0.1. GENEL

0.1.1. Bu egitim el kitabi, HSF Savunma Havacilik Ltd. Sti. (HSF) tarafindan uygulanan isil islem surecleri icin genel kosullari belirlemektedir.

0.1.2. Urun kosullarina ve/veya ham madde durumuna bagli olarak isil islem sureci guncellenebilir veya degistirilebilir. Yetkilendirilmis muhendis her zaman ilgili standardlari, uygulamalari ve deneyimleri dikkate almalidir.

0.1.3. Bu el kitabi, firin ekipman gereklilikleri, test prosedurleri ve isil islem prosedurleri, isil islem surec sicaklik ayarlari ve malzeme test sureclerine iliskin bilgilerin yani sira isil islem operator gereklilikleri, periyodik (onleyici) bakimlar ve kalibrasyon gerekliliklerini de kapsamaktadir.

0.1.4. Bu egitim el kitabinda yer alan bilgiler, HSF tarafindan uygulanan uretim ve kalite kontrol surecleri kapsaminda uluslararasi standardlar ve musteri gereksinimleri dikkate alinarak hazirlanmistir.

0.1.5. Bu egitim el kitabinin **kullanici seviyesi**

- hizmet ici **egitimini almis**,
- **en az 6 ay** isil islem unitesinde hizmet almis,
- isil islem surecini **degerlendirebilecek** muhendislerdir.

0.1.6. Isil islem unitesi icin muhendis yetkilendirilmesinin **on kosulu** 0.1.5. maddesinin tamamlamis olmaktir.

0.1.7. Yeterli isil islem egitimi olmayan muhendisler ve operatorler bu klavuzun kapsam disindadir.

0.1.8. Bu **egitim el kitabinin konulari** SAE ARP1962 (Training and Approval of Heat-Treating Personnel) Havacilik Endustrisi Tavsiye Edilen Uygulamalar dokumaninda yer alan Tablo 1'e gore hazirlanmistir.

0.1.9. Uretim gereksinimlerinde aksi belirtilmedigi surece, isil islem, test, muayene ve ilgili islemleri gerceklestiren tum personel, belgelenmis farkindalik ve egitim belgelerine uygun olarak egitilecek ve onaylanacaktir. HSF, ARP1962'yi isil islem personelinin egitimi icin kabul edilebilir bir tavsiye edilen uygulama belgesi olarak kabul etmektedir.

0.1.10. Bu egitim el kitabi HSF Isil Islem Firini Kullanim Klavuzunun bir parcasidir ve tum kullanicilar bu iki klavuzu ve diger gerekli tum standardlari birlikte degerlendirmelidir.

0.1.11. Bu egitim el kitabinda verilen sicaklik ve sure degerleri, veya diger her turlu bilgi HSF bunyesinde uygulanan isil islem sureclerini kapsar. Isil islem uygulanacak hammaddenin dokum kosullarina bagli olarak bu verilerde degisme olabilir. Bu nedenle, hammadde birden fazla lot veya tedarikci tarafindan saglaniyorsa mutlaka bu lotlar

GENERAL

√ This training handbook establishes general requirements for the heat treatment processes performed by HSF Savunma Havacilik Ltd. Sti. (HSF).

√ Depending on the product conditions and/or raw material status, the heat treatment process can be updated or changed. The authorized engineer should always consider the related standards, lived practices, and experiences.

√ This handbook covers the requirements for furnace equipment, test procedures, and information on heat-treating procedures, heat-treating temperatures, and material test procedures, as well as the operator requirements, periodic (preventive) maintenance, and calibration processes.

√ The information contained in this training manual has been prepared according to international standards and customer requirements within the scope of the production and quality control processes implemented by HSF.

√ The **user level of this handbook** is engineers who

- **have completed** in-service heat treatment training,
- **worked** in the heat treatment unit for at least six months,
- **can evaluate** the heat treatment process.

√ **The prerequisite** for engineer authorization for the heat treatment unit is completing article 0.1.5.

√ The engineers whose do not enough heat treatment training and the operators are **excluded** from this manual.

√ The **subjects of this training handbook** have been determined according to Table 1, published in the SAE ARP1962 (Training and Approval of Heat-Treating Personnel) Aerospace Recommended Practice document.

√ Unless otherwise specified in the production requirements, all personnel performing heat treating, testing, inspection, and associated operations shall be trained and approved in accordance with documented awareness and training documents. HSF accepts ARP1962 as an acceptable recommended practice document for training the heat treatment staff.

√ This training manual is part of the HSF Heat Treatment Furnace User Manual, and all users should consider these two manuals and all required standards together.

√ The temperature and time values given in this training manual, or any other information given, cover the heat treatment processes applied within HSF. These data may change depending on the casting conditions of the raw material to be heat treated. For this reason, if the raw material is provided by more than one lot or supplier, these lots must be kept separate from each

birbirinden ayri tutulmali ve her lot icin isil islem sureci ayri uygulanmalidir.

0.1.12. Bu egitim el kitabi celik ve paslanmaz celik hammaddelerini kapsamaktadir; titanyum, aluminyum ve diger hammaddeler icin lutfen teknik destek isteyin.

other, and the heat treatment process must be applied separately for each lot.

√ **This training handbook covers the steel and stainless-steel raw materials; for the materials including titanium, aluminum, and others, please ask for technical support.**

Guvenlik ve Tehlikeli Maddeler:

Bu egitim el kitabinda aciklanan veya atifta bulunulan materyeller, yontemler, uygulamalar ve islemler, tehlikeli maddelerin kullanimini icerebilse de, bu el kitabi bu tur malzemelerin kullanimini ele almamaktadir.
Tehlikeli maddelerin guvenli ve dogru kullanimi ve ilgili tum personelin saglik ve guvenligini saglamak icin gerekli onlemleri almak tamamen isil islem surecini uygulayicisi ve surec yonetici muhendis sorumlulugundadir.

Safety - Hazardous Materials:

While the materials, methods, applications, and processes described or referenced in this training handbook may involve the use of hazardous materials, this handbook does not address the hazards that may be involved in such use. It is the sole responsibility of the user to ensure familiarity with the safe and proper use of any hazardous materials and to take necessary precautionary measures to ensure the health and safety of all personnel involved.

0.2. UYGULANAN STANDARDLAR

HSF bunyesinde uygulanan isil islem ve alt-surecler asagidaki standardlar dikkate alinarak planlanmakta, uygulanmakta, kalite kontrolleri gerceklestirilmete ve tum surec izlenebilirligi raporlanmaktadir. Musteri tarafindan ozel bir standard istenmedigi surece HSF bu standardlarin son versiyonunu uygular. Atifta bulunulan standardin iptal edilmesi ve yerine gececek standardin belirtilmemesi durumunda, soz konusu belgenin yayinlanan son revizyonu gecerli olur.

APPLICABLE STANDARDS

The heat treatment and sub-processes applied within HSF are planned, implemented, and the quality controls carry out and the entire process traceability is reported taking into account the following standards. Unless a specific standard is requested by the customers, HSF implements the final revision of these standards. When the referenced document has been cancelled and no superseding document has been specified, the last published issue of that document shall apply.

REFERENCE	STANDARD DESCRIPTION
AMS2750	Pyrometry
AS7766	Terms Used in Aerospace Metals Specifications
AMS2769	Heat Treatment of Parts in a Vacuum
AMS2761	Heat Treatment of Steel Raw Materials
AMS2771	Heat Treatment of Aluminum Alloy Castings
AMS2772	Heat Treatment of Aluminum Alloy Raw Materials
AMS2774	Heat Treatment Nickel Alloy and Cobalt Alloy Parts
AMS2801	Heat Treatment of Titanium Alloy Parts
AMS-H-81200	Heat Treatment of Titanium and Titanium Alloys
AMS2759	Heat Treatment of Steel Parts, General Requirements
AMS2759/1	Heat Treatment of Carbon and Low-Alloy Steel Parts Minimum Tensile Strength Below 220 ksi (1517 MPa)
AMS2759/2	Heat Treatment of Low-Alloy Steel Parts Minimum Tensile Strength 220 ksi (1517 MPa) and Higher
AMS2759/3	Heat Treatment Precipitation-Hardening Corrosion-Resistant, Maraging, and Secondary Hardening Steel Parts
AMS2759/4	Heat Treatment Austenitic Corrosion-Resistant Steel Parts
AMS2759/5	Heat Treatment Martensitic Corrosion-Resistant Steel Parts
AMS2759/9	Hydrogen Embrittlement Relief (Baking) of Steel Parts
AMS2759/11	Stress Relief of Steel Parts
AMS-H-6875	Heat Treatment of Steel Raw Materials
ARP1962	Training and Approval of Heat-Treating Personnel

ARP1917	Clarification of Terms Used in Aerospace Metals Specifications
AS7766	Terms Used in Aerospace Metals Specifications
ASTM E220	Standard Test Method for Calibration of Thermocouples By Comparison Techniques
ASM HANDBOOK	Heat Treating – Volume 4

0.3. TANIMLAR VE KISALTMALAR
(Tam tanim listesi icin AS7766 Standardina bakin)

0.3.1. **Kesinlik:** Uygulanan standardin degerlerinin test edilen ekipman veya sensor icin maksimum sapmasidir.

0.3.2. **Kalibrasyon:** Uygulanan standard kapsaminda bir ekipman veya sensorun ciktilarinin standard gereksinimlerini tam karsiladigindan emin olmak icin sensor veya ekipmandan bir veya birden fazla olcum alinarak ve ciktilardaki sapmalarinin potansiyel ayarlamalarinin standarda bagli olarak duzeltilmesi.

0.3.3. **Duzeltme Faktoru** sapmanin (hata) cebirsel tersidir.

0.3.4. **Set Value (SV):** Istenen Sicaklik (standard disi)

0.3.5. **Point Value (PV):** Mevcut Sicaklik (standard disi)

0.3.6. **Sapma (Hata):** Uygulanan gereklilik kapsaminda mevcut sicaklik (PV) ile istenen sicaklik (SV) arasindaki farkdir. (Mevcut Sicaklik – Istenen Sicaklik = Sapma (Hata))

0.3.7. **Siklik (Aralik):** Bir kalibrasyon, test veya sensordegisim tarihinden veya gununden (tarih gun dahil dahil) bir sonraki kalibrasyon, test veya sensor degisimin icin sonraki takvim gunu.

DEFINITIONS AND ABBREVIATIONS
(see AS7766 Standard for whole definition list)

√ **Accuracy:** The maximum deviation of the instrument or sensor being tested from the values of a traceable standard.

√ **Calibration:** An assessment of the accuracy of a sensor or an instrument to a traceable standard sensor and/or field test or standard instrument, based on one or more measurements, and potentially adjusting an instrument and/or compiling a deviation chart for a sensor or instrument in order to ensure compliance with requirements.

√ **Correction factor** is the algebraic opposite of deviation (error).

√ **Set Value:** SV (Non-standard definition)

√ **Point Value:** PV (Non-standard definition)

√ **Deviation (Error):** In the context of this specification, the difference between the uncorrected indicated temperature and the true temperature (Indicated Temperature - True Temperature = Deviation/Error).

√ **Frequency (Interval):** The calendar days from the day/date a calibration, test, or sensor replacement was performed and the next day/date a calibration, test, or sensor replacement is due (inclusive).

KALIBRASYON / TEST / SENSOR DEGISIMI ICIN ZAMAN ARALIK TANIMLARI
TIME FREQUENCY DEFINITIONS FOR CALIBRATION / TEST / SENSOR REPLACEMENT

Siklik (Aralik) Frequency (Interval)	Her Seferine Esit Equal to Once Every	Zamaninda veya Oncesinde Tamamlanacak Shall be Completed On or Before
Haftada Bir Weekly	Hafta Week	Her hafta, haftanin ayni gunu The same day of the week every week
Iki Haftada Bir Biweekly	2 Hafta 2 Weeks	Her iki haftada bir, haftanin ayni gunu The same day of the week every 2 weeks
Ayda Bir Monthly	Ay Month	Her ay, ayin ayni gunu The same day of the month every month (1)
Iki Ayda Bir Bimonthly	2 Ay 2 Months	Her iki ayda bir, ayin ayni gunu The same day of the month every 2 months (1)
Uc Ayda Bir Quarterly	3 Ay 3 Months	Her uc ayda bir, ayin ayni gunu The same day of the month every 3 months (1)
6 Ayda Bir Semiannually	6 Ay 6 Months	Her alti ayda bir, ayin ayni gunu The same day of the month every 6 months (1)
Yillik Annually	Bir Yil Year	Her yil, yilin ayni gunu The same day of the year every year (1)

(1) Kalibrasyon, test veya sensor degisimi icin gun ay icinde bulunmuyorsa, sonraki kalibrasyon icin ayin son takvim gunu kullanilir.
If the next calibration, test, or sensor replacement is due on a calendar date not contained in that month, then the last day of that calendar month shall be used for the next calibration.

0.3.8. KISALTMALAR ABBREVIATIONS

0.3.8.1. **TUT:** Temperature Uniformity Tolerance (Sicaklik Esdeger Toleransi)

0.3.8.2. **SAT:** System Accuracy Test (Sistem Esdeger Testi)

0.3.8.3. **TUS:** Temperature Uniformity Survey (Sicaklik Esdeger Testi)

0.3.8.4. **WS:** Witness Sample (Sahit Numune)

0.3.8.5. **PAQL:** Process Acceptance Quality Level (Surec Kabul Edilebilir Kalite Seviyesi)

0.4. AMS2750 GEREKSINIMLERI

AMS2750 kapsaminda HSF tarafindan kullanilan firinlarin genel ozellikleri:

0.4.1. Sicaklik Kontrolu: Dahili ve Harici Kontroller
0.4.2. Pyrometer: Harici (Bagimsiz) Surec Kontrolu
0.4.3. Thermocouple – Sinif: Noble Metal
0.4.4. Thermocouple – Tip: S
0.4.5. Thermocouple – Kapsam: 1400 ^{0}C (2552 ^{0}F)
0.4.6. Load-Sensor: Inconel Alloy 1400 ^{0}C (2552 ^{0}F)
0.4.7. Thermocouple Kalibrasyon: ASTM E220
0.4.8. Kalibrasyon Adimi: 100 ^{0}C (200 ^{0}F)
0.4.9. Kalibrasyon Tekrari: 6 Ayda Bir
0.4.10. Tekrar Kullanilabilirlik: Sinirlama yok
0.4.11. Thermocouple – Kalibrasyon Etiketi: En az asagidaki bilgileri icermelidir

√ Ekipman veya Firin No
√ Thermocouple Tipi
√ Kalibrasyon Tarihi
√ Kalibrasyon Son Gecerlilik Tarihi
√ Kalibrasyonu Yapan Kisi / Gorevi
√ Kalibrasyon Limitleri

AMS2750 REQUIREMENTS

In the scope of AMS2750, the general specifications of the furnaces used by HSF:

√ **Temeprature Controllers:** Internal and External
√ **Pyrometer:** External (Non-Touch) Process Control
√ **Thermocouple – Class:** Noble Metal,
√ **Thermocouple – Type:** S
√ **Thermocouple – Range:** 1400 ^{0}C (2552 ^{0}F)
√ ***Load-Sensor:*** *Inconel Alloy 1400 ^{0}C (2552 ^{0}F)*
√ **Thermocouple Calibration:** ASTM E220
√ **Calibration Steps:** 100 ^{0}C (200 ^{0}F)
√ **Recalibration:** Semiannually
√ **Reuse:** No other restrictions
√ **Thermocouple – Calibration Sticker:** As a minimum, the information shall include:

- Instrument or Furnace Number
- Thermocouple Type
- Calibration Date
- Calibration Due Date
- Identification of the engineer performed the calibration
- Calibration Limits

0.4.12. FIRIN SINIFLARI *FURNACE CLASSES*

FURNACE CLASS			INSTRUMENT TYPE AND REQUIREMENTS						
CLASS	TUT ^{0}F	TUT ^{0}C	REQUIREMENTS	A	B	C	D+	D	E
1	5 +/-	3 +/-	1 Control Sensor & Display Temp	√	X	X	X	X	X
2	10 +/-	6 +/-	Second Control Recorder	√	X	X	X	X	
3	15 +/-	8 +/-	2 Additional Control Recorder	√		X			
4	20 +/-	10 +/-	1 Load Sensor	√	X				
5	25 +/-	14 +/-	Over-Temperature Protection	√	X	X	X	X	
6	50 +/-	28 +/-	Hottest Temperature Sensor	√		X			
			Coldest Temperature Sensor	√		X			

TUT: Temperature Uniformity Tolerance (Sicaklik Esdeger Toleransi)

0.4.13. SISTEM DOGRULUK TESTI VE TEST ARALIGI SYSTEM ACCURACY TEST (SAT) INTERVAL

FURNACE CLASS	MINIMUM INSTRUMENT	NORMAL SAT	EXTENDED SAT	MINIMUM SAT DIFFERENCE		
				^{0}F (+/-)	^{0}C (+/-)	% READING
1	A	MONTHLY	QUARTERLY	2.00	1.10	0.20

0.4.14. SICAKLIK ESDEGER TESTI VE TEST ARALIGI TEMPERATURE UNIFORMITY SURVEYS (TUS) INTERVAL

FURNACE CLASS	MINIMUM INSTRUMENT	NORMAL TUS	SUCCESSFUL PERIOD	EXTENDED TUS	MAXIMUM PERMITTED OFFSET		
					^{0}F (+/-)	^{0}C (+/-)	% READING
1	A	MONTHLY	4	SEMIANNUALLY	2.50	1.50	N/A

0.5. ISIL ISLEM ONCESI KONTROLLER

0.5.1. Su Sogutucu: Kesinlikle su sogutucu hattinda kacak olmamalidir,
0.5.2. Vana Kontrolu: Sistemin kuru calistirilmasi durumunda mutlaka tum vanalar kapali olmalidir,

PRE-CHECKS BEFORE HEAT TREATMENT

√ **Water Chiller:** There should definitely be no leakage in the water cooler line.

vakumla calisiyorsa lutfen kullanici klavuzuna bakin,

0.5.3. **Urun Kontrolu:** Hic bir kosul altinda isil islem uygulanacak urunlerde kaplama, yag, tiner veya benzeri dis etken bulunmamalidir,

0.5.4. **Agirlik Kontrolu:** Isil islem sonrasinda sistemden cikarilacak tasiyici unitenin kutlesel sicakligi nedeniyle, operatorun tasiyamayacagi kadar agir bir sepet ciddi yaralanma nedenidir.

0.5.5. **Urun Yerlesim Kontrolu:** Isil islem uygulanacak urunler sepete yerlestirilirken, firin icinde sicaklik dolasimini kesecek veya degistirecek sekilde olmamalidir,

0.5.6. **Sepet Yerlesim Kontrolu:** Firin icine yerlestirilecek sepet, isiticilara ve thermocoupla direk temas etmemelidir.

0.5.7. **Birden fazla sepet** yerlestiriliyorsa sepet agirligina gore en alta en agir, en uste de en hafif sepet gelecek sekilde yerlesim olmalidir.

√ **Valve Control:** If the system is run dry, all valves must be closed. If the system is running vacuum, please check the user manual for instructions.

√ **Product Control:** Under no circumstances should any coating, oil, thinner or similar external factors in the products to be heat treated.

√ **Load Control:** Due to the mass temperature of the carrier unit to be removed from the system after the heat treatment, a basket that is too heavy for the operator to carry is a cause of serious injury.

√ **Product Placement Control:** While the products to be heat treated are placed in the basket, the temperature inside the oven should not be in a way that would interrupt or change the circulation,

√ **Rack Placement Control:** The rack placed in the oven should not come into direct contact with the heaters and the thermocouple,

√ **If more than one rack is placed**, the heaviest rack should be placed at the bottom and the lightest rack should be at the top, depending on the weight of the products.

GUVENLIK UYARISI:
Isil islem uygulamasi oncesi "0.5." maddesinin tam karsilanmasi zorunluluktur. Aksi uygulamalar cok ciddi yaralanma veya zarara neden olur.

SAFETY WARNING:
It is a mandatory security control check before all heat treatment processes that article 0.5. must met fully. Otherwise, this may cause serious injury or damage.

0.6. ISIL ISLEM YETKI KARTI — HEAT TREATMENT AUTHORIZATION FORM

0.6.1. HSF bunyesinde uygulanacak tum isil islem surecleri icin yetkili muhendis tarafindan hazirlanmis bir Isil Islem Yetki Formu gereklidir.

√ It is mandatory to prepare a Heat Treatment Authorization Form for all heat treatment processes to be applied within HSF.

0.6.2. Isil islem Yetki Formu yetkili muhendis tarafindan hazirlanmali ve uygulanacak isil islem surecinin temel kurallarini belirlemektedir.

√ The Heat Treatment Authorization Form is prepared by the authorized engineer and determines the basic norms for the heat treatment process to be applied.

0.6.3. Isil Islem Yetki Formu en az asagidaki bilgileri icermelidir:

√ The Heat Treatment Authorization Form must include minimum following information:

0.6.3.1. Proje No,
0.6.3.2. Tarih – Saat,
0.6.3.3. Hammadde Adi ve Standardi,
0.6.3.4. Hammade Boyutlari,
0.6.3.5. Hammadde Kimyasal Analiz Raporu,
0.6.3.6. Hammadde Mevcut Sertlik,
0.6.3.7. Istenen Sertlik,
0.6.3.8. Isil Islem Surec ve Standardi,
0.6.3.9. Soak Derecesi ve Zamani,
0.6.3.10. Sogutma Sekli ve Suresi,
0.6.3.11. Sahit Numune Resimleri,
0.6.3.12. Yetkili muhendis kase ve imza

- Project Number,
- Date – Time,
- Raw Material Name and Standard,
- Raw Material Dimensions,
- Raw Material Chemical Analysis report,
- Raw Material Current Hardness,
- Required Hardness,
- Heat Treatment Process and Standard,
- Soak Temperature and Time,
- Quenching Type and Time,
- Witness Sample Pictures,
- Authorized engineer stamp and signature

0.6.4. Eger urun vida somun v.b. cok ve karmasik boyutluysa en kucuk ve en buyuk degerler birlikte belirtilir.

√ If the product has multi and complex dimensions like as bolts or washers, the minimum and maximum values are determined together.

0.7. SAHIT NUMUNE POLITIKASI — WITNESS SAMPLING POLICY

0.7.1. **Sahit Numune** (**WS**) Politikasi, HSF uretim ve kalite kontrol sureclerinin en onemli temel taslarindan biridir.

0.7.2. HSF bunyesinde uygulanan uretim ve kalite kontrol surecleri icin aktif bir WS politikasi mevcuttur.

0.7.3. HSF WS'ye gore numune sayisi **Surec AQL** (**PAQL**) seviyesine gore belirlenir.

0.7.4. PAQL sayisina bagli olarak, isil islem sureci oncesinde en az 5 numune veya PAQL miktarinin %1'i kadar numune secilir.

0.7.5. **WS Politikasi Surec Adimlari:**

- **WS Miktari:** En az 5 adet veya PAQL'in yuzde 1'i kadar
- **WS Secimi:** Rastgele
- **WS'nin Markalanmasi:** Secilen numuneler isil islem surecinden etkilenmeyecek sekilde markalanir.
- **WS'nin Sertligi:** Sirali bir sekilde numunelerin sertlik degeri olculur.
- **WS'nin Fotograflanmasi:** Sirali numunlerin fotografi cekilir,
- **Fotograflarin Kaydedilmesi:** isil islem oncesi ve sonrasi cekilen fotograflar Isil Islem Surec Formuna yuklenir,
- **Numunlerin Saklanmasi:** Sahit numuneler numune kutusunda saklanir.

√ The **Witness Sampling** (**WS**) Policy is one of the fundamental columns of HSF's production and quality control processes.

√ The production and quality control processes applied within HSF have an active ES policy.

√ According to HSF's WS Policy, the quantity of the samples is determined by the **Process AQL** (**PAQL**) quantity.

√ Depending on the PAQL quantity, before the heat treatment process, a minimum of 5 samples or 1% of the PAQL samples are selected.

√ **Process Steps of the WS Policy:**

- **WS Quantity:** Minimum five each or 1% of the PAQL quantity,
- **WS Selection:** Random,
- **Marking of the WS:** The selected samples are marked in a way that will not be affected by the heat treatment process,
- **The hardness of the WS:** the hardness of the samples is measured depending on the numeric sort,
- **Photo of the WS:** numerically sorted samples are taken photos,
- **Record of the Photo:** the photos taken before and after the heat treatment process are uploaded into the Heat Treatment Process Form.
- **Storage of Samples:** Witness samples are stored in the sample box.

0.8. ON ISITMA SURECI

On isitma surecinde firin en az 1 saatlik bir periyotta ortalama 60 ^{0}C (140 ^{0}F) derecelik bir sicaklikta calistirilir. On isitma surecinde hedeflenen amaclar su sekildedir:

√ Calistirilacak isil islem programinin degerlendirilmesi,

√ Firinin genel kosullarinin kontrolu ve firinin stabil sicakliga ulastirilmasi,

√ Isil islem uygulanacak malzemelerin esit sicaklik seviyesine getirilmesi,

√ Sistem vakumda calistiriliyorsa, vakum degerlerinde ayar degerleri disinda istenmedik bir degisim var olup olmadigi da kontrol edilir.

PREHEATING PROCESS

During the pre-heating process, the oven is operated at an average temperature of 60 ^{0}C (140 ^{0}F) degrees for a period of at least 1 hour. The aims of the pre-heating process are as follows:

√ Evaluation of the heat treatment program to be run,

√ Control the general conditions of the furnace and to keep the inside temperature of the furnace in stable,

√ Bringing the materials to be heat treated to equal temperature levels,

√ If the system is settled for the vacuum operating, it is also checked whether there is any undesirable change in the vacuum values other than the setting values.

0.9. ISITMA HIZI

0.9.1. Isitma hizi metaryelde yasanabilecek kusurlar icin onemli bir etkendir. Bu nedenle 1300 ^{0}F (704 ^{0}C) uzerinde uygulanacak isil islem surecleri icin 1000 – 1200 ^{0}F (538 – 649 ^{0}C) derece arasinda on isitma uygulanmasi asagidaki kosullarda tavsiye edilir:

√ 35 HRC ve uzerine onceden sertlestirilmis,

√ Yuzde olarak nominal 0.50 veya ustu karbon iceren materyeller,

√ Keskin acili veya ic ice gecmis acilara sahip yuzeyli malzemeler.

RATE OF HEATING

√ Heating rates shall be controlled to prevent damage to the material. Pre-heating at 1000 to 1200 °F (538 to 649 °C) is recommended before heating material above 1300 °F (704 °C) if the material has any of the following conditions:

- Has been previously hardened above HRC 35,
- Is made of steel of 0.50 (nominal) percent carbon or higher,
- Has abrupt changes of section, or sharp re-entrant angles.

0.10. HAMMADDE VE UYGULANAN STANDARDLAR — RAW MATERIALS AND STANDARDS

0.10.1. **Aksi musteri veya ana uretici gereksinimlerinde belirtilmedigi surece,** HSF isil islem surecleri icin asagidaki standardlari temel almaktadir.

0.10.2. Ilgili standardlarinda belirtilen degerler tavsiye niteligindedir. HSF tum isil islem surecleri icin hammaddeye ve isil islem uygulanacak urunun fiziki yapisina bagli olarak oncelikle deneme calismasi yapar.

√ **Unless otherwise stated in customer or main manufacturer requirements,** HSF is based on the following standards for heat treatment processes.

√ The values specified in the relevant standards are recommendations. HSF first conducts trial runs for all heat treatment processes, depending on the raw material and the physical structure of the product to be heat treated.

HAMMADDE / RAW MATERIAL	STANDARD
Steel Parts General Requirements	AMS2759
Carbon and Low-Alloy Below 220 ksi UTS	AMS2759/1
Low-Alloy 220 ksi UTS and Higher	AMS2759/2
PH and Maraging	AMS2759/3
Austenitic Corrosion-Resistant Steel Parts	AMS2759/4
Martensitic Corrosion-Resistant Steel Parts	AMS2759/5
Steel Raw Materials	AMS2761
Aluminum Alloy Castings	AMS2771
Aluminum Alloys	AMS2772
Nickel Alloy and Cobalt Alloy Parts	AMS2774
Titanium Alloy Parts	AMS2801
Titanium and Titanium Alloys	AMS-H-81200

0.11. SOGUTMA SIVISI — QUENCHING MEDIA

0.11.1. HSF, isil islem sogutma surecleri icin Polimer Sogutucu kullanmaktadir.

0.11.2. Polimer sondurucunun sicakligi, sondurme surecinde 60 ile 160 ^{0}F (16 – 71 ^{0}C) arasinda olmalidir.

0.11.3. Polimer sondurucunun sicakligi ureticinin belirledigi maksimum sicaklik degerini asmamalidir.

0.11.4. Polimer sogutucunun tuz oraninin 6%'yi gecmemesi gerekir.

0.11.5. Isil islem surec formunda polimer sogutucu ile ilgili olarak asagidaki bilgiler belirtilmelidir:

0.11.5.1. uretici adi,
0.11.5.2. marka adi,
0.11.5.3. model adi,
0.11.5.4. batch/seri no,
0.11.5.5. tuz orani,
0.11.5.6. uretim yili,
0.11.5.7. son kullanim tarihi

√ HSF uses polymer quenching media for the heat treatment quenching process.

√ Polymer quenchants shall be in the range of 60 to 160 °F (16 to 71 °C) at the initiation of the quench operation.

√ Polymer quenchants shall not be used at temperatures exceeding the manufacturer's recommended maximum temperature.

√ Polymers shall be monitored to ensure salt content does not exceed 6% by weight.

√ For the polymer, at the heat treatment process form, the following information will be specified:

- the manufacturer name,
- brand name,
- model number,
- batch/serial number,
- salt content,
- manufacturing date,
- expiry date