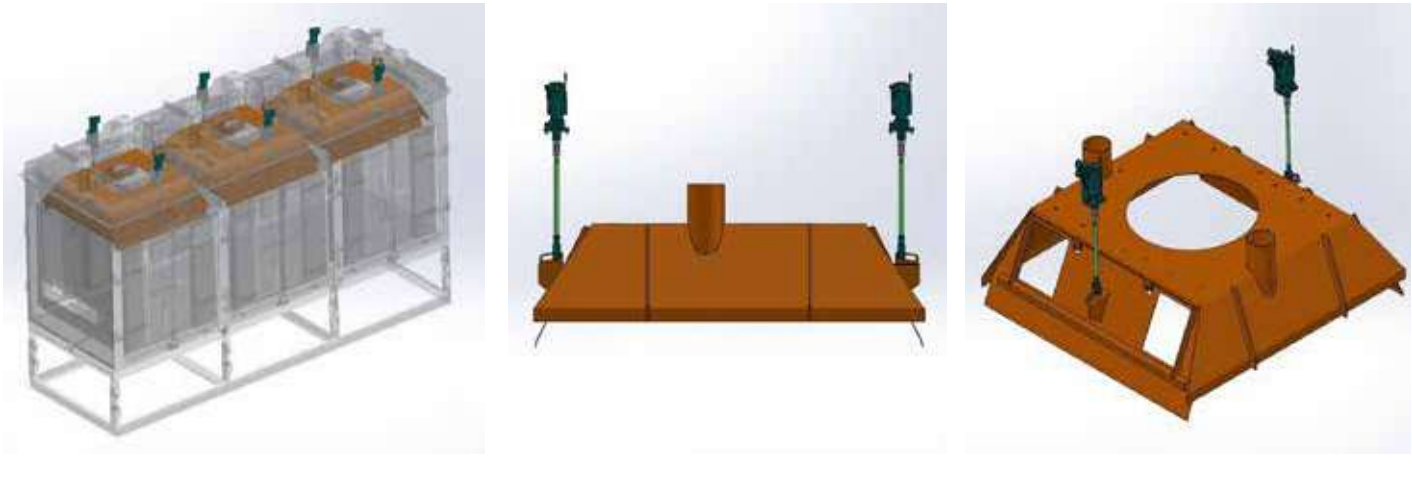
Homogeneous in every portion of the fabric: "Automatic Adjustment of Prepreg Fabric's Precise Thickness Value"

The design ensures that the prepereg fabric is immersed in the resin and solvent mixture in the resin immersion tank, and then the excess resin on this resin-impregnated fabric is stripped with squeezing-stripping roller systems, where the distance between them can be adjusted precisely (±20µ). In this way, a process takes place that ensures that the resin absorption is homogeneous in every portion of the fabric.

The design that directs the movement of the air: "Moving Muffle System"

Our last design was the "Moving Muffle System". This invention is used in industrial industrial furnaces in order to direct the movement of the heated air in the furnace. It is designed to adjust the path that the heated air will follow inside the furnace after exiting the circulation fans. It is used to change the direction of the air flow in the furnace, depending on whether the blades are in an open, closed or intermediate position.

We wish the continuation of their success in their work to all our team members who have signed these three valuable inventions.



Movable Muffle System

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The durable and portable data logger is easy to use and can be used in many industrial applications that require recording, trending and reporting. Eagleye PDR®includes 15 channels with user-defined inputs for each channel. Eagleye PDR® includes software for managing tests and creating custom reports based on test results.


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- Password protected menu options
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- Easy calibration
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# Eagleye AGA® (Atmosphere Gas Analyzer)

It measures the atmospheric gases of heat treatment furnaces containing a protective atmosphere. You can evaluate the performance of your Endogas/Exogas generators and the condition of your catalysts. You can control your oxygen probe with the atmosphere gas in your furnaces.

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| | |
|---|---|
| CO: 0-50% | O2: 0-25% (Optional) |
| CO2: 0-5% | H2: 0-100% (Optional) |
| CH4: 0-10% | Carbon: 0-2% (Calculated) |

## Carbon measurement based on gas composition

- Easy to use, operator training in minutes
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Industrial Furnace Heating Elements are heat treatment systems that enable the internal environments of the furnaces to reach the desired temperature values. are the types of heaters used in the oven. Oven interior use at the same time in different types and usage sizes Production is carried out in the quality of Baykal Rezistans, according to the temperatures.

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» Spiral Wound Heaters (Maximum 1100°C)
» Metal Sheathed Ceramic Carrier Supported Heaters (Maximum 1200 °C)
» Silicon Carbide Heaters (Maximum 1400 °C)

*Industrial Furnace Heater

A wide range of customer needs in all your processes that require heat treatment from the best manufactured products that you will prefer as a welcome tool.
You can use it as one of these types of customers together with its expert personnel. You can work with Baykal Rezistans, our team that offers expert solutions in terms of experience. A strong infrastructure and With its 100% solution-oriented approach, you can always manufacture industrial furnaces and equipment. Take advantage of the right furnace heater types in your processes. A heat treatment furnace, also known as a high-temperature heater Today, the heaters are up to 1400 degrees Celsius with a special ceramic material and high degree structure. It is produced by being manufactured from resistance wire together. Today, according to the types of furnaces, suitable for the desired projects As Baykal Rezistans, we provide the production in the dimensions you want. Anything you want at the special production point you can reach anytime, you can also stay in touch for information and support.

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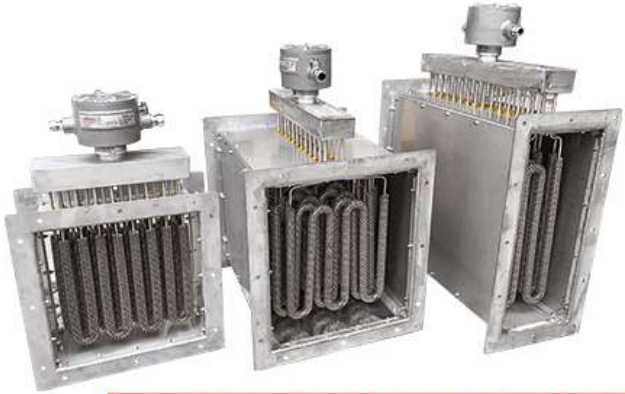

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Exproof Heaters Exproof Tubular Heaters can be used for a wide variety of purposes. It is used safely in the chemical and petrochemical industry, in industrial processes, oil platforms, military facilities and many other places, in areas where an explosive atmosphere may occur, in environments where substances are stored, processed or produced.
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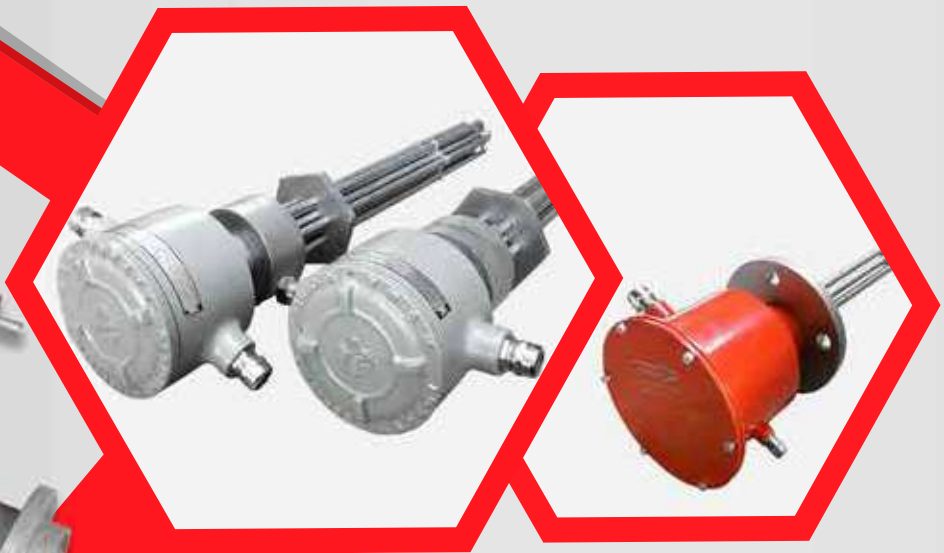

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# PHD-4 PORTABLE LEAK DETECTOR FOR TESTING UNDERGROUND STORAGE TANKS

Leak Testing for Underground Storage
of Hazardous Materials

Leaks in underground gasoline and fuel oil tanks are a danger to the environment especially if leaking fuel enters local water supplies. To avoid environmental damage, countries worldwide are instituting legislation restricting the level of leaks allowed to emanate from underground tanks.
To protect the environment and to avoid the liability costs associated with non-compliance with environmental legislation, it is very important to find and repair leaks quickly.
The average cost to clean up a simple tank leak is very high and increases with the size of the leak. One way to minimize the danger and expense of leaks is to find them when they are very small. This requires a high degree of sensitivity and reliability in the leak detection method, one that both identifies and locates leaks precisely. The PHD-4 does both. This eliminates the need to excavate the area around an entire tank to fix a leak that may only be in the piping.

## What Is PHD-4?

The PHD-4 is a self-contained, ready-to-use portable leak detector capable of detecting helium concentration as small as 2 parts-per-million.

### • Why Helium?

Due to the low concentration of helium in the atmosphere (only 5 ppm), very small leaks can be detected.
Helium is non-reactive with other chemicals.
Helium as a tracer gas is advantageous because it is non-toxic, non-flammable, inexpensive, and quickly diffuses through small leaks.

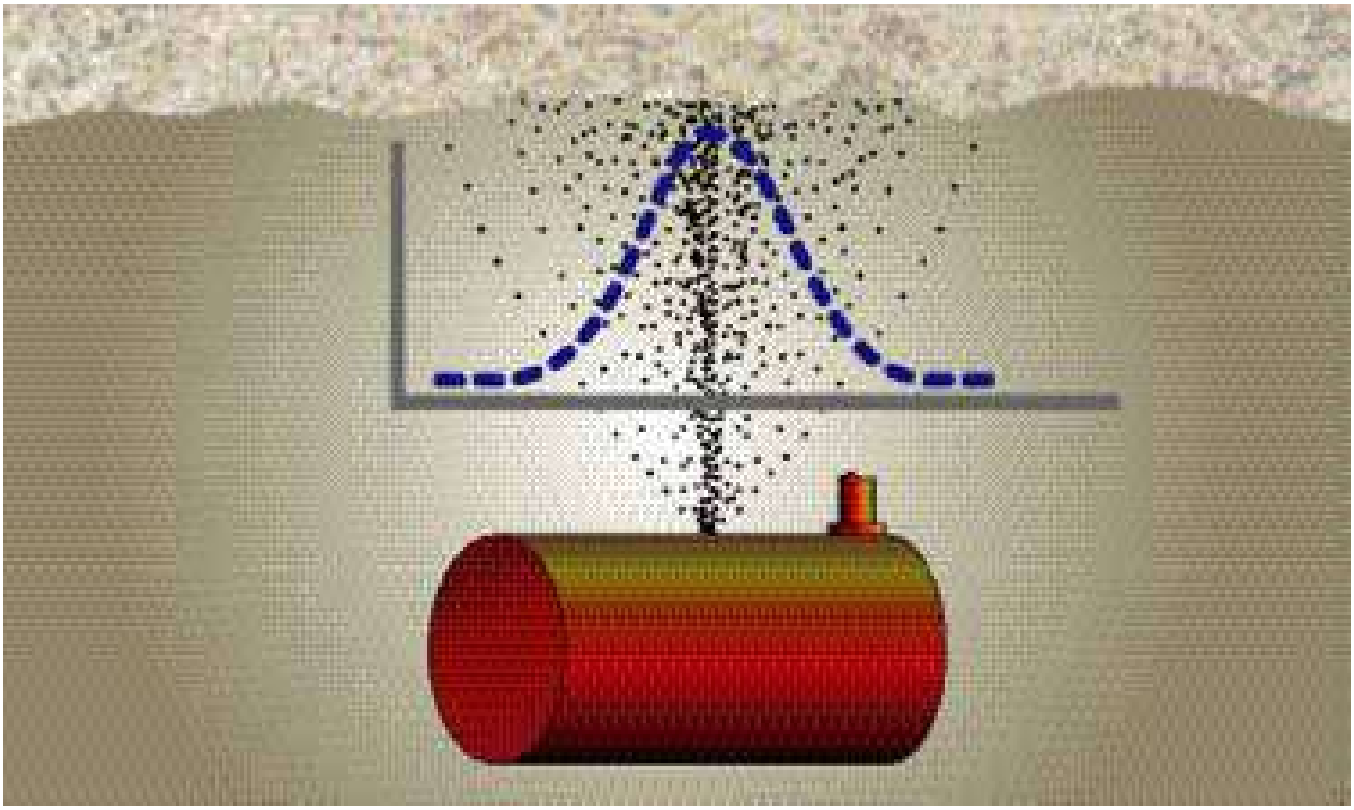
### • Easily permeates earth and asphalt.

1- Leak Detection At Initial Installation
2- Post Installation Leak Detection

### • Leak Detection At Initial Installation

Leak detection during initial installation is usually easier to accomplish because most or all components of the UST are readily accessible. Today, most new installations consist of primary and secondary containment systems. Tanks are typically double-walled and piping runs consist of an inner primary pipe and outer secondary pipe. Product leaking from the

> One way to minimize the danger and expense of leaks is to find them when they are very small. This requires a high degree of precision and reliability in the leak detection method that both pinpoints and detects leaks.



primary pipe is caught by the secondary pipe. Since piping runs are pitched back toward the sump area, any captured product flows in that direction to help insure containment.
Generally, testing of the tank top and piping in a new installation proceeds as follows:
• Adequately seal all tank and piping penetrations.
• Apply helium flow to one end of the system and monitor helium flow at the opposite and farthest end of the system to insure flushing of the ambient air within and to make sure that helium has reached all components.
• Seal the downstream penetration and pressurize the system with welding grade helium.
Although higher total pressures will increase the flow rate at leak sites and make smaller leaks easier to detect, one hundred percent helium is not necessarily required. Once the system is flushed and helium is added, the total pressure can be increased with air or nitrogen. When testing the primary piping using the PHD-4 helium "sniffer", the secondary piping can often be used to help contain any leaking helium. An accumulation effect occurs, making detection easier. In these cases, once the primary system is found to be leak free, the secondary piping can be sealed. Then, using a similar process, this secondary containment area, the interstitial space between pipes, can be flushed, pressurized with helium, and checked for potential leaks.

**• Post Installation Leak Detection**

Leak detection of a previously installed UST can be much more challenging since the tank and most of the piping are less accessible. These sites also typically have a layer of concrete or asphalt at the surface. The system must be flushed of air and pressurized with helium as described earlier, and leak detection must be performed through the layers of dirt, sand, gravel, concrete, etc.
Helium will pass through all substrates but will not always follow a straight-line path to the surface. To aid in finding the precise location of the leak site, holes may be drilled through the concrete at regular intervals along and directly over the piping runs. Once pressurization and a short dwell time are accomplished, the PHD-4 probe is placed at each of these holes to determine the approximate location of the leak.
Tape or some other material is placed over the hole during the dwell period to permit an accumulation effect and make the detection method more sensitive. Proper execution of this method can significantly reduce the amount of excavation required to repair leaks at an existing UST site.

**• Why PHD-4 ?**

High Selectivity PHD-4 is sensitive only to helium. There are no false signals due to the presence of any other gases.
High Sensitivity PHD-4 is nearly as sensitive to small leaks as a more expensive mass spectrometer leak detector used in the sniffing mode. This allows precise location of the leak which helps minimize excavation costs.
Battery Operated PHD-4 can be operated without a main power supply or power generator. Up to 4 hours on a single charge.
Simple Operation PHD-4 is very easy to use and does not require any special operator training. All the active menus of the PHD-4 are available in four languages. Specifically designed for underground testing (see sampling probe in photo on page 3).
Very Low Maintenance Replacement of sampling line filters is straightforward and requires only a screwdriver.
Portable PHD-4 is lightweight, portable and easy to carry, even to the most difficult leak check locations. It weighs only 2.6 kg.

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