GÜVEN PLUS GRUP A.Ş. ORP GPGD ISO 9001:2008 REGISTERED

CERTIFICATE OF APPRECIATION

3. ULUSLARARASI MÜHENDİSLİK VE FEN BİLİMLERİ KONGRESİ

3rd INTERNATIONAL CONGRESS ON ENGINEERING AND SCIENCES

10-11 MAYIS 2024 İSTANBUL - TÜRKİYE / 10-11 MAY 2024 ISTANBUL- TURKIYE

PROF. DR. İSMAİL EKMEKÇİ

Yukarıda bilgileri bulunan çalışma ile ilgili kişi(ler) kongremize DAVETLİ KONUŞMACI olarak katılım sağlamıştır. Kendilerine katılımlarından dolayı teşekkür eder; gelecek bilimsel hayatlarında başarılarının devamını dileriz.

The person(s) related to the above-mentioned study participated in the congress KEYNOTE SPEAKER. We thank them for their contribution; we wish them continued success in their future scientific lives.

Prof. Dr. Abdülkadir GÜLLÜ — Organizing Committee Member

Prof. Dr. Çetin YAMAN — Organizing Committee Member

Prof. Dr. Gülten HERGÜNER — Organizing Committee Member

Prof. Dr. Yusuf ŞAHİN — Organizing Committee Member

Prof. Dr. Ümran SEVİL — Chairman of the Board

Prof. Dr. Ashok JAMMI — Organizing Committee Member

Prof. Dr. Asuman Seda SARAÇOĞLU — Organizing Committee Member

Prof. Dr. Ayhan AYTAÇ — Organizing Committee Member

Tariq Muneer
Prof. Dr. Tariq MUNEER — Organizing Committee Member

Prof. Dr. Zeki ÇIZMECİOĞLU — Organizing Committee Member

GÜVEN PLUS GRUP A.Ş. ORP GPGD ISO 9001:2008 REGISTERED

CERTIFICATE OF ATTENDANCE

3. ULUSLARARASI MÜHENDİSLİK VE FEN BİLİMLERİ KONGRESİ

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3. ULUSLARARASI MÜHENDİSLİK VE FEN BİLİMLERİ KONGRESİ

11-12 MAYIS 2024 İSTANBUL (KONGREMİZ UZAKTAN ERİŞİM ONLINE OLARAK YAPILACAKTIR)

BİLİMSEL PROGRAM

3. ULUSLARARASI MÜHENDİSLİK VE FEN BİLİMLERİ KONGRESİ

3rd INTERNATIONAL CONGRESS ON ENGINEERING AND SCIENCES

KONFERANS PROGRAMI / CONFERENCE PROGRAM

AÇILIŞ / OPENING

11-12 MAYIS 2024 / 11-12 MAY 2024

ISTANBUL - TURKIYE

Açılış Konuşması / Opening Speech

PROF. DR. MURAT DARÇIN

ASSIST. PROF. SENAİ YALÇINKAYA

11 MAYIS / MAY 2024 - SAAT: 09:30 TIME: 09:40 (GMT+3)

Konferans Başkanı (Chair of Conference)

DAVETLİ KONUŞMACILAR / KEYNOTE SPEAKERS

09:40 - 14:00 (GMT+3) (11 MAYIS - MAY 2024)

OTURUM BAŞKANI / HEAD OF SESSION

PROF. DR. MURAT DARÇIN

ASSIST. PROF. SENAİ YALÇINKAYA

KEYNOTE SPEAKERS

Prof. Dr. Muhammad SAFDAR BHATTI (Pakistan) (09:40) (GMT+3)

Prof. Dr. İsmail EKMEKÇİ (Türkiye) (10:00) (GMT+3)

Prof. Dr. Mehmet Ali ÖZÇELİK(Türkiye) (10:20) (GMT+3)

Assoc. Prof. Jintana SALAENOI (Thailand) (10:40) (GMT+3)

Assoc. Prof. Afər Əlifov (Azerbaijan) (11:00) (GMT+3)

Assoc. Prof. Cihat BOYRAZ (Türkiye) (11:20) (GMT+3)

Assoc. Prof. Halil ŞENOL (Türkiye) (11:40) (GMT+3)

Assist. Prof. L. Santhosh KUMAR (India) (12:00) (GMT+3)

Prof. Dr. Hıdır Selçuk NOĞAY (Türkiye) (12:20) (GMT+3)

Joanna HAENLEIN KOCABIÇAK (Fransa) (12:40) (GMT+3)

Prof. Dr. Sergio Ricardo QUIROGA (Argentina) (13:00) (GMT+3)

SÖZEL - POSTER OTURUMLAR / ORAL - POSTER SESSIONS

OTURUM / SESSION : 1

Tarih ve Saat / Date and Time : 11 MAY 2024 - 13:00 - 17:00 (GMT+3)

Oturum Başkanı (Head of Session) : Prof. Dr. Murat DARÇIN

Prof. Dr. İsmail EKMEKÇİ

Prof. Dr. Emine DARÇIN

Assoc. Prof. Cihat BOYRAZ

Assist. Prof. Senai YALÇINKAYA

Admin

13:00	Cigdem AVCI-KARATAŞ	SEISMIC DESIGN AND ANALYSIS OF VIADUCT STRUCTURES

13:10	Abdul Samet BULUT	CASSEGRAİN YAPILI BİR ELEKTRO-OPTİK KEŞİF VE GÖZETLEME SİSTEMİ: YÜKSEK İRTİFA PERFORMANSI İÇİN TASARIM OPTİMİZASYONU
13:20	Abuzer ÖZKAN, Güzel YILMAZ	PESTİSİTLERİN YER ALTI SULARINA ETKİSİNİ BELİRLEYEN FAKTÖRLER
13:30	Arif BALCI, Osman Emre ÇELİKEL	316L PASLANMAZ ÇELİK TOZ YATAKTA DÜŞÜK AKIM DEĞERLERİNE SAHİP ARK İLE ERGİTİLEBİLİRLİĞİN ARAŞTIRILMASI
13:40	Aslıhan KALYON, Yener YILMAZ, Furkan BELLİBAŞ	ÖZEL PUNCH FORMLU BAĞLANTI ELEMANININ SİMÜLASYON DESTEKLİ ÜRETİMİ
13:50	Ayodele Samuel AYANYINKA, Şaban Selim ŞEKER	DESIGN, DEVELOPMENT, AND PERFORMANCE EVALUATION OF DISTRIBUTED GENERATION SOURCES INTEGRATION IN MICRO-GRID: A CASE STUDY OF THE NIGERIAN POWER SECTOR
14:00	Ayşe DİVANOĞLU, Cem ÇÖMLEKÇİOĞLU	OTOMOBİLLERDE BAGAJ ALTI KORUMA PARÇALARININ “SU GEÇİŞİ (WATER FORDING)” TESTİ İÇİN GÜÇLENDİRME ÇALIŞMALARI VE AĞIRLIK AZALTIMI
14:10	Fethan TEMİZ	OTOMOTİV PLASTİK PARÇALARINDA 2K ENJEKSİYON PARÇALARINDA CORE-BACK ÜRETİM TEKNİĞİ
14:20	Semih ÇEVİK	OTOMOTİV PLASTİK PARÇALARINDA FORCE MOLDİNG KULLANIMI İLE MALİYET AZALTIMI
14:30	Semih ÇEVİK	OTOMOTİV PLASTİK PARÇALARINDA GRAFEN TEKNOLOJİSİ KULLANILARAK AĞIRLIK AZALTIMI, MEKANİK VE TERMAL DAYANIM ARTTIRMA
14:40	Yunus VARGÜN, Semih ÇEVİK	ARAÇLARDA HAVA FİLTRELEME SİSTEMİNDE HAVA FİLTRESİNİN TOZ TUTMA KAPASİTESİ VE ETKİLEYEN FAKTÖRLER
14:50	Berna YEŞİLDAL DİKMEN, Hakan GAŞAN	SEÇİCİ LAZER ERGİTME İLE ÜRETİLEN MARAGİNG ÇELİĞİNİN (1.2709) SERTLİĞİNE KRİYOJENİK İŞLEMİN ETKİSİNİN İNCELENMESİ
15:00	Büke ELENAY HONCA	ULTRAFAST LAZER MARKALAMA SÜREÇLERİNDE GÜÇ VE PARAMETRE OPTİMİZASYONU

15:10	Cemre Nur DİNÇKURT BİÇER, Özgür KABAK	ÇOK AMAÇLI KAYNAK KISITLI ÇOKLU PROJE ÇİZELGELEME: BİR TRAKTÖR FİRMASI ÖRNEĞİ
15:20	Duygu KAYA, Yüksel YILMAZ	KAYALARDA TEK EKSENLİ BASINÇ DAYANIMI İLE BRAZILIAN ÇEKME DAYANIMI ARASINDAKİ İLİŞKİNİN ARAŞTIRILMASI
15:30	Edanur GÜZEL, Mehmet UÇAR	EXAMINING PERFORMANCE EFFECTS OF GEAR MICRO GEOMETRY OPTIMIZATION IN A SINGLE STAGE TRAIN GEARBOX
15:40	Emirhan TOPRAK	BÜKÜM MERKEZİ MAKİNESİ BASKI GRUBUNDA TORK OPTİMİZASYONUNUN ÖNEMİ
15:50	Emre TOY, Buğra ÇİÇEK	EFFECT OF CALCINATION TEMPERATURE ON COLOR AND NIR REFLECTIVITY OF (FE,CR)2O3 BLACK PIGMENT
16:00	Engin BÜYÜKTARAKCI, Erol GÜL, Eşref ÜN, Mahmut Can DOĞAN, Ahmet Burhan BALHAN	BOR KATKILI HFFR KABLOLARDA YANMA ÖZELLİKLERİNİN İNCELENMESİ
16:10	Fatih Kerem BOZ	KENT İÇİ ULAŞIM SORUNLARI VE ÇÖZÜM ÖNERİLERİ YALOVA İLİ ÖRNEĞİ
16:20	Fatih Kerem BOZ	ÜCRETSİZ TOPLU TAŞIMAYA İLİŞKİN AVRUPA'DAN ÖRNEKLER
16:30	Filiz AYDOĞAN, Mustafa ÇAKIR	KOMPOZİT MATRİS MALZEMESİ OLARAK POLİ(AMİD-İMİD) REÇİNE ÜRETİMİ VE KARAKTERİZASYONU
16:40	Furkan ERMİŞ, Yakup CUCİ	ONİKİŞUBAT İLÇESİ PAZAR YERLERİNDE GÜRÜLTÜ KİRLİLİĞİ ÖLÇÜMÜ VE DEĞERLENDİRİLMESİ
16:50	Hasan OLGUN, Nuri AKKAŞ, Murat MANDIRACI	SX700-CR ÇELİKLERİNİN ELEKTRİK DİRENÇ NOKTA KAYNAĞINDA MİKROYAPI ANALİZLERİNİN İNCELENMESİ
17:00	Hıdır Selçuk NOĞAY	DEEP LEARNING-BASED CLASSIFICATION OF URBAN AIR POLLUTION INTO SIX CATEGORIES WITH HIGH ACCURACY

17:10	Hıdır Selçuk NOĞAY	CLASSIFICATION OF BONE FRACTURES INTO THREE MAIN CLASSES USING CONVOLUTIONAL NEURAL NETWORKS
17:20	Hıdır Selçuk NOĞAY	AUTOMATED DETECTION OF DUSTY SOLAR PANELS USING PRE-TRAINED CONVOLUTIONAL NEURAL NETWORKS
17:30	Nadia QUTAIBA M. Al-SABBAGH, Hasan Hüssein BALIK	DETECTION OF THE NETWORK INTRUSION TRAFFIC USING DEEP LEARNING
17:40	Doğukan İlbey ÖREN, Hüseyin Özkan TOPLAN, Abdi SOYLU	ATIK DÖKÜM MALZEMELERİNDEN CAM-SERAMİK ELDESİ

SÖZEL - POSTER OTURUMLAR / ORAL - POSTER SESSIONS

OTURUM / SESSION : 2

Tarih ve Saat / Date and Time : 12 MAY 2024 - 11:00 - 16:00 (GMT+3)

Oturum Başkanı (Head of Session) : Prof. Dr. Murat DARÇIN

Prof. Dr. Emine DARÇIN

Prof. Dr. Ayhan ONAT

Assoc. Prof. Zeynep YAMAN

Assist. Prof. Senai YALÇINKAYA

Admin

11:00	Isam ATTAR, Melih SÜRMELİ	TABAN ANKASTRE BETONARME BİR BİNA VE TABAN YALITIMLI HALİNİN DEPREM PERFORMANSLARININ KARŞILAŞTIRILMASI
11:10	Koray Emre ÖZCAN, Rahmi GÜÇLÜ	PALETLİ VE ASKERİ GÜÇ GRUPLARININ TİTREŞİM VE ŞOK İZOLASYONLARI
11:20	Mehmet ALTUĞ, Yakup YILMAZ	AL 6063 ALAŞIMIN TEL EROZYONDA İŞLENEBİLİRLİĞİNDE KESME GENİŞLİĞİNİN DERİN ÖĞRENME İLE OPTİMİZASYONU
11:30	Mehmet ALTUĞ, Yakup YILMAZ	AL 6060 ALAŞIMIN TEL EROZYONDA İŞLENEBİLİRLİĞİNDE KESME GENİŞLİĞİNİN AŞIRI ÖĞRENME MAKİNESİ İLE OPTİMİZASYONU

11:40	Mehmet ÖZER, Fatih BALIKOĞLU, Tayfur Kerem DEMİRCİOĞLU	DENİZ SINIFI SANDVİÇ KOMPOZİTLERDE KÖPÜK KESİM KONFİGÜRASYONUNUN YARI STATİK BATMA DİRENÇLERİNE ETKİSİNİN ARAŞTIRILMASI
11:50	Mehmetcan EVREN, Ahmet ÜNAL	HAVA ARAÇLARINDA KULLANILAN KOMPOZİT YAPISALLARIN ONARIM YÖNTEMLERİNDE UYGULANAN YAPIŞTIRMA BAĞLANTILARININ OPTİMİZASYONU
12:00	Menşure Zühal BARAK, Gizem Gül KOÇ	HATA MODU VE ETKİLERİ ANALİZİ YÖNTEMİ İLE TEDARİK ZİNCİRİNDE YÖNETİMİNDE YEŞİL SATIN ALMA
12:10	Merveil Lanvain ELENGA OSSETE, Kubilay YILDIRIM	ASBEST KİRLİLİĞİNİN KAVAK VE SÖĞÜT TÜRLERİ İLE BİYOARITIMI VE BİTKİ-METAL İLİŞKİSİNİN MOLEKÜLER DÜZENLENMESİNİN İNCELEMESİ
12:20	Mustafa GÖKTAŞ, Mehmet UÇAR	HİDROLİK SİLİNDİRLER İLE LİNEER ELEKTRİKLİ AKTİVATÖRLERİN KARŞILAŞTIRILMASI
12:30	Mustafa YAZAR, Hilal KIR, Şükrü TALAŞ	M4 SOMUNUN PROJEKSİYON KAYNAĞI İLE 3 MM KALINLIĞINDAKİ ÇELİK SACA PUNTALAMA OPERASYONUNUN KAYNAK PARAMETRELERİNİN İNCELENMESİ
12:40	Mustafa YAZAR, Hilal KIR, Şükrü TALAŞ	PROJEKSİYON KAYNAĞINDA KAYNAK CIVATASININ FARKLI MEME YÜKSEKLİKLERİNİN KAYNAK KALİTESİ ÜZERİNDEKİ ETKİSİNİN İNCELENMESİ
12:50	Müslim ERGEL, Murat TONAROĞLU	DÜŞEY DREN KULLANARAK ÖNYÜKLEME İLE YUMUŞAK ZEMİNLERİN İYİLEŞTİRİLMESİ
13:00	Necati GEZER, Güzel YILMAZ	İÇME VE KULLANMA SULARINDA RİSK ANALİZİ, ADIYAMAN ÖRNEĞİ
13:10	Neva Emel İŞLER, Emin GÜNDOĞAR	ERP SİSTEMİNE ENTEGRE TÜKETİME DAYALI STOK KONTROL PARAMETRELERİNİN BELİRLENMESİ
13:20	Nurdan GÜNEŞ	NORMALITY ANALYSIS OF MICRO REBOUND HARDNESS DATA SETS IN RELATION TO UNIAXIAL COMPRESSIVE STRENGTH PREDICTION OF ROCK MATERIALS
13:30	Nurullah ÇÖPOĞLU, Abdi SOYLU, Buğra ÇİÇEK	CRYSTALLIZATION KINETICS AND THERMAL BEHAVIOR OF LITHIUM ZINC BOROSILICATE GLASS-CERAMIC COATINGS

13:50	Oğuzhan TIRAŞCI, Niyazi Uğur TERZİ	TOPRAKARME VE ZEMİN ÇİVİLİ BİR DERİN KAZI UYGULAMASININ ÖRNEK BİR PROJE ÜZERİNDE NÜMERİK ANALİZLERİNİN YAPILMASI
14:00	Pınar Cansu YALIN, Nail ÜNSAL, Erhan TEKİN	SIVILAŞAN ZEMİN İÇERİSİNDEKİ FORE KAZIKLARIN SONLU ELEMANLAR YÖNTEMİ İLE DAVRANIŞLARININ İNCELENMESİ
14:10	Pınar YEŞİLGÖZ	İNŞAAT UYGULAMALARINDA AKILLI BARET KULLANIMI
14:20	Sena ÇADIRCI , İbrahim GÜRSU TEKDEMİR	FARKLI YÖNTEMLERLE ELEKTRİK TÜKETİMİNİN KISA DÖNEM YÜK TAHMİNİ VE MEVSİMSELLİK ANALİZİ
14:30	Tanem KÖTEŞLİ AYDIN	UZAKTAN ÇALIŞMA İŞ MODELİNİN İNŞAAT SEKTÖRÜ ÜZERİNDEKİ ETKİLERİNİN DEĞERLENDİRİLMESİ
14:40	Tayfun KALAYCI	ENDÜSTRİYEL ÜRETİM MAKİNELERİNDE (P)ANEL BENDER VE LAZER KESİM MAKİNELERİ REFERANS ALINARAK) HMI'YA YAPAY ZEKA ENTEGRASYONU VE ÜRETİME ETKİSİ
14:50	Tuğba METİN TORTOP, Yunus Emre SELÇUK	REFACTORING TEKNİKLERİNİN YAZILIMIN İÇ KALİTE ÖZELLİKLERİ ÜZERİNDEKİ ETKİSİNİN İNCELENMESİ
15:00	Yaren KOCABIYIKCI AKTAŞ, Mustafa ÇAKIR	EPOKSİ MATRİSİNE UYGUN CAM ELYAF SİZİNG ÜRETİMİ VE KARAKTERİZASYONU
15:10	İlknur CORE, Mehmet AKANSEL	BİR OTOMOTİV SEKTÖRÜ İŞLETMESİNDE YEDEK PARÇA TALEP TAHMİN ANALİZİ
15:20	İmdat Kaan GEÇİMLİ, Melih BAŞARANER	DÜNYA HARİTA PROJEKSİYONLARINDA ŞEKİL DEFORMASYONU ANALİZİ İÇİN YENİ BİR YAKLAŞIM GELİŞTİRİLMESİ
15:30	Ümit KOÇ, Elif TOK, Barış KARA, Emre ÇİNKILIÇ	ISIL İŞLEMİN YÜKSEK BASINÇLI DÖKÜMDE KULLANILAN EN AC 44300 ALAŞIMIN MEKANİK ÖZELLİKLERİNE ETKİSİNİN İNCELENMESİ
15:40	İrem BOZYİĞİT	KİLLİ KUMLARIN YÜKSEK DEFORMASYON SEVİYESİNDEKİ DAVRANIŞLARININ İNCELENMESİ
15:50	Üsame Ali USCA, Ünal DEĞİRMENCİ, Serhat ŞAP	INCONEL 718 SÜPERALAŞIMININ FARKLI SOĞUTMA/YAĞLAMA ORTAMLARINDA FREZELENMESİNİN ETKİLERİ

16:00	İsmail ÜLKER, Yaşar PALA	FEDERLERDE KAYNAK GERİLMESİ ÜZERİNDEN TASARIM BOYUTLARININ BELİRLENMESİ ÜZERİNE ANALİTİK BİR YÖNTEM
16:10	Yusuf TURAN, Rıdvan GECÜ, Ali Serdar VANLI	AZ91 SERİSİ MAGNEZYUM ALAŞIMLARININ SOĞUK KAMARALI BASINÇLI DÖKÜM YÖNTEMİ İLE ÜRETİMİNDE ALAŞIM MODİFİKASYONU
16:20	Zekai TURAN, Satılmış ÜRGÜN, Sinan FİDAN, Mustafa Özgür BORA	INVESTIGATION OF THE EFFECT OF CUTTING PARAMETERS ON SURFACE ROUGHNESS IN THE MANUFACTURING OF HARDOX 450 MATERIAL BY MILLING METHOD
16:30	Zeynep YAĞIZ, Merve CENGİZ TOKLU	BİR YAZILIM FİRMASINDA KARINCA KOLONİSİ VE PARÇACIK SÜRÜ OPTİMİZASYONU İLE PERFORMANS DEĞERLENDİRME MODELİ
16:40	Zeynep YARDIMCI, Nail ÜNSAL, Erhan TEKİN	KAFES SİSTEMİN ZEMİN SIVILAŞMASININ ÖNLENMESİNDEKİ ETKİNLİĞİNİN ARAŞTIRILMASI
16:50	Özkan PULAT, Musaffa Ayşen LAV	STATİK KAZIK YÜKLEME TESTLERİNDE YÜK DEPLASMAN DEĞERLERİ ÜZERİNDEN KAZIK TAŞIMA GÜCÜ TAHMİN YÖNTEMLERİNİN KIYASLANMASI
17:00	Esra OYMAK, Veli ÇELİK	STATIC ANALYSIS OF FRAMES USED IN AVIATION STRUCTURES WITH DIFFERENT MATERIALS AND COMPARISON WITH FINITE ELEMENT METHOD
17:10	Hanife TURYAN GÖREN	SOLVENTSİZ VE SOLVENTLİ İNLİNE LAMİNASYON YAPILAN BASKI SİSTEMİNDE OPP/METOPP YAPISINDA BENCİK PROBLEMİ YARATMAYACAK BEYAZ MÜREKKEP TASARIMI
17:20	Senai YALÇINKAYA, Oğuz DÜZ	THE IMPACT OF INFORMATION TECHNOLOGIES ON BUSINESS PERFORMANCE IN ENTERPRISES: 2019-2023 ANALYSIS

SÖZEL - POSTER OTURUMLAR / ORAL - POSTER SESSIONS

OTURUM / SESSION : 3

Tarih ve Saat / Date and Time : 11 MAY 2024 - 13:00 - 17:00 (GMT+3)

Oturum Başkanı (Head of Session) : Prof. Dr. Ashok JAMMI

Prof. Dr. Ayhan AYTAÇ

Prof. Dr. Muhammad SAFDAR BHATTI

Prof. Dr. Harikrishnan GOPAKUMAR

Prof. Dr. Hayrettin GÜMÜŞDAĞ

Assoc. Prof. Gökşen ARAS

Assist. Prof. L. Santhosh KUMAR

Admin

13:00	Nehuen FOLLIERO, Melisenda ROMANO	THE ROLE OF BIOTECHNOLOGY IN ENVIRONMENTAL ENGINEERING: BIOLOGICAL TREATMENT AND BIODIVERSITY CONSERVATION
13:10	Silvina MANSILLA, Melisenda ROMANO	RISK ASSESSMENT AND EMERGENCY PLANNING IN ENVIRONMENTAL ENGINEERING: PREPARATION FOR DISASTERS AND CATASTROPHES
13:20	Chandrakala KAR, Bharat CHAUDHURI, Taneesha DASGUPTA	DESIGN AND APPLICATIONS OF SMART TEXTILE MATERIALS: THE FUTURE OF WEARABLE TECHNOLOGIES
13:30	Taneesha DASGUPTA	THE USE OF NANO TECHNOLOGY IN TEXTILE MATERIALS: FUNCTIONAL AND PERFORMANCE ENHANCING APPLICATIONS
13:40	Bibhuti SINHA, Chandrakala KAR	SUSTAINABLE TEXTILE PRODUCTION AND RECYCLING: INNOVATIVE APPROACHES FOR MINIMISING ENVIRONMENTAL IMPACTS
13:50	Adrien CALLEEUW, Thomas DELMOTTE	ENERGY EFFICIENCY IN FOOD PROCESSING TECHNOLOGIES: REDUCING ENVIRONMENTAL IMPACTS AND SUSTAINABLE PRODUCTION
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SÖZEL - POSTER OTURUMLAR / ORAL - POSTER SESSIONS

OTURUM / SESSION : 4

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Oturum Başkanı (Head of Session) : Prof. Dr. Ashok JAMMI

Prof. Dr. Ayhan AYTAÇ

Prof. Dr. Muhammad SAFDAR BHATTI

Prof. Dr. Harikrishnan GOPAKUMAR

Prof. Dr. Hayrettin GÜMÜŞDAĞ

Assoc. Prof. Gökşen ARAS

Assist. Prof. L. Santhosh KUMAR

Admin

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17:30	Pavlo Adamovych NOVAK	PROJECT EVALUATION AND DECISION ANALYSIS: COST BENEFIT ANALYSIS AND DECISION MAKING PROCESSES IN ENGINEERING PROJECTS
17:40	Phạm Kiều NGUYỆT, Trần Phượng LOAN	SUSTAINABLE PLANNING OF URBAN AREAS AND MANAGEMENT OF ENVIRONMENTAL IMPACTS: ENVIRONMENTAL ENGINEERING APPROACHES

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DETERMINATION OF THE ENERGY CONSUMPTION OF PUBLIC BUILDING BY USING BIN_METHOD

Ali Sadık HEKİMOĞLU Prof. Dr. İsmail EKMEKÇİ

3. ULUSLARARASI MÜHENDİSLİK VE FEN BİLİMLERİ KONGRESİ
3rd INTERNATIONAL CONGRESS ON ENGINEERING AND SCIENCES

CONTENTS

- Abstract

  Keywords
- Introduction
- Bin Method

ABSTRACT

- - Energy consumption in the construction sector is one of the most important sectors in this respect such as the industrial, service and agricultural sectors.
- - Public buildings of sectors also contribute greatly to this increase. Therefore, it becomes important to make fast and accurate energy demand forecasts of public buildings.
- - Due to this fact, in our study, the energy consumption of a municipality building in Istanbul, as a public building, was determined using the BIN Data values created for Istanbul and compared with the actual energy consumption values.
- - For Istanbul's BIN data values, dry bulb temperatures in the Typical Meteorological Year, which were created according to 15-year meteorological values.
- - According to these obtained BIN data values, heating and cooling thermal loads were calculated by taking into account required values of the municipality building, then these obtained values were also compared with actual fuel and electricity consumptions.

KEYWORDS:

ENERGY, HEATING, COOLING, BUILDING, ENERGY CONSUMPTION, BIN METHOD

INTRODUCTION

- Energy consumption has reached to very critical values with increasing of the necessities of human being.
- The lack of usable energy resources and the need for these resources increases the energy unit costs every day.
- The future of the countries, which are dependent outward about energy, are directly affected from this situation.
- According to the increasing the populations, energy demands and energy consumptions are also increasing.
- The energy consumption of the building sector is also one of the most important sectors as well as three sectors concept such as, agriculture, transportation and industrial sectors.
- Most of the people searching the method to reduce the consumption of energy and using energy efficiently.
- In the building sectors, energy consumption has been effected the changing of the climate, prices of energy, demand of energy and supply chain of the energy.
- The aims of the energy consumption in the building is to increase the thermal comforts.

INTRODUCTION

- For the condition of climates, in the winter, energy would be used for heating indoor environment and then in summer, energy would be used to cool the environment too.
- In Türkiye, energy consumptions trying to be limited and trying to find many ways for saving the energy and how to save energy in the buildings.
- Most of the modern buildings which are designed with appropriate condition of the climate changes, the condition of weather, so on.
- The calculation of building energy consumptions depend upon the heating and cooling. There are many ways to calculate the energy consumptions of the buildings.
- In this study, BIN Method will be used to calculate the amount of the necessary energy for heating and cooling.
- In BIN method, using the interval of temperature difference and time intervals. Moreover, the efficiency of heating, cooling, ventilation and air conditioning would also be calculated.

INTRODUCTION

- In Bin methods, temperature and time interval we used separately to evaluate the energy consumption, hourly climate data should be used to be determined the energy consumption for hourly, daily, weekly, monthly and yearly, instead of using the average daily temperature of outdoor environment.
- By using the Bin method for the calculations the building energy consumptions would be determined as the amount of the consumption of energy for heating and cooling, and also the energy loading to consume the system of HVAC, such as, fan, air-conditioning, chiller group, and boiler, radiators would be calculated.
- Also heat transfer of the building be calculated. As for the structural design of the building, the thickness of the outer layer and wall, thickness of colomn and beam, base and ceiling be also calculated.
- Bin method having also bin data of the year, the frequency in which interval of temperature corresponding with the time interval.

INTRODUCTION

- Although energy consumption methods are widespread using in developed countries, specially degree-day and bin methods aren't adequately investigated in Türkiye.
- In Türkiye, there are many different methods could be using to find the solution of energy consumption.
- In recent years, specially degree-days and bin methods are studied independently and getting the appropriate amount of the values.
- In this study, the amount of the energy consumption of the building sectors could be defined by using bin methods.
- Also, the data of Istanbul has already been determined.
- Using the values of the bin data of Istanbul, after applying in a public building (a municipal building) and the amount of the value of heating capacity in the winter and cooling in the summer would be obtained.

BIN METHOD

- Energy demand and energy consumption is one of the most important factors and people cannot live without energy consumption. In many countries, energy consumption affects their economies and industrial levels.
- Therefore, most countries are trying to find ways to save energy and use energy efficiently.
- After the global crisis in the 1970s, energy management, trying to find new method of obtaining energy, renewable energy types have been explored in developed and developing countries.
- In most countries, building sectors such as commercial, residential and industrial buildings consume about 40% of energy consumption.
- Energy should be used economically and energy consumption should be reduced and used efficiently.

BIN METHOD

The energy consumption of public buildings can be easily determined with the bin method so that temperature and time interval can be evaluated separately.

In addition, the efficiency of heating systems, cooling systems and ventilation systems, the temperature of the equilibrium point, building types and location of the building, total heat transfer coefficient and relative humidity are also used in the application.

By using the bin method, both the daily average outdoor temperature of the outdoor environment and the data on hourly climate changes will be obtained. The result of the values obtained is more accurate than other methods

$$Q_{bin,i} = N_{bin,i} \frac{\sum U_{\cdot A}}{\eta_{\cdot}} \left(T_{bp} - T_{o,i}\right)^{\pm}$$

- where,
- Σ U.A (W/°C) is total heat transfer coefficient of the building,
- η is the efficiency of the heating of cooling system's coefficient,
- $N_{bin,i}$ (h) is duration of the number of time taken determining the interval of temperature changes,
- To,i , the midpoint of the temperature range and
- Tb is the equilibrium point temperature at which the outdoor temperature at which heating or cooling is required is above or below the value

BIN METHOD

In general, the value of the heating temperature will be 18°C. In the above formula (1), the positive (+) sign is for heating and the negative (-) sign is for cooling.
For the total energy consumption of the temperature range, the total value of Qbin,i is calculated by the above formula (1) and

$$Qtot = \sum_{i=0}^{m} Q_{b_{in,i}}$$

Where m refers to the total number of temperature ranges.

Fuel consumption will be calculated by the following formula (3);

$$\boldsymbol{F_{tot} = \frac{Q_{tot}}{H}}$$

BIN METHOD

In this study, the determination of the temperature over a period of a month and a year will be verified using this method, the outdoor air temperature (To,i) and the temperature range (bin) and the bin data of the received time in hours (Nbin,i).

The amount of energy will be determined according to the corresponding temperature value obtained in the elapsed time (hours).

The total energy consumption will be obtained by summing the energy consumption over the whole range of temperature differences

BIN METHOD

- $T_{o,i}$, midpoint of the interval of the temperature, and T_b is the balance point temperature of the value of outdoor temperature which heating or cooling needed above or below.
- Generally the value of the heating temperature would be 18°C.
- In above the formula(1) , positive (+) sign is for heating and negative (-) sign is for cooling. For the total energy consumption of the interval of the temperature, the value of the total Qbin,i would be calculated above the formula (1) and
- Then, bin data about the period of time (Nbin) would be determined as deviding the whole day by 2 hours with 12 parts.

BIN METHOD

- In this study, the dry bulb temperature of the 2°C range between -6°C and 34°C is used for the bin data of Istanbul.
- Then, the bin data for the time period (N_{bin}) will be determined by dividing the whole day into 12 parts and dividing by 2 hours.
- By taking 19 years of data from the General Directorate of State Meteorological Affairs between 1983-2001, the value of the bin data will be calculated by using the hourly value of the dry bulb temperature for a total of 19 years.
- In Table 1, the value of the bin data to get the dry bulb temperatures of Istanbul is given separately on a monthly basis.

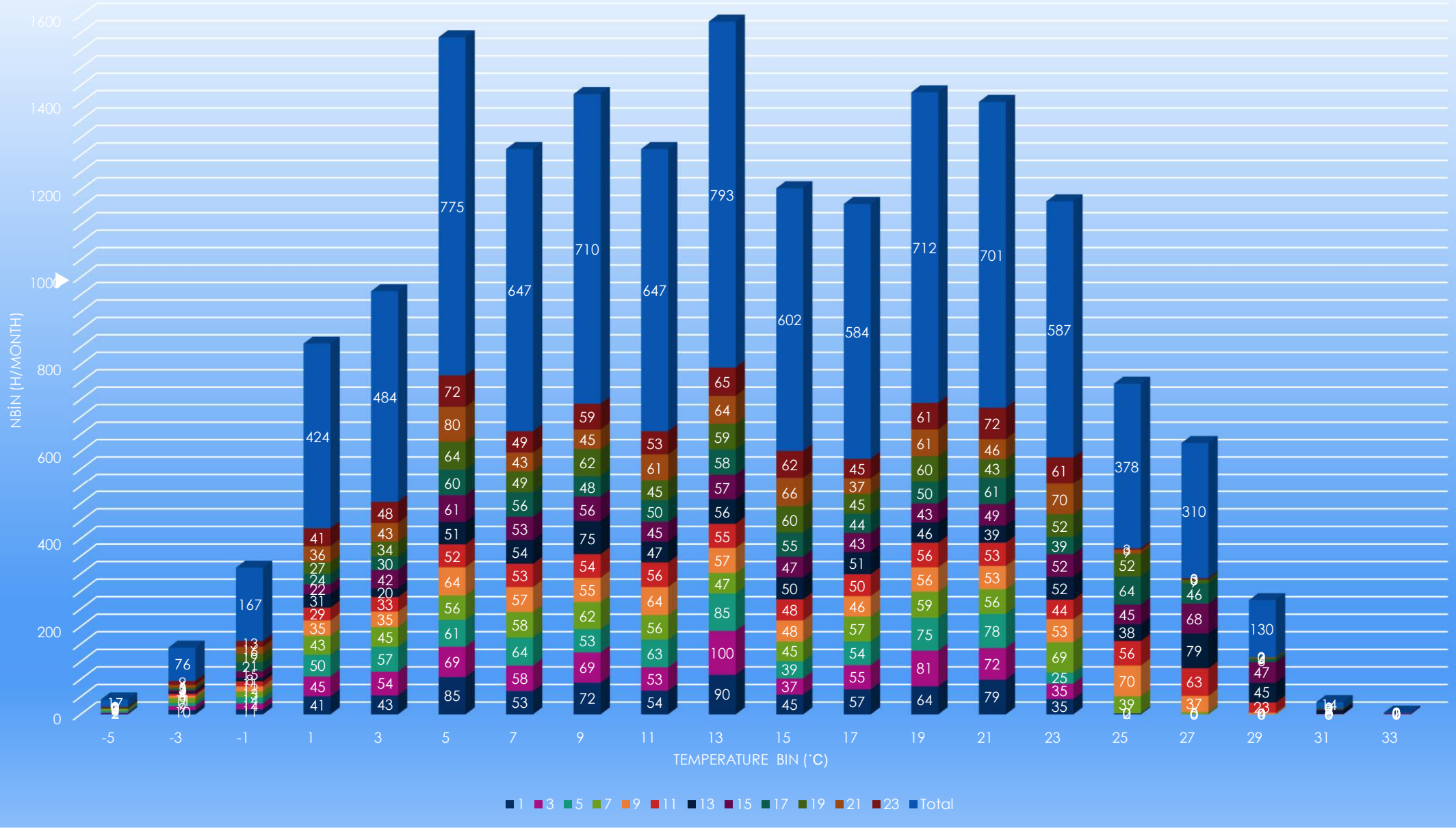
Table 1. Monthly total Nbin values for Istanbul (h/month).

Month	Time Interval (h)	Temperature Bin (°C)																		
		<-6/-4	-4/-2	-2/0	0/2	2/4	4/6	6/8	8/10	10/12	12/14	14/16	16/18	18/20	20/22	22/24	24/26	26/28	28/30	30/32	32/34
January	0-2	1	8	4	10	10	11	5	5	0	0	0	0	0	0	0	0	0	0	0	0
	2-4	1	6	5	12	9	8	5	9	0	0	0	0	0	0	0	0	0	0	0	0
	4-6	3	4	5	9	9	7	10	7	3	0	0	0	0	0	0	0	0	0	0	0
	6-8	3	11	5	7	5	9	6	8	3	0	0	0	0	0	0	0	0	0	0	0
	8-10	1	6	4	7	5	6	8	5	9	2	0	0	0	0	0	0	0	0	0	0
	10-12	0	4	4	8	4	6	8	10	15	10	2	0	0	0	0	0	0	0	0	0
	12-14	0	4	3	7	1	8	10	10	15	6	3	0	0	0	0	0	0	0	0	0
	14-16	0	4	5	8	0	7	14	6	9	5	0	0	0	0	0	0	0	0	0	0
	16-18	1	3	7	12	1	9	14	7	12	16	0	0	0	0	0	0	0	0	0	0
	18-20	2	3	8	13	2	10	10	9	12	10	0	0	0	0	0	0	0	0	0	0
	20-22	0	6	5	5	7	9	3	8	3	4	0	0	0	0	0	0	0	0	0	0
	22-24	2	6	4	5	7	7	3	6	3	0	0	0	0	0	0	0	0	0	0	0
	Total	14	68	59	93	80	97	96	90	89	71	7	0	0	0	0	0	0	0	0	0
February	0-2	1	2	4	10	10	11	4	5	0	0	0	0	0	0	0	0	0	0	0	0
	2-4	1	2	5	12	8	8	5	10	0	0	0	0	0	0	0	0	0	0	0	0
	4-6	1	2	5	12	8	8	9	6	3	0	0	0	0	0	0	0	0	0	0	0
	6-8	0	0	5	10	5	9	5	9	5	0	0	0	0	0	0	0	0	0	0	0
	8-10	0	0	4	8	0	7	7	5	10	10	2	0	0	0	0	0	0	0	0	0
	10-12	0	0	4	8	0	7	7	10	15	7	11	1	0	0	0	0	0	0	0	0
	12-14	0	0	3	8	0	10	10	12	12	3	15	4	0	0	0	0	0	0	0	0
	14-16	0	0	5	8	0	7	12	10	7	5	5	0	0	0	0	0	0	0	0	0
	16-18	0	0	7	8	0	10	12	10	5	14	0	0	0	0	0	0	0	0	0	0
	18-20	0	0	8	8	0	10	10	9	5	6	0	0	0	0	0	0	0	0	0	0
	20-22	0	0	10	9	4	7	5	7	3	6	0	0	0	0	0	0	0	0	0	0
	22-24	0	0	5	8	5	4	2	6	5	0	0	0	0	0	0	0	0	0	0	0
	Total	3	6	62	108	40	98	87	92	70	58	33	5	0	0	0	0	0	0	0	0
March	0-2	0	0	0	5	3	19	11	13	4	2	0	0	0	0	0	0	0	0	0	0
	2-4	0	0	0	3	12	20	13	9	10	0	0	0	0	0	0	0	0	0	0	0
	4-6	0	0	0	3	10	21	14	8	3	0	0	0	0	0	0	0	0	0	0	0
	6-8	0	0	0	3	11	15	15	9	1	0	0	0	0	0	0	0	0	0	0	0
	8-10	0	0	0	2	10	15	14	10	4	0	0	0	0	0	0	0	0	0	0	0
	10-12	0	0	0	0	5	16	10	6	0	0	0	0	0	0	0	0	0	0	0	0
	12-14	0	0	0	0	1	21	8	0	0	0	0	0	0	0	0	0	0	0	0	0
	14-16	0	0	0	0	37	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	16-18	0	0	0	0	23	15	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	18-20	0	0	0	2	21	17	4	2	0	0	0	0	0	0	0	0	0	0	0	0
	20-22	0	0	0	3	10	31	10	11	10	0	0	0	0	0	0	0	0	0	0	0
	22-24	0	0	0	3	10	24	16	16	10	0	0	0	0	0	0	0	0	0	0	0
	Total	0	0	0	34	159	232	116	84	53	37	20	2	0	0	0	0	0	0	0	0
April	0-2	0	0	0	1	2	10	14	24	10	20	6	2	0	0	0	0	0	0	0	0
	2-4	0	0	0	3	11	6	17	12	10	15	6	4	0	0	0	0	0	0	0	0
	4-6	0	0	0	3	10	8	15	11	14	3	4	1	0	0	0	0	0	0	0	0
	6-8	0	0	0	3	7	8	22	9	10	0	6	3	0	0	0	0	0	0	0	0
	8-10	0	0	0	0	0	6	18	13	6	0	0	1	0	0	0	0	0	0	0	0
	10-12	0	0	0	0	0	8	13	11	1	0	0	0	0	0	0	0	0	0	0	0
	12-14	0	0	0	0	0	0	6	16	5	0	0	0	0	0	0	0	0	0	0	0
	14-16	0	0	0	0	0	0	5	20	4	0	0	0	0	0	0	0	0	0	0	0
	16-18	0	0	0	0	0	0	8	10	3	0	0	0	0	0	0	0	0	0	0	0
	18-20	0	0	0	0	0	7	5	12	3	0	0	0	0	0	0	0	0	0	0	0
	20-22	0	0	0	0	7	15	15	15	13	4	0	0	0	0	0	0	0	0	0	0
	22-24	0	0	0	1	6	14	20	20	10	5	20	1	0	0	0	0	0	0	0	0
	Total	0	0	0	8	43	88	158	173	86	49	48	26	14	10	4	1	0	0	0	0
May	0-2	0	0	0	0	0	0	0	0	6	20	10	12	10	9	0	0	0	0	0	0
	2-4	0	0	0	0	0	0	0	0	5	20	10	11	10	9	0	0	0	0	0	0
	4-6	0	0	0	0	0	0	0	0	3	35	11	14	6	4	0	0	0	0	0	0
	6-8	0	0	0	0	0	0	0	0	0	10	15	10	10	4	3	0	0	0	0	0
	8-10	0	0	0	0	0	0	0	1	0	5	15	10	10	3	3	0	0	0	0	0
	10-12	0	0	0	0	0	0	0	0	0	10	13	7	10	3	4	6	2	0	0	0
	12-14	0	0	0	0	0	0	0	0	0	15	10	7	3	10	4	6	2	3	1	0
	14-16	0	0	0	0	0	0	0	0	0	13	20	12	1	4	2	7	1	4	0	0
	16-18	0	0	0	0	0	0	0	0	0	10	33	5	4	2	0	1	0	0	0	0
	18-20	0	0	0	0	0	0	0	0	0	10	20	7	7	0	0	12	0	0	0	0
	20-22	0	0	0	0	0	0	0	0	0	13	33	8	15	0	0	0	0	0	0	0
	22-24	0	0	0	0	0	0	0	0	0	18	21	10	18	0	0	0	0	0	0	0
	Total	0	0	0	0	0	0	0	6	14	174	211	113	112	51	43	16	3	1	0	0
June	0-2	0	0	0	0	0	0	0	0	11	11	10	12	14	12	10	0	0	0	0	0
	2-4	0	0	0	0	0	0	0	0	1	4	10	12	16	10	6	0	0	0	0	0
	4-6	0	0	0	0	0	0	0	0	0	0	12	10	15	10	7	0	0	0	0	0
	6-8	0	0	0	0	0	0	0	0	0	0	0	12	10	10	7	6	0	0	0	0
	8-10	0	0	0	0	0	0	0	0	0	0	0	15	10	8	10	10	4	0	0	0
	10-12	0	0	0	0	0	0	0	0	0	0	0	10	10	8	10	18	15	5	1	1
	12-14	0	0	0	0	0	0	0	0	0	0	0	7	3	0	7	5	15	12	3	1
	14-16	0	0	0	0	0	0	0	0	0	0	0	10	1	10	7	13	10	12	1	1
	16-18	0	0	0	0	0	0	0	0	0	0	0	10	4	17	2	13	24	0	2	0
	18-20	0	0	0	0	0	0	0	0	0	0	0	4	10	20	14	12	1	2	1	0
	20-22	0	0	0	0	0	0	0	0	0	0	0	0	15	16	15	9	0	0	0	0
	22-24	0	0	0	0	0	0	0	0	0	0	0	0	14	13	9	0	0	0	0	0
	Total	0	0	0	0	0	0	0	0	12	15	32	112	122	134	90	74	75	35	8	2

Month	Time Interval (h)	Temperature Bin (°C)																			
		-6/-4	-4/-2	-2/0	0/2	2/4	4/6	6/8	8/10	10/12	12/14	14/16	16/18	18/20	20/22	22/24	24/26	26/28	28/30	30/32	32/34
July	0-2	0	0	0	0	0	0	0	0	0	0	0	2	10	12	20	2	0	0	0	0
	2-4	0	0	0	0	0	0	0	0	0	0	0	2	10	11	10	0	0	0	0	0
	4-6	0	0	0	0	0	0	0	0	0	0	0	0	5	14	10	0	0	0	0	0
	6-8	0	0	0	0	0	0	0	0	0	0	0	0	0	10	33	17	4	0	0	0
	8-10	0	0	0	0	0	0	0	0	0	0	0	0	0	8	22	36	17	0	0	0
	10-12	0	0	0	0	0	0	0	0	0	0	0	0	0	8	12	9	26	14	0	0
	12-14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	8	20	22	4	0
	14-16	0	0	0	0	0	0	0	0	0	0	0	0	0	10	14	16	44	25	1	0
	16-18	0	0	0	0	0	0	0	0	0	0	0	0	0	17	15	14	40	6	0	0
	18-20	0	0	0	0	0	0	0	0	0	0	0	0	0	23	15	21	2	1	0	0
	20-22	0	0	0	0	0	0	0	0	0	0	0	0	0	9	24	9	0	2	0	0
	22-24	0	0	0	0	0	0	0	0	0	0	0	0	0	21	22	2	2	0	0	0
	Total	0	0	0	0	0	0	0	0	0	0	0	2	25	143	210	134	155	70	5	0
August	0-2	0	0	0	0	0	0	0	0	0	0	6	15	19	20	3	0	0	0	0	0
	2-4	0	0	0	0	0	0	0	0	0	0	2	12	24	20	7	0	0	0	0	0
	4-6	0	0	0	0	0	0	0	0	0	0	0	5	20	14	9	0	0	0	0	0
	6-8	0	0	0	0	0	0	0	0	0	0	0	5	15	10	12	9	0	0	0	0
	8-10	0	0	0	0	0	0	0	0	0	0	0	5	21	8	9	13	10	0	0	0
	10-12	0	0	0	0	0	0	0	0	0	0	0	1	20	7	8	19	20	3	0	0
	12-14	0	0	0	0	0	0	0	0	0	0	0	0	15	2	10	4	15	6	0	0
	14-16	0	0	0	0	0	0	0	0	0	0	0	0	15	5	11	10	10	3	0	0
	16-18	0	0	0	0	0	0	0	0	0	0	0	0	22	19	12	21	2	0	0	0
	18-20	0	0	0	0	0	0	0	0	0	0	0	0	23	20	15	10	1	0	0	0
	20-22	0	0	0	0	0	0	0	0	0	0	0	0	15	41	21	0	0	0	0	0
	22-24	0	0	0	0	0	0	0	0	0	0	0	5	3	26	10	0	0	0	0	0
	Total	0	0	0	0	0	0	0	0	0	0	8	48	212	192	127	86	58	12	0	0
September	0-2	0	0	0	0	0	0	0	0	6	19	10	10	10	16	2	0	0	0	0	0
	2-4	0	0	0	0	0	0	0	0	4	21	9	10	10	14	2	0	0	0	0	0
	4-6	0	0	0	0	0	0	0	0	3	10	13	13	10	14	5	0	0	0	0	0
	6-8	0	0	0	0	0	0	0	0	8	2	13	18	8	10	12	7	0	0	0	0
	8-10	0	0	0	0	0	0	0	0	0	2	8	9	8	8	3	11	0	0	0	0
	10-12	0	0	0	0	0	0	0	0	0	0	2	6	10	6	3	10	2	3	0	0
	12-14	0	0	0	0	0	0	0	0	0	0	0	8	15	6	7	8	16	6	1	0
	14-16	0	0	0	0	0	0	0	0	0	0	0	5	15	6	7	10	2	3	0	0
	16-18	0	0	0	0	0	0	0	0	0	3	0	10	13	1	6	16	0	0	0	0
	18-20	0	0	0	0	0	0	0	0	0	5	0	15	10	0	1	10	0	0	0	0
	20-22	0	0	0	0	0	0	0	0	0	6	0	16	10	0	10	0	0	0	0	0
	22-24	0	0	0	0	0	0	0	0	4	8	21	13	18	17	10	0	0	0	0	0
	Total	0	0	0	0	0	0	0	0	27	76	76	133	137	98	68	72	20	12	1	0
October	0-2	0	0	0	0	0	0	0	9	10	17	10	3	4	1	10	0	0	0	0	0
	2-4	0	0	0	0	0	0	0	8	10	20	40	0	4	6	8	0	0	0	0	0
	4-6	0	0	0	0	0	0	0	8	7	17	35	0	8	5	10	2	0	0	0	0
	6-8	0	0	0	0	0	0	0	5	9	24	2	6	4	3	2	2	0	0	0	0
	8-10	0	0	0	0	0	0	0	0	7	10	8	6	5	6	8	1	0	0	0	0
	10-12	0	0	0	0	0	0	0	0	3	5	10	2	10	5	5	5	0	0	0	0
	12-14	0	0	0	0	0	0	0	0	26	3	5	2	5	8	12	7	4	0	0	0
	14-16	0	0	0	0	0	0	0	0	13	3	7	2	5	8	5	5	2	0	0	0
	16-18	0	0	0	0	0	0	0	0	9	10	5	4	9	7	0	3	0	0	0	0
	18-20	0	0	0	0	0	0	0	0	4	5	10	0	17	10	0	0	0	0	0	0
	20-22	0	0	0	0	0	0	0	0	6	10	16	13	0	7	5	0	0	0	0	0
	22-24	0	0	0	0	0	0	0	0	2	10	10	33	0	5	3	3	0	0	0	0
	Toplam	0	0	0	0	0	0	38	118	140	178	23	84	67	63	24	6	0	0	0	0
November	0-2	0	0	0	5	8	16	6	8	0	0	0	0	0	0	0	0	0	0	0	0
	2-4	0	0	0	3	7	9	5	9	0	0	0	0	0	0	0	0	0	0	0	0
	4-6	0	0	0	3	6	8	9	7	3	0	0	0	0	0	0	0	0	0	0	0
	6-8	0	0	0	3	9	7	4	9	10	5	3	0	0	0	0	0	0	0	0	0
	8-10	0	0	0	3	7	10	5	7	15	6	6	0	3	0	0	0	0	0	0	0
	10-12	0	0	0	6	12	8	6	10	10	10	6	0	5	0	0	0	0	0	0	0
	12-14	0	0	0	6	8	15	10	7	6	10	8	10	8	1	0	0	0	0	0	0
	14-16	0	0	0	3	3	19	8	2	10	26	12	10	3	0	0	0	0	0	0	0
	16-18	0	0	0	3	1	10	8	2	15	7	14	10	0	0	0	0	0	0	0	0
	18-20	0	0	0	3	2	14	10	7	15	6	0	2	0	0	0	0	0	0	0	0
	20-22	0	0	0	8	7	8	3	9	10	6	0	2	0	0	0	0	0	0	0	0
	22-24	0	0	0	8	9	11	3	9	5	0	0	0	0	0	0	0	0	0	0	0
	Total	0	0	0	56	79	135	77	86	99	76	49	43	19	1	0	0	0	0	0	0
December	0-2	0	0	3	10	10	18	4	7	0	0	0	0	0	0	0	0	0	0	0	0
	2-4	0	1	4	12	7	9	5	8	0	0	0	0	0	0	0	0	0	0	0	0
	4-6	0	1	4	20	8	9	9	7	3	0	0	0	0	0	0	0	0	0	0	0
	6-8	0	0	4	20	8	8	6	9	10	5	2	0	0	0	0	0	0	0	0	0
	8-10	0	0	4	15	13	9	7	7	10	5	2	0	2	0	0	0	0	0	0	0
	10-12	0	0	3	7	12	7	9	10	12	8	6	4	1	0	0	0	0	0	0	0
	12-14	0	0	2	10	10	9	10	10	6	17	4	4	2	0	0	0	0	0	0	0
	14-16	0	0	3	1	6	13	13	5	12	5	3	0	0	0	0	0	0	0	0	0
	16-18	0	0	7	2	2	10	13	5	5	4	4	0	0	0	0	0	0	0	0	0
	18-20	0	0	3	12	9	10	10	9	5	6	0	0	0	0	0	0	0	0	0	0
	20-22	0	0	2	6	8	10	3	6	5	5	0	0	0	0	0	0	0	0	0	0
	22-24	0	0	4	11	11	12	3	8	5	0	0	0	0	0	0	0	0	0	0	0
	Toplam	0	2	43	126	104	124	92	91	73	55	21	8	5	0	0	0	0	0	0	0

BIN METHOD

- In Table 1, the lowest temperature be -6°C (-6°C/-4°C) be taken 3 hours in January. In January, the frequency of total time taken of the interval of the the lowest temperature (-6°C/-4°C) be 14 hours.
- Then, the highest temperature be 32°C, wich is the frequency of 2 hours and obtainning in June.
- The frequency of the highest temperature be at the interval of (32°C/34°C) about 2 hours in June.
- In Table 2, the values of the bin data for yearly be already given.
- The highest value of total Nbin for the year determined by 793 hours in 13°C and in the interval of (12°C/14°C).
- In Table 3, the total Nbin has already been calculated monthly and as shown in following Table


NBİN (H/MONTH)
1600
1400
1200
1000
800
600
400
200
0
-5
-3
-1
1
3
5
7
9
11
13
15
17
19
21
23
25
27
29
31
33
TEMPERATURE BIN (˚C)
1 3 5 7 9 11 13 15 17 19 21 23 Total

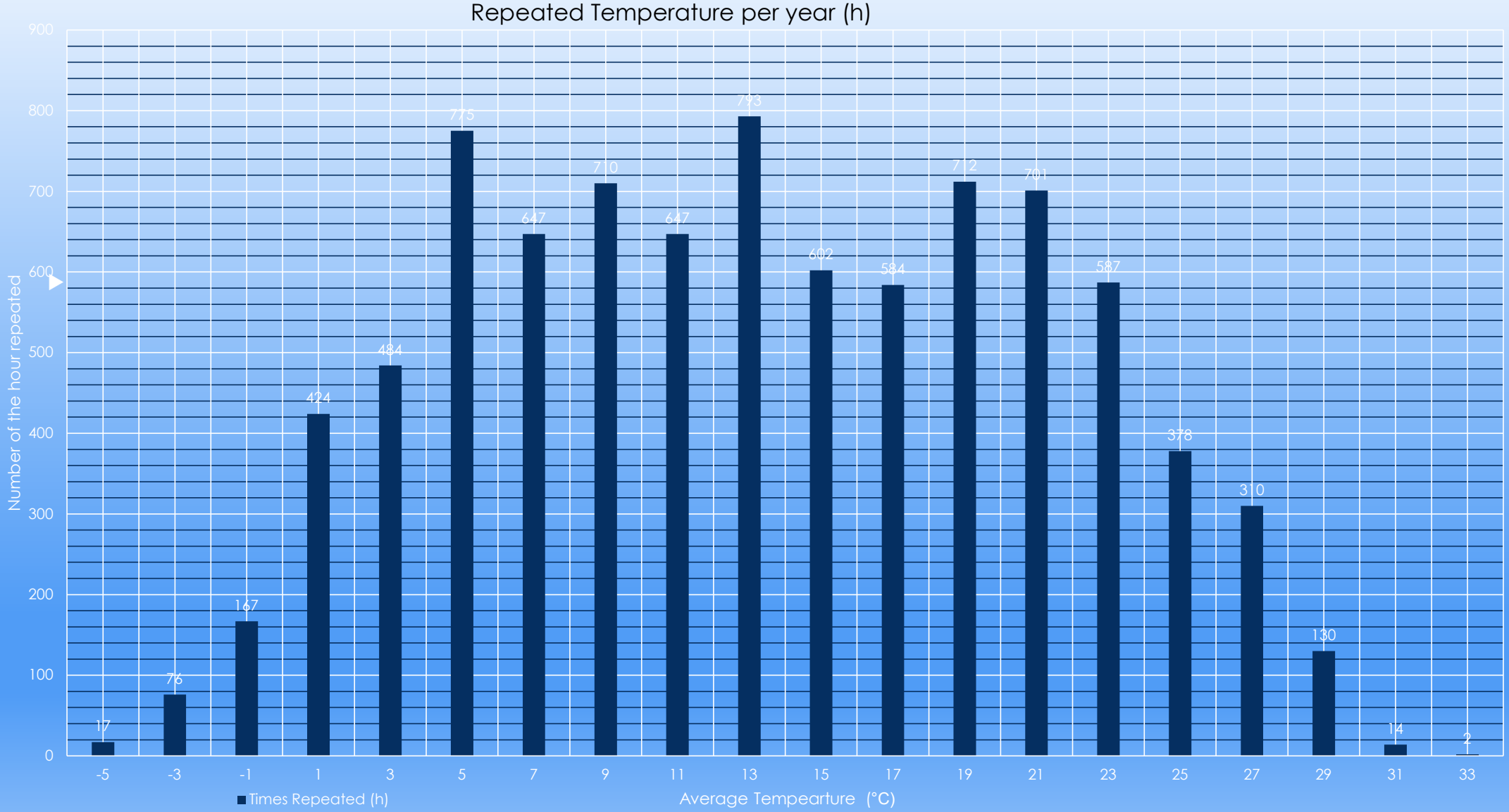
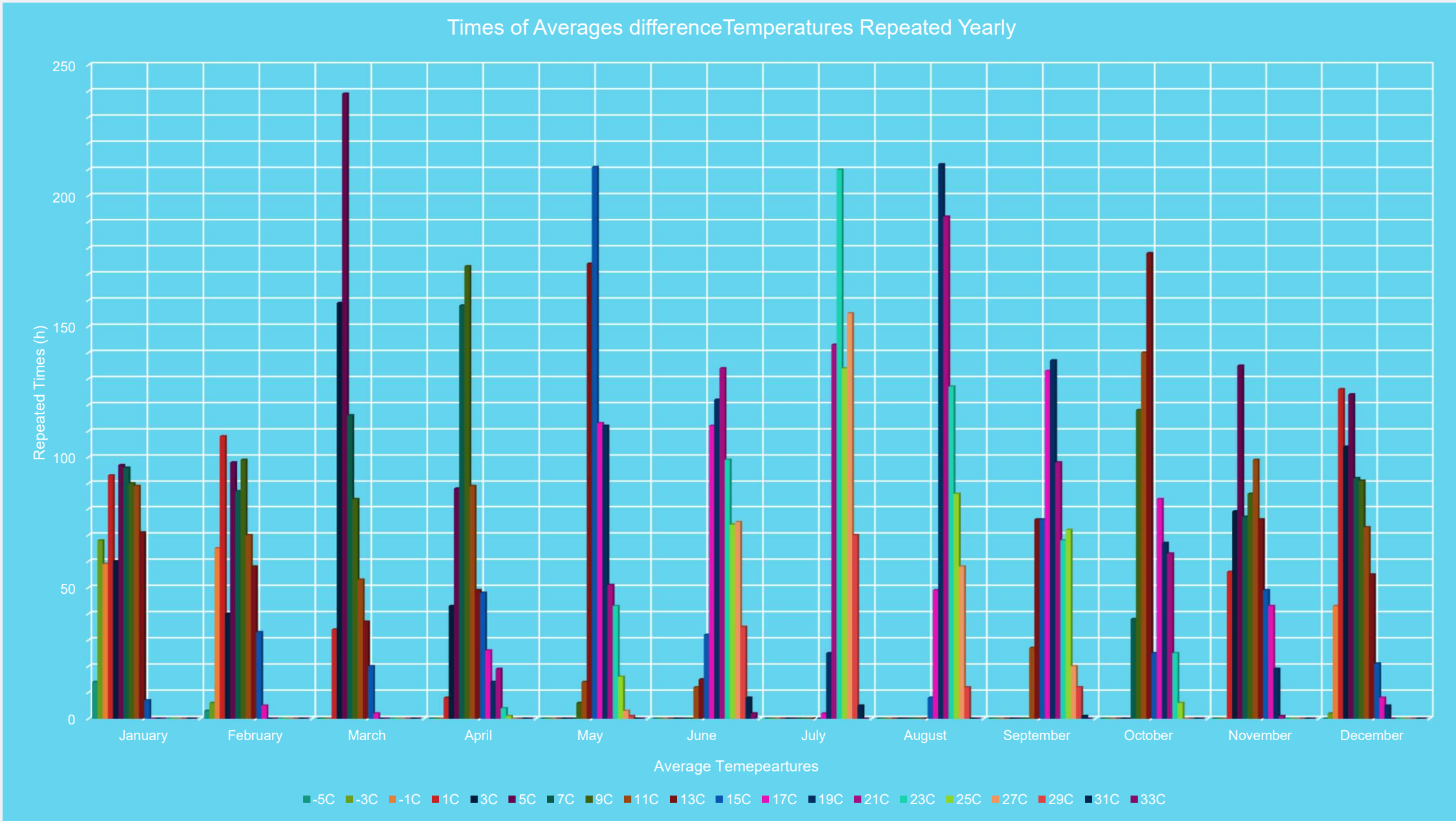

Repeated Temperature per year (h)
Number of the hour repeated
900
800
700
600
500
400
300
200
100
0
17
76
167
424
484
775
647
710
647
793
602
584
712
701
587
378
310
130
14
2
-5
-3
-1
1
3
5
7
9
11
13
15
17
19
21
23
25
27
29
31
33
Times Repeated (h)
Average Tempearture (°C)

Table 2. Yearly total N_{bin} (h/year) for 12 separate time periods of day for Istanbul.

Time Interval (h)	Temperature Bin (°C)																		
	-6/-4	-4/-2	-2/0	0/2	2/4	4/6	6/8	8/10	10/12	12/14	14/16	16/18	18/20	20/22	22/24	24/26	26/28	28/30	30/32	32/34
0-2	2	10	11	41	43	85	53	72	54	90	45	57	64	79	35	2	0	0	0	0
2-4	2	9	14	45	54	69	58	69	53	100	37	55	81	72	35	0	0	0	0	0
4-6	4	7	14	50	57	61	64	53	63	85	39	54	75	78	25	0	0	0	0	0
6-8	3	11	13	43	45	56	58	62	56	47	45	57	59	56	69	39	5	0	0	0
8-10	1	6	12	35	35	64	57	55	64	57	48	46	56	53	53	70	37	4	0	0
10-12	0	4	11	29	33	52	53	54	56	55	48	50	56	53	44	56	63	23	1	1
12-14	0	4	8	31	20	51	54	75	47	56	50	51	46	39	52	38	79	45	8	0
14-16	0	4	15	22	42	61	53	56	45	57	47	43	43	49	52	45	68	47	2	1
16-18	1	3	21	24	30	60	56	48	50	58	55	44	50	61	39	64	46	6	2	0
18-20	2	3	19	27	34	64	49	62	45	59	60	45	60	43	52	52	9	3	1	0
20-22	0	6	16	36	43	80	43	45	61	64	66	37	61	46	70	9	0	2	0	0
22-24	2	9	13	41	48	72	49	59	53	65	62	45	61	72	61	3	3	0	0	0
Total	17	76	167	424	484	775	647	710	647	793	602	584	712	701	587	378	310	130	14	2

Month	Temperature Bin (°C)																			Total Nbin (h)
	-6/-4	-4/-2	-2/0	0/2	2/4	4/6	6/8	8/10	10/12	12/14	14/16	16/18	18/20	20/22	22/24	24/26	26/28	28/30	30/32	32/34	
January	14	68	59	93	60	97	96	90	89	71	7	0	0	0	0	0	0	0	0	0	744
February	3	6	65	108	40	98	87	99	70	58	33	5	0	0	0	0	0	0	0	0	672
March	0	0	0	34	159	239	116	84	53	37	20	2	0	0	0	0	0	0	0	0	744
April	0	0	0	8	43	88	158	173	89	49	48	26	14	19	4	1	0	0	0	0	720
May	0	0	0	0	0	0	0	6	14	174	211	113	112	51	43	16	3	1	0	0	744
June	0	0	0	0	0	0	0	0	12	15	32	112	122	134	99	74	75	35	8	2	720
July	0	0	0	0	0	0	0	0	0	0	0	2	25	143	210	134	155	70	5	0	744
August	0	0	0	0	0	0	0	0	0	0	8	49	212	192	127	86	58	12	0	0	744
September	0	0	0	0	0	0	0	0	27	76	76	133	137	98	68	72	20	12	1	0	720
October	0	0	0	0	0	0	38	118	140	178	25	84	67	63	25	6	0	0	0	0	744
November	0	0	0	56	79	135	77	86	99	76	49	43	19	1	0	0	0	0	0	0	720
December	0	2	43	126	104	124	92	91	73	55	21	8	5	0	0	0	0	0	0	0	744
Total	17	76	167	425	485	781	664	747	666	789	530	577	713	701	576	389	311	130	14	2	8760

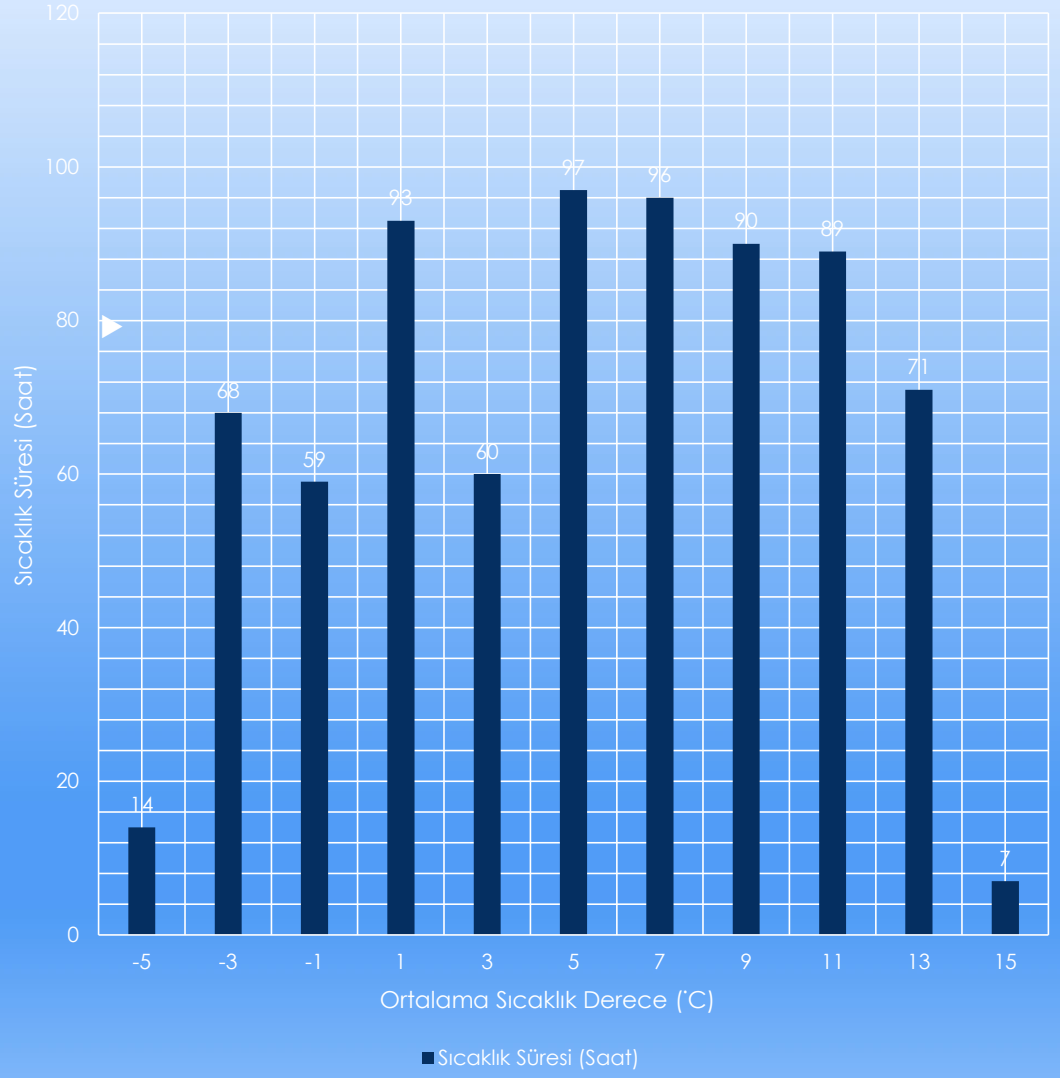
Table 3. Yearly total N_{bin} (h) for 12 month


Times of Averages differenceTemperatures Repeated Yearly
Repeated Times (h)
250
200
150
100
50
0
January
February
March
April
May
June
July
August
September
October
November
December
Average Temepeartures
-5C -3C -1C 1C 3C 5C 7C 9C 11C 13C 15C 17C 19C 21C 23C 25C 27C 29C 31C 33C

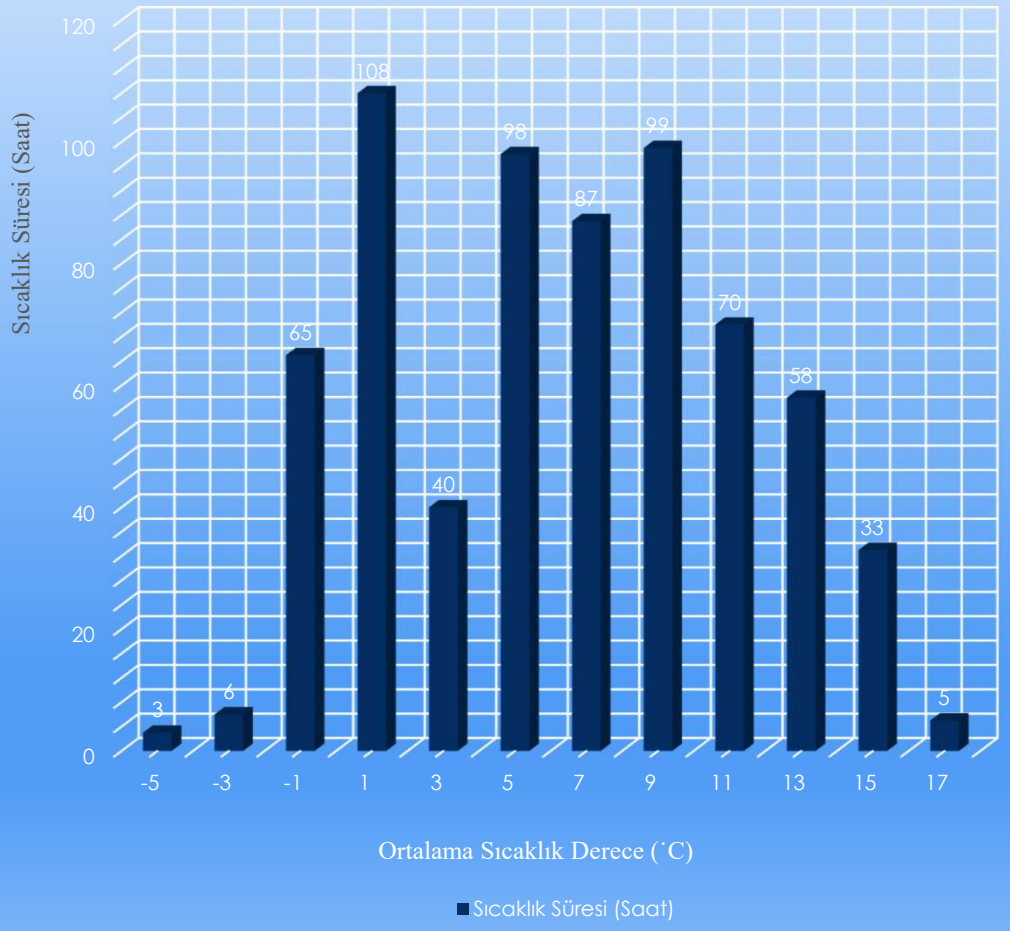
BIN METHOD

- The total N_{bin} per year could be calculated from the Table.2 and the number of times acting on the average temperature from -6 to 34ºC repeated in a year and the average hours in a day can be calculated as the Table.2.
- As for the table 2, the interval of the temperature between -6 and -34 repeated as follows. The total repeated time of the same temperature in 1.am could be calculated about 743 times, in 3.am repeated about 753 times, in 5 am repeated about 729 times and respectively. The minimum repeated time of 685h could be seen in 21pm, the maximum repeated times of 754 hours could be seen in 13.pm.
- The average Bin temperature between -6 and 34 could be calculated as the duration of repeated hours per day.
- The average temperature of -5ºC has been repeated about 17 times per year and every one time is the equivalent of one hour. Then, the average temperature of -3 ºC has been repeated as 76 times per year, the average temperature of -1ºC has been repeated as 167 times, 1ºC has been repeated about 424 times, 3ºC repeated about 484 times, 5ºC has been repeated about 775 times, 7ºC and 11ºC repeated about 647 times, 9ºC repeated about 710 times, 13ºC repeated about 793 times, 15ºC repeated about 602 times, 17ºC repeated about 584 times, 19ºC repeated about 712 times, 21ºC repeated about 701 times, 23ºC repeated about 587 times, 25ºC repeated about 378 times, 27ºC repeated about 310 times, 29ºC repeated about 130 times 31ºC repeated about 14 times and 33ºC also repeated in 2 times and respectively.
- In this study, we know that the relationships between bin temperature and repeated times could be calculated from the bin data of İstanbul and it can be applied in the public building to get the amount of energy consumptions and to estimate the energy consumptions of next future.

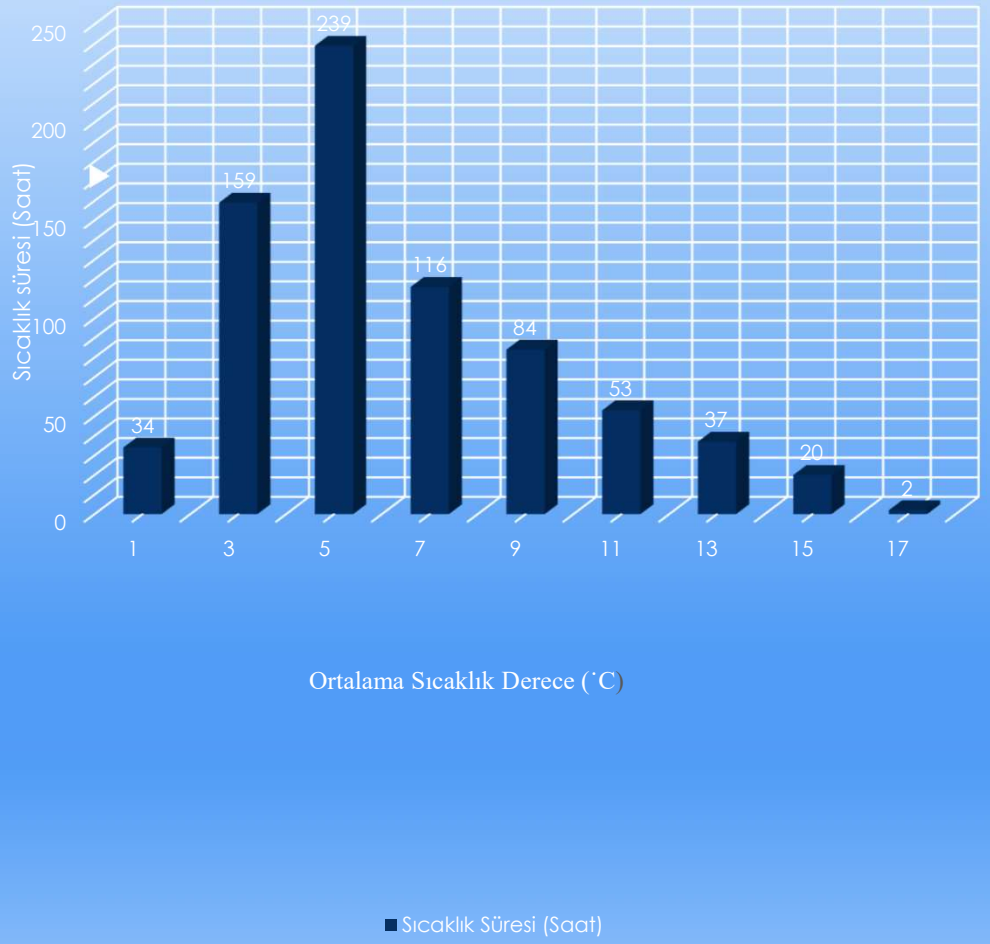
Total Bin Temperature in January



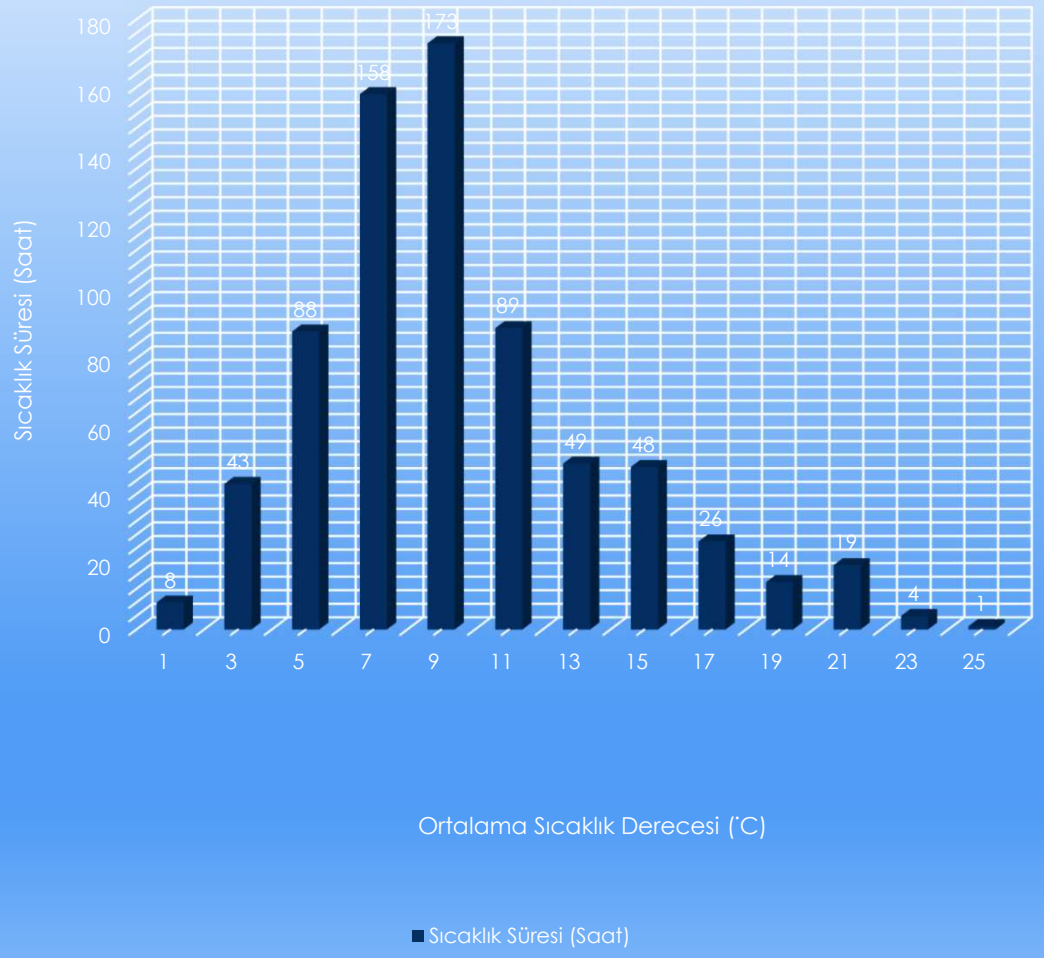
Total Bin Temperature in February



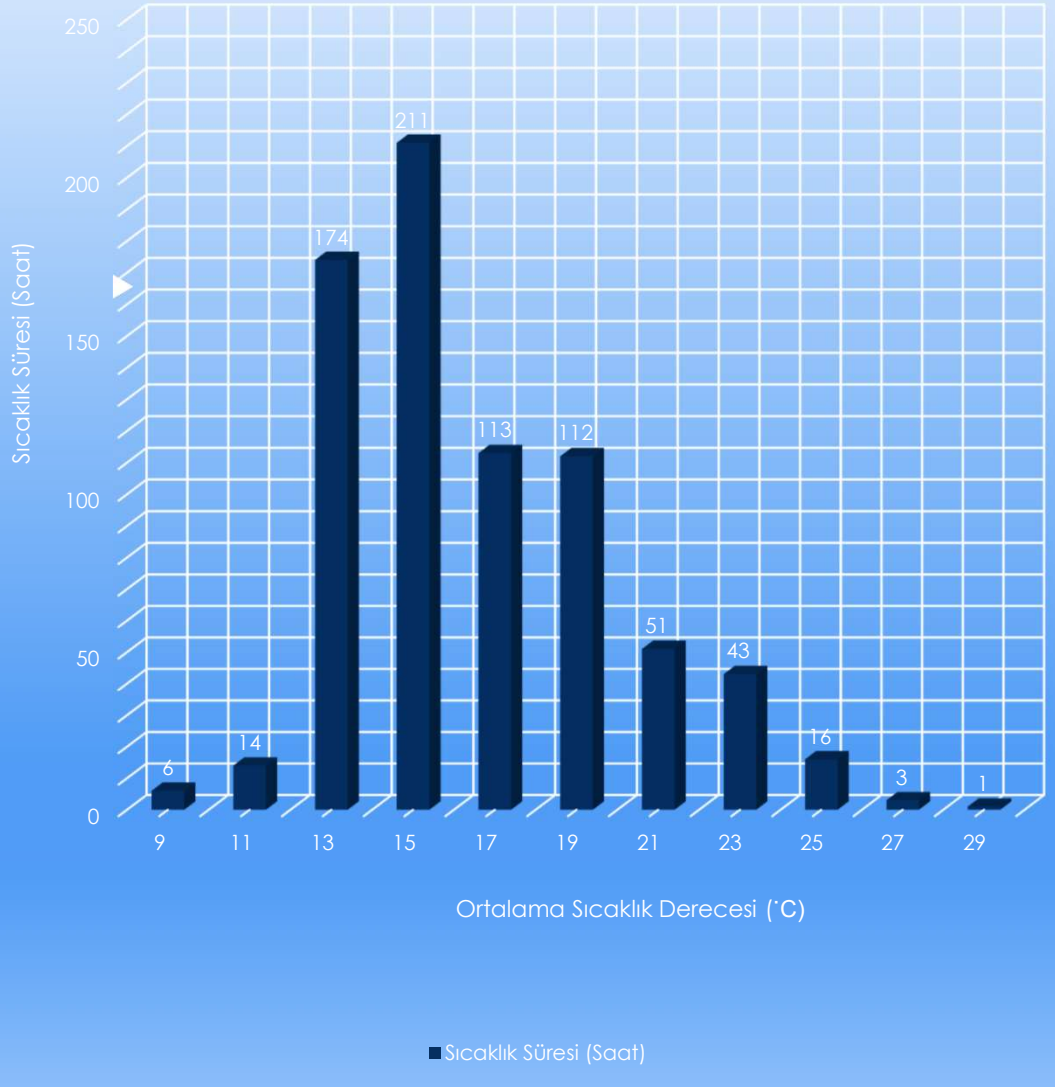
Total Bin Temperature in March



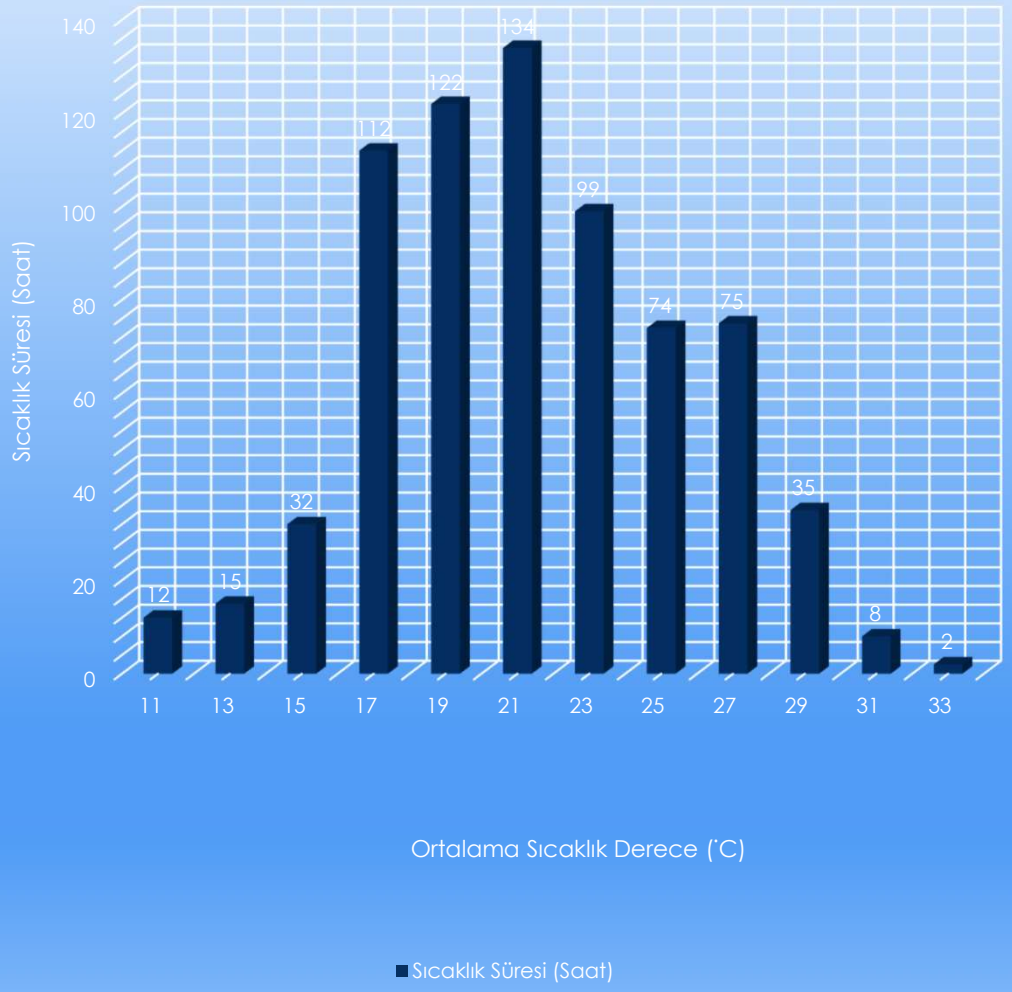
Total Bin Temperature in April



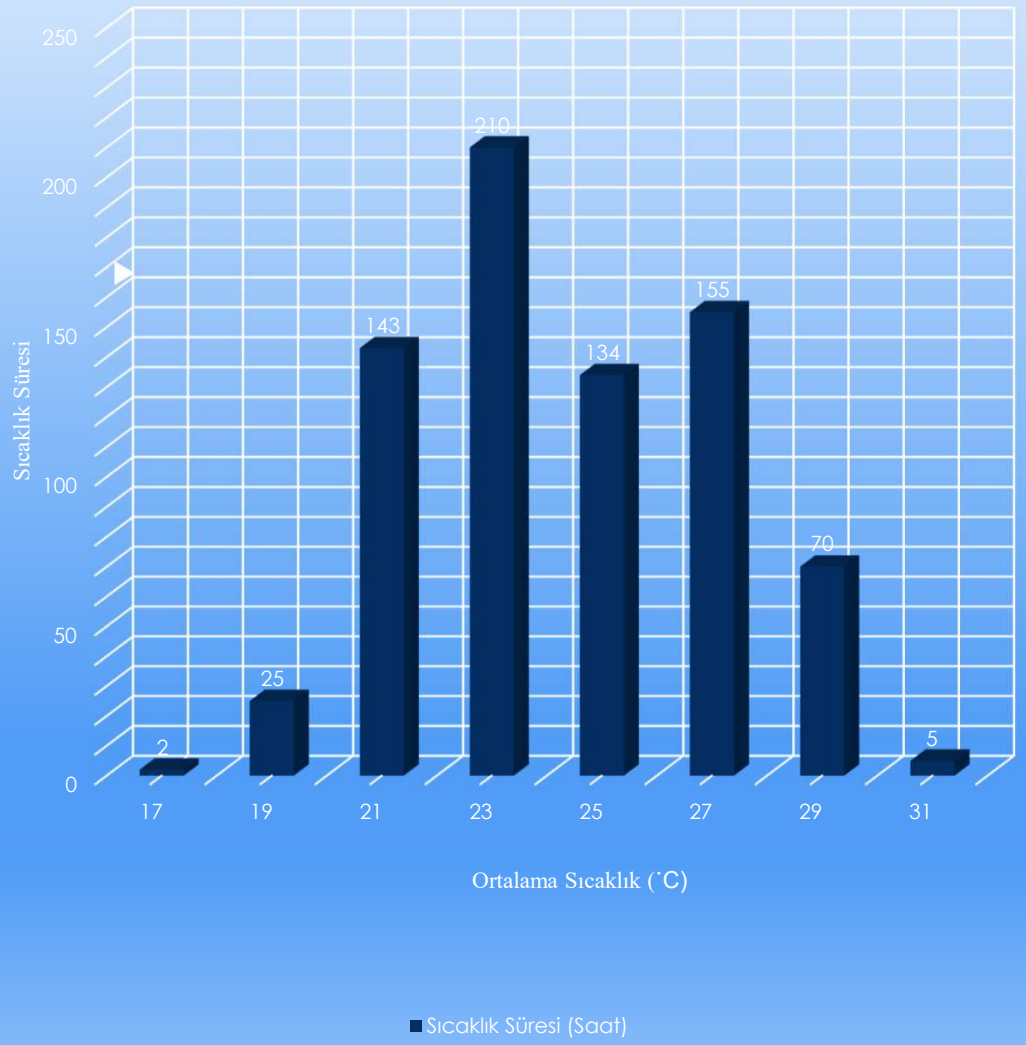
Total Bin Temperature in May



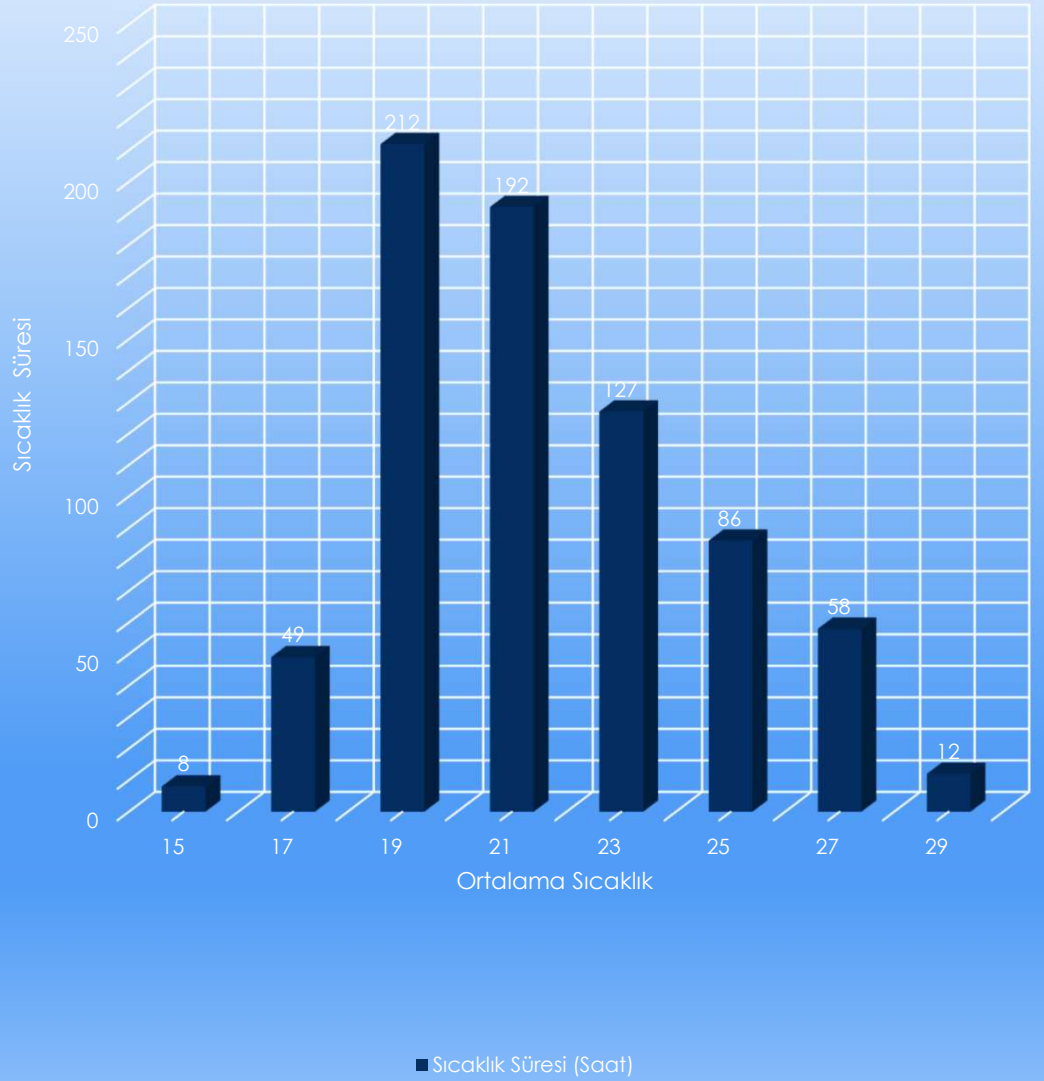
Total Bin Temperature in June



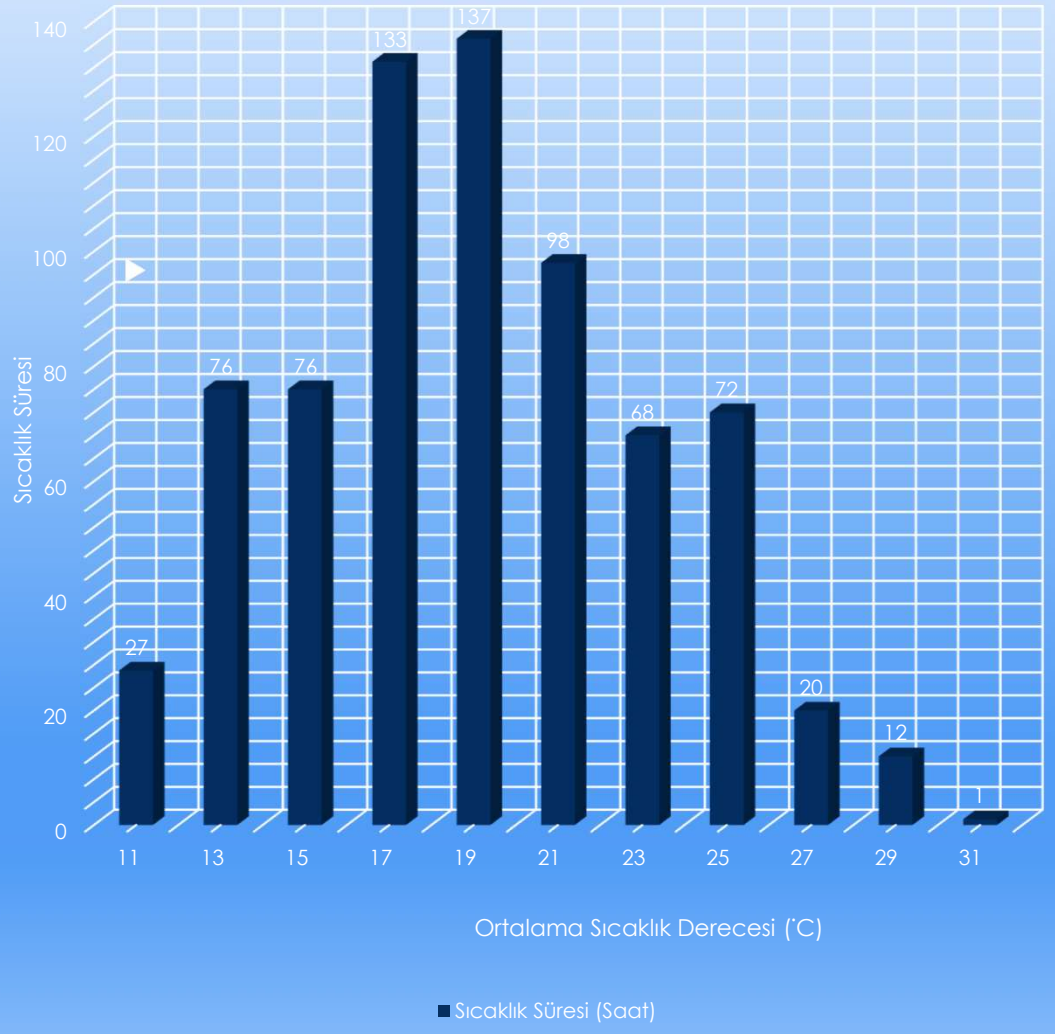
Total Bin Temperature in July



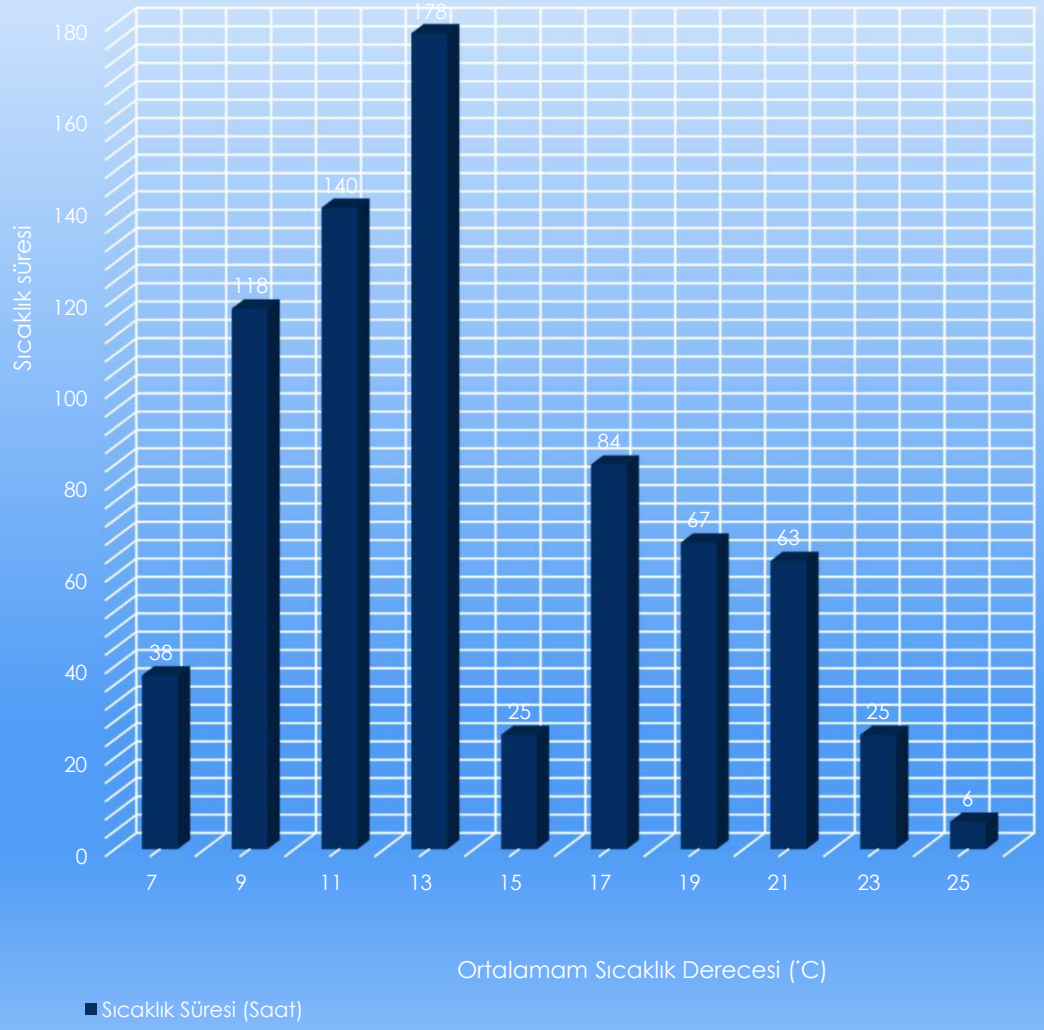
Total Bin Temperature in August



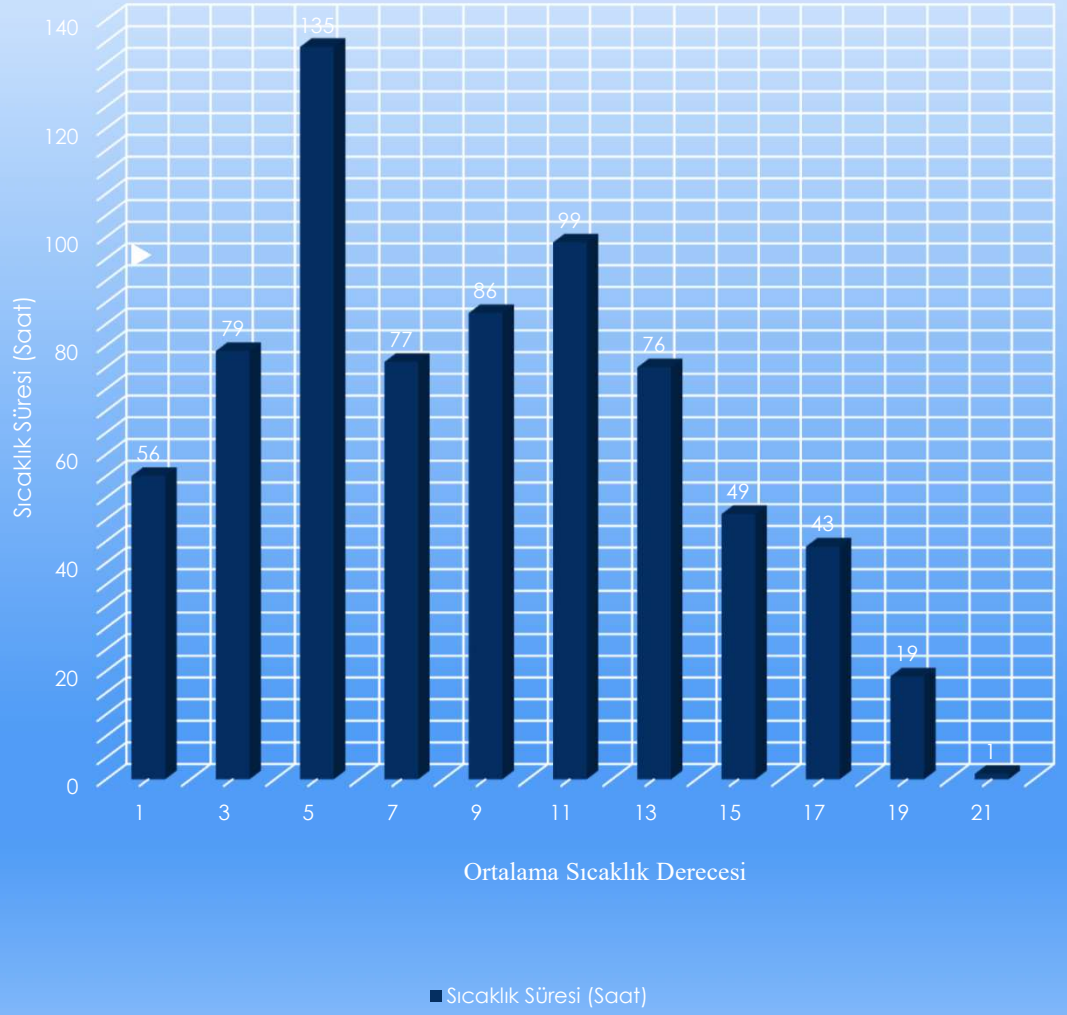
Total Bin Temperature in September



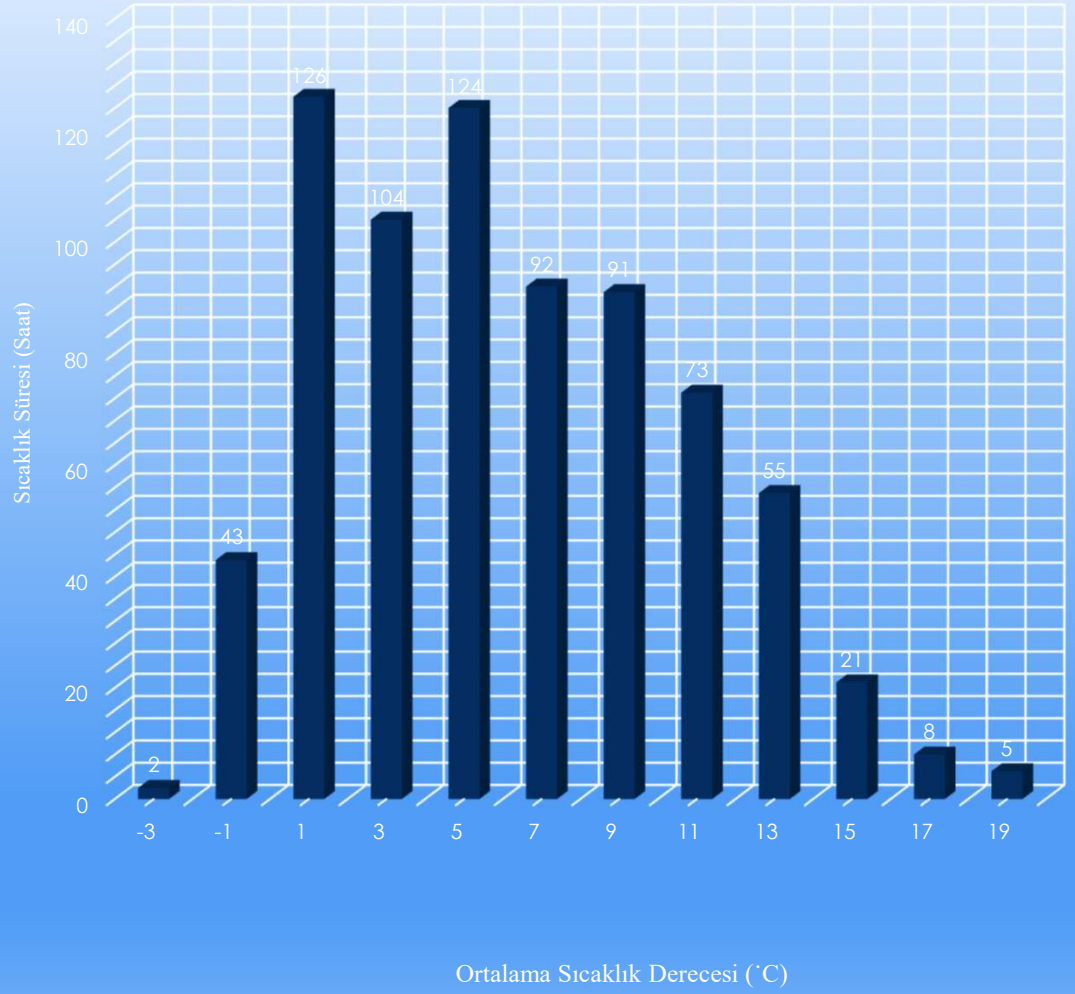
Total Bin Temperature in October



Total Bin Temperature in November



Total Bin Temperature in December



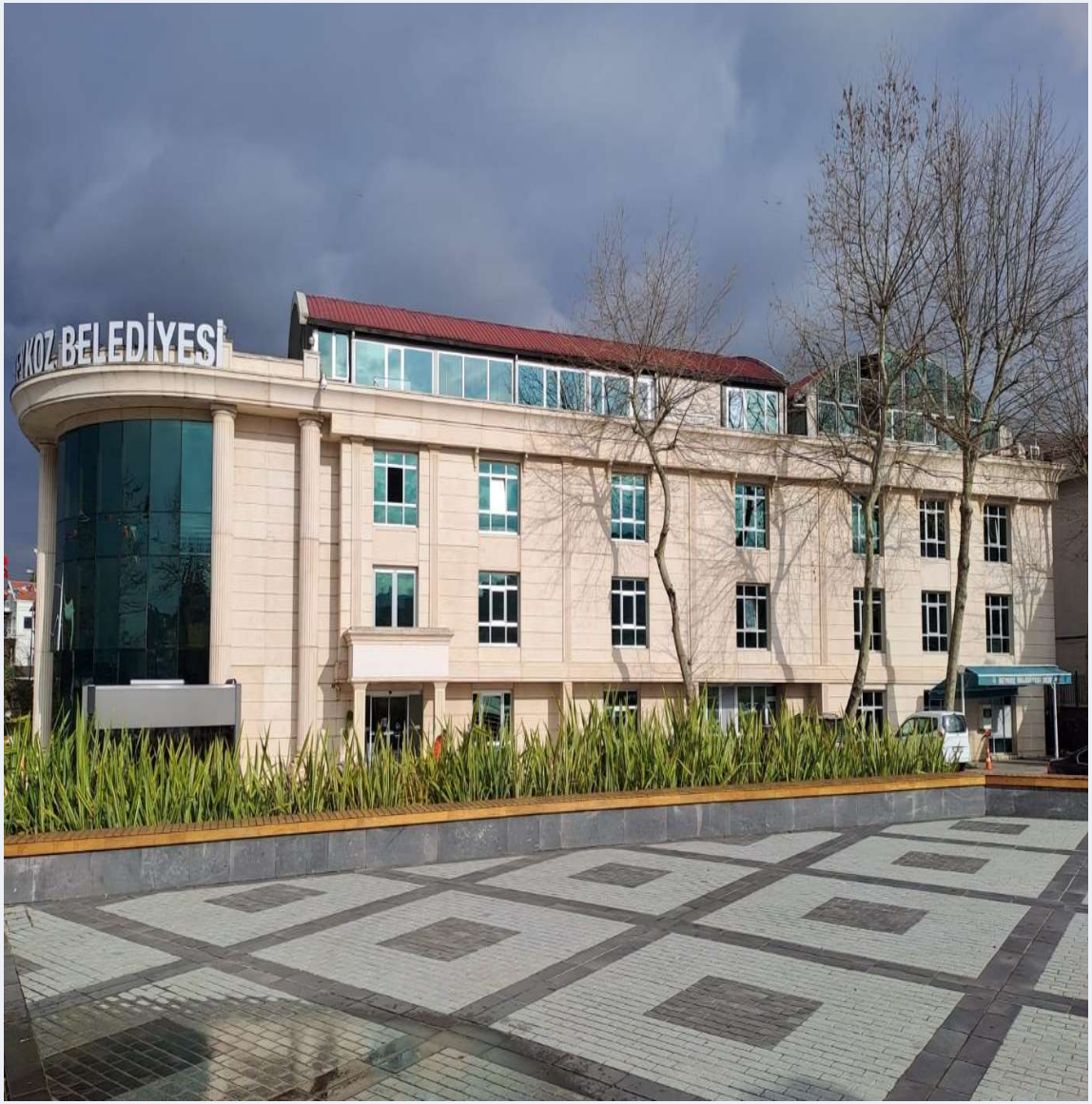
	Hizmet Binası	Kullanım Amacı	Bulunduğu Mahalle	Toplam Kat Adet	Bağımsız Bölüm Sayı	Kapalı Alanı m²	İnşaat Bitiş Yılı
1	Belediye Meclis Binası	Ana Bina Müdürlükler	Gümüşsuyu	5	3	5168	2019
2	Başkanlık Binası	Ana Bina Müdürlükler	Gümüşsuyu	4	1	10735	2011
3	Başkanlık Ek Hizmet Binası	Temizlik İşleri Müdürlüğü	Gümüşsuyu	3	3	835	2020
4	Çavuşbaşı Hizmet Binası	Tarımsal Hizmetler Binası Gençlik ve Spor Müdürlüğü	Çiftlik	2	2	906	2021
5	Kanuni Kent Ormanı Nikah Salonu	Nikah Salonu	Yenimahalle	2	2	1165	2021
6	Kavacık Hizmet Binası	Sağlık İşleri Müdürlüğü	Kavacık	4	4	504	1990
7	Akbaba Hizmet Binası(Akom)	Afet Arama Kurtarma Merkezi	Akbaba	2	2	180	2020
8	Çubuklu Ek Hizmet Binası	Aile Sağlık Merkezi	Çubuklu	3	3	322,32	2020
9	Kent Konseyi İdari Binası	Kent Konseyi İdari Binası	Çubuklu	2	2	212	2020
10	Çavuşbaşı Ulaşım Birimi	Ulaşım Hizmetleri Garaj ve Bakım Ona	Çiftlik	1	1	71	
11	Kavacık Yaşam Merkezi	Nikah Salonu ve Millet Kıraathanesi	Çubuklu	2	1	1692	2021
12	Beykoz Hayvan Rehabilitasyon Merkezi	Hayvan Bakım Evi	Öğümce/Mahmutşevketpaşa	1	1	407	2022
13	BEYTAŞ Yemek Üretim ve Dağıtım Merke	Yönetim Binası ve Üretim Merkezi	Çavuşbaşı	1	1	677,5	2021
14	Zabıta Müdürlüğü	Hizmet Binası	Çubuklu	2	2	800	
15	Fen İşleri Müdürlüğü ve Park Bahçeler Müdürlüğü Depo	Göztepe Bent Yolu	Göztepe	3	8	1015	2017
16	Ahmet Mithat Efendi Kültür Merkezi	Tiyatro ve Kültür Merkezi	Göztepe	3	1	424,83	2007
17	M.Akif Ersoy Şiir Müzesi	Şiir Müzesi ve Kültür Evi	Merkez	3	3	396,5	2018
18	Muhsin Yazıcıoğlu Hizmet Binası		Tokatköy	5	5	1240	
19	Şeyh Ethem Sırrı Efendi Kültür Evi	Kültür Evi	Yalıköy	1	1	110,67	
20	Yenimahalle Şehit Şerife Bacı Kültür Merkezi	Kültür Merkezi	Yenimahalle	1	1	301,81	
21	BEYSEM Kanlıca	Sanat ve Eğitim Merkezi	Kanlıca	1	1	150	
22	BEYSEM Otağtepe	Etüt Merkezi	Kavacık-Otağtepe	1	1	325,86	
23	BEYSEM Çavuşbaşı	Sanat ve Eğitim Merkezi	Çiftlik	1	1	837	2021
24	BEYSEM Kavacık	Sanat ve Eğitim Merkezi	Kavacık	1	1	798,7	2023***
25	Baruthane Parkı Sanat Atölyesi	Sanat ve Eğitim Merkezi	Göksu	1	1	106,76	2021
26	Yücel Çelikbilet Gençlik Merkezi	Sanat ve Eğitim Merkezi Kadın Spor Merkezi	Gümüşsuyu	1	1	537	2021
27	Soğuksu Spor Merkezi	Spor Merkezi	Soğuksu	3	3	735	
28	Elmalı Spor Merkezi	Spor Merkezi	Elmalı	1	1	322,73	2021
29	Paşamandıra Spor Merkezi	Spor Merkezi	Paşamandıra	1	1	148,74	
30	Tokatköy Spor Merkezi	Spor Merkezi	Tokatköy	1	1	345,62	
31	Cumhuriyetköy Spor Merkezi	Spor Merkezi	Cumhuriyetköy	1	1	389,64	
32	Gümüşsuyu Garaj-Şoför Odası	Garaj Şoförler Bekleme Salonu	Gümüşsuyu	2	3	285	
33	Yücel Çelikbilet Meyve Bahçesi	Meyve Bahçe İdari Binası	Paşamandıra	1	1	202,81	2022
34	Riva Elmas Burnu Tabiat Parkı Sosyal Tesis	İdari Bina,Plaj ve Restoran	Riva	1	1	270	2021
35	Çubuklu Engelliler Merkezi(AK-DEM)	Engelli Yaşam Merkezi	Çubuklu	1	1	525	2021
36	Elmalı Köy Konağı	Hizmet Binası	Elmalı	4	5	375	
37	Riva Zabıta Merkezi	Hizmet Binası	Riva	1	1	119,7	2021
38	Baklacı Kadın Spor Merkezi	Hizmet Binası	Baklacı		1	471,67	
39	Cumhuriyetköy Aile Sağlığı Merkezi	Hizmet Binası	Cumhuriyetköy	1	1	390	
40	Çiftlik Aile Sağlığı Merkezi	Hizmet Binası	Çiftlik	2	2	800	
41	Çiftlik Emniyet Hizmet Binası	Hizmet Binası	Çiftlik	3	3	405	
42	Çavuşbaşı Kasrı Düğün Salonu	Hizmet Binası	Çiftlik	1	1	1105,87	
43	Çavuşbaşı Kasrı	Hizmet Binası	Çiftlik	3	3	1408,44	
44	Çubuklu Tarımsal Hizmet Müd. Binası	Hizmet Binası	Çubuklu	1	1	53	
45	Rüzgarlıbahçe Engelliler Merkezi+ASM	Hizmet Binası	Rüzgarlıbahçe	2	2	400	
46	Göksu Baruthane Parkı Zabıta Noktası	Hizmet Binası	Göksu	1	1	29	2021
47	Göksu Muhtarlık Binası	Hizmet Binası	Göksu	4	5	648	
48	Göllü Muhtarlık+ASM	Hizmet Binası	Göllü	2	4	198	
49	Görele Muhtarlık+ASM	Hizmet Binası	Görele	3	3	270	
50	Gümüşsuyu Restoran	Restoran	Gümüşsuyu	1	2	1118,1	2021
51	Gümüşsuyu İşçi Lokali+İBB Cenaze İşleri	Hizmet Binası	Gümüşsuyu	2	3	285	
52	Gümüşsuyu Sosyal İşler Müdürlüğü Binası+(	Hizmet Binası	Gümüşsuyu	1	2	51	
53	Gümüşsuyu Belediye Atölye Binası		Gümüşsuyu	1	1	1208,34	
54	Gümüşssuyu Muhtarlık Binası	Hizmet Binası	Gümüşsuyu	1	1	32,65	
55	Gümüşssuyu Sağlık İşleri Md. Deposu	Depo	Gümüşsuyu	1	1	140	
56	Gümüşssuyu Sosyal Yardım İşleri Md. Depo	Depo	Gümüşsuyu	1	1	143,36	
57	Gümüşsuyu Destek Hizmetleri Md. Deposu	Depo	Gümüşsuyu	1	1	300	
58	Soğuksu ASM	Hizmet Binası	Soğuksu	5	5	879	
59	Kavacık ASM(Sağlıkevi Sk)	Hizmet Binası	Kavacık	2	4	384,36	
60	Kaynarca Muhtarlık+ASM	Hizmet Binası	Kaynarca	3	6	420	
61	Mahmutşevketpaşa ASM	Hizmet Binası	Mahmutşevketpaşa	4	9	894	
62	Mehmet Akif Ersoy Şiir Müzesi		Merkez	3	3	396,5	2021
63	Ortaçeşme Hizmet Binası	Hizmet Binası	Ortaçeşme	4	6	691,44	2017
64	Öğümce ASM	Hizmet Binası	Öğümce	2	2	160	2021
65	Örnnekköy Muhtarlık	Hizmet Binası	Örnnekköy	2	2	343.24	2000
66	Paşabahçe-Çiğdem Muhtarlık+ASM	Hizmet Binası	Paşabahçe	3	4	215	1990
67	Millet Sofrası	Hizmet Binası	Kavacık	2	1	672,29	2022
68	Akbaba Köy Kahvehanesi	Hizmet Binası	Akbaba	1	1	138	2021
69	Öğümce Hayvan Rehabilitasyon Merkezi	Hizmet Binası	Öğümce	1	11	2950,81	2021

Table: List of Public Buildings which the energy consumptions support by Beykoz Municipality

DETERMINATION OF HEATING AND COOLING LOADS FOR BEYKOZ MUNICIPAL BUILDING

- Municipal Building was constructed in 2011, in Beykoz, in Istanbul.
- The total floor area of the building is about 10735m2 and total number of the employees are 561 (in 2023).
- As for structurally, this building is having 4 floors, such as; ground floor, underground floor, first and second floors, respectively.
- The specification of physical and thermal values of the public building be already given in table 4. In this public building, some of the outer layer (Wall) are completely glasses, Windows having also double glasses.
- According to the standard of TS 825, this building including in the class of A with good insulation.
- As for the determination energy consumptions, the amount of necessary natural gas consumption for heating could be calculated.
- The coefficient of heating value for natural gas as a fuel would be assumed as 0,92 as constant value and the balance point of temperature for heating could be assumed as 18°C.


T.C.
BEYKOZ BELEDİYE BAŞKANLIĞI


BEYKOZ BELEDİYESİ

Construction Material	Area (m²)	U (W/m²°C)	UA (W/°C)
Outter Layer (wall) 1	3314	0,3	994
Beam and Colon (Wall) 2	1760	0,35	616
Outter layer (Glass wall) 3	744	2,4	1.786
Ceiling	300	0,4	120
Base	200	0,4	80
Window (doble glasses)	1100	2,12	2.332
Total	7418	5,97	
		Ktop = ∑UA	5.928

Table 4. Physical and thermal specifications of the Public Building

Time interval	Temperature (°C)																			Total (h)
	-6-4	-4/-2	-2/0	0/2	2/4	4/6	6/8	8/10	10/12	12/14	14/16	16/18	18/20	20/22	22/24	24/26	26/28	28/30	30/32	32/34	
0-2	2	10	11	41	43	85	53	72	54	90	45	57	0	0	0	0	0	0	0	0	563
2-4	2	9	14	45	54	69	58	69	53	100	37	55	0	0	0	0	0	0	0	0	565
4-6	4	7	14	50	57	61	64	53	63	85	39	54	0	0	0	0	0	0	0	0	551
6-8	3	11	13	43	45	56	58	62	56	47	45	57	0	0	0	0	0	0	0	0	496
8-10	1	6	12	35	35	64	57	55	64	57	48	46	0	0	0	0	0	0	0	0	480
10-12	0	4	11	29	33	52	53	54	56	55	48	50	0	0	0	0	0	0	0	0	445
12-14	0	4	8	31	20	51	54	75	47	56	50	51	0	0	0	0	0	0	0	0	447
14-16	0	4	15	22	42	61	53	56	45	57	47	43	0	0	0	0	0	0	0	0	445
16-18	1	3	21	24	30	60	56	48	50	58	55	44	0	0	0	0	0	0	0	0	450
18-20	2	3	19	27	34	64	49	62	45	59	60	45	0	0	0	0	0	0	0	0	469
20-22	0	6	16	36	43	80	43	45	61	64	66	37	0	0	0	0	0	0	0	0	497
22-24	2	9	13	41	48	72	49	59	53	65	62	45	0	0	0	0	0	0	0	0	518
Total	17	76	167	424	484	775	647	710	647	793	602	584	0	0	0	0	0	0	0	0	5926

Table: Bin Temperature for Heating

Zaman(Saat Aralığı)	Sıcaklık Derece (°C)																			
	-6/-4	-4/-2	-2/0	0/2	2/4	4/6	6/8	8/10	10/12	12/14	14/16	16/18	18/20	20/22	22/24	24/26	26/28	28/30	30/32	32/34	Total
0-2	0	0	0	0	0	0	0	0	0	0	0	0	64	79	61	3	0	0	0	0	207
2-4	0	0	0	0	0	0	0	0	0	0	0	0	81	72	35	0	0	0	0	0	188
4-6	0	0	0	0	0	0	0	0	0	0	0	0	75	78	25	0	0	0	0	0	178
6-8	0	0	0	0	0	0	0	0	0	0	0	0	59	56	69	39	5	0	0	0	228
8-10	0	0	0	0	0	0	0	0	0	0	0	0	56	53	53	70	37	4	0	0	273
10-12	0	0	0	0	0	0	0	0	0	0	0	0	56	53	44	56	63	23	1	1	297
12-14	0	0	0	0	0	0	0	0	0	0	0	0	46	39	52	38	79	45	8	0	307
14-16	0	0	0	0	0	0	0	0	0	0	0	0	43	49	52	45	68	47	2	1	307
16-18	0	0	0	0	0	0	0	0	0	0	0	0	50	61	39	64	46	6	2	0	268
18-20	0	0	0	0	0	0	0	0	0	0	0	0	60	43	52	52	9	3	1	0	220
20-22	0	0	0	0	0	0	0	0	0	0	0	0	61	46	70	9	0	2	0	0	188
22-24	0	0	0	0	0	0	0	0	0	0	0	0	61	72	61	3	3	0	0	0	200
Total	0	0	0	0	0	0	0	0	0	0	0	0	712	701	613	379	310	130	14	2	2861

Table: Bin Temperature for Cooling

DETERMINATION OF HEATING AND COOLING LOADS FOR BEYKOZ MUNICIPAL BUILDING

- First of all, the value of N_{bin} could be calculated from Table 2, and the total value is 8760h.
- The total amount of heat transfer coefficient ($\sum U*A$) is 5928 W/°C.
- The value of η assumed as 0,92. Tb=18°C and To,i =13°C receiving from table 2.
- By using the Eq.1, Qbin,i = 8760* 5928/0,92 (18-13).
- The total energy for heating required in this public building could be calculated as follows:
- Q_{tot} = 319139 kWh (for heating),
- As for natural gas, assuming low calorific value should be 34534,5 kJ/m³ and fuel consumption also calculated as from Eq.3, F_{tot} = (319139 / 34534,5) *3600 = 33268 m³.
- Total energy consumption in the winter has been calculated about 319139 kWh.
- In winter, the minimum temperature of the degree of -6ºC has been reached in Istanbul.
- The interval of the temperature of -6˙C to -4˙C has been seen in the frequency of 17 times (17 hours), which are 14 times (14 hours) in January and 3 times (3 hours) in February.
- The average maximum outside temperature is 19˙C in the Winter.
- In this study, the reference temperature for the heating would be assumed as 18 ˙C.

CALCULATIONS OF THE ENERGY CONSUMPTION OF THE PUBLIC BUILDING (BEYKOZ MUNICIPAL BUILDING)

Hour (Time interval)	Temperature (°C)																				Total (kWh)
	-6/-4	-4/-2	-2/0	0/2	2/4	4/6	6/8	8/10	10/12	12/14	14/16	16/18	18/20	20/22	22/24	24/26	26/28	28/30	30/32	32/34	
0-2	251	1145	1140	3802	3518	6027	3757	4175	2436	2900	870	367	0	0	0	0	0	0	0	0	30388
2-4	251	1031	1451	4172	4418	4892	4111	4001	2391	3222	715	355	0	0	0	0	0	0	0	0	31010
4-6	502	802	1451	4635	4663	4325	4536	3074	2842	2739	754	348	0	0	0	0	0	0	0	0	30671
6-8	376	1260	1347	3987	3681	3971	4111	3595	2526	1514	870	367	0	0	0	0	0	0	0	0	27605
8-10	125	687	1244	3245	2864	4538	4040	3190	2887	1836	928	297	0	0	0	0	0	0	0	0	25881
10-12	0	458	1140	2689	2699	3687	3757	3132	2526	1772	928	322	0	0	0	0	0	0	0	0	23110
12-14	0	458	829	2875	1636	3616	3826	4350	2120	1804	967	277	0	0	0	0	0	0	0	0	22758
14-16	0	458	1555	2040	3436	4325	3757	3248	2030	1836	909	284	0	0	0	0	0	0	0	0	23878
16-18	125	344	2176	2225	2454	4254	3970	2784	2255	1869	1063	290	0	0	0	0	0	0	0	0	23809
18-20	251	344	1969	2503	2782	4538	3474	3595	2030	1901	1160	290	0	0	0	0	0	0	0	0	24837
20-22	0	687	1659	3338	3518	5672	3048	2610	2752	2061	1276	238	0	0	0	0	0	0	0	0	26859
22-24	251	1031	1347	3802	3927	5105	3473	3422	2391	2095	1199	290	0	0	0	0	0	0	0	0	28333
Total	2132	8705	17308	39313	39596	54950	45860	41176	29186	25549	11639	3725	0	0	0	0	0	0	0	0	319139

Table: The amount of the required energy for heating in the public building

DETERMINATION OF HEATING AND COOLING LOADS FOR BEYKOZ MUNICIPAL BUILDING

- First of all, the value of N_{bin} could be calculated from Table 2, and the total value is 8760h.
- The total amount of heat transfer coefficient (ΣU*A) is 5928 W/°C.
- The value of η assumed as 0,92. T_b=18°C and $T_{o,i}$ =13°C receiving from Table 2.
- By using the Eq.1, $Q_{bin,i}$ = 8760* 5928/0,92 (18-13)
- The annual energy consumption could be calculated by addition of the total energy consumption of the winter and summer.
- In summer $T_{o,i}$ should be assumed as 21˙C.
- The hottest time has been seen about 33˙C in June and which shows the frequency of 2 times (2 hours) in June.
- In the summer, the temperature varies from 15˙C to 33˙C.
- From the calculation of the energy consumption, we can assumed that the hottest month in Istanbul is June.

ENERGY CONSUMPTION VALUES OF THE MUNICIPALITY BUILDING DETERMINED WITH THE HELP OF NATURAL GAS AND ELECTRICITY ENERGY INVOICES

- The total annual energy consumption is the addition of $Q_{tot\ (Heating)}$ =319139 kWh (energy consumption in the winter), which can be seen the time interval between 2-4 am. It can be assumed that in 1. am, the most energy consumption would be obtained.
- The lowest energy consumption for heating in the winter is at noon, the time interval between 12_14PM and the amount of energy consumption is about 22758 kWh. It can be assumed that the lowest energy consumption at 13.pm.
- In this study, three years of the energy consumption of Beykoz Municipal Building, in 2021, 2022 and 2023 would be evaluated.
- According to the detailed invoice of both the natural gas consumption and electrical energy consumptions, it has been a bit difference from the result of the energy consumption by using bin methods.
- The total energy consumption for heating in the winter for 3 years would be received from the invoices of natural gas of Beykoz municipal building is about 140675m^3 and the average natural gas consumption is 46892 m^3 equivalent with 494707 kWh.

ENERGY CONSUMPTION VALUES OF THE MUNICIPALITY BUILDING DETERMINED WITH THE HELP OF NATURAL GAS AND ELECTRICITY ENERGY INVOICES

- Comparing the energy consumption for heating by using Bin method with the invoice of natural gas of Beykoz Municipal Building by using bin method, the total energy consumption for heating in the winter has been calculated about 319139 kWh at the temperature between -6 ˚C and 19 ˚C.
- $Q_{tot} = \Sigma\ Qbin\ mi$, Calculation of annual heating energy for the public building in different intervals of times and temperature as follow in Table 4. According to the Eq.1 and Eq.2 above; the total energy for heating required in this public building could be calculated as follows:
- Q_{tot} = 319139 kWh (for heating), As for natural gas, assuming lower calorific value should be 34534kj/m³ and fuel consumption also calculated as from Eq.3,
- Ftot = (319139 / 34534,5) *3600 = 33268m3
- In this study, the detailed information of the invoice of natural gas consumption has been used.
- The average natural gas consumption could be determined about 494707 kWh.
- To compare both the amount of the energy consumption for heating, the real value of the invoice is higher than using bin method. Energy consumption by using bin method is more efficiently than any other method.

ENERGY CONSUMPTION VALUES OF THE MUNICIPALITY BUILDING DETERMINED WITH THE HELP OF NATURAL GAS AND ELECTRICITY ENERGY INVOICES

Months	The Amount of Naturel gas Consumption (m^3) , in 2021	The Amount of Electrical Energy Consumption (kWh), in 2021	The Amount of Naturel gas Consumption (m^3), in 2022	The Amount of Electrical Energy Consumption (kWh), in 2022	The Amount of Naturel gas Consumption (m^3), in 2023	The Amount of Electrical Energy Consumption (kWh), in 2023
January	8.396,00	62.103,96	7.279,00	116.400,00	5.868,00	230.792,00
Febuary	4.507,00	51.670,84	8.928,00	73.500,00	6.450,00	165.886,00
March	5.965,00	62.005,01	7.698,00	59.700,00	7.402,00	142.472,00
April	5.937,00	82.673,34	4.930,00	78.000,00	7.176,00	153.212,34
May	3.735,00	86.242,44	4.370,00	87.800,00	6.255,00	102.045,55
June	2.044,00	90.940,67	1.392,00	139.200,00	2.883,00	89.000,38
July	1.246,00	103.341,68	735	173.500,00	2.464,00	222.736,17
August	705	99.208,01	597	159.700,00	2.285,00	230.528,21
September	620	93.745,56	780	137.800,00	2.313,00	160.667,29
October	1.574,00	60.683,76	878	123.509,00	2.029,00	133.218,45
November	3.459,00	72.189,24	1.891,00	97.239,00	3.035,00	163.211,48
December	3.453,00	93.140,64	4.339,00	108.259,00	7.057,00	139.604,50
Total	41.641,00	957.945,14	43.817,00	1.354.607,00	55.217,00	1.933.374,37

Table 8. Energy consumption between 3 years (according to the invoice of natural gas and electrical energy)

ENERGY CONSUMPTION OF THE MUNICIPAL BUILDING BY USING THE INVOICE OF NATURAL GAS AND ELECTRIC ENERGY

Year	The Amount of Natural gas Consumption (m^3)	The Amount of Electrical Energy Consumption (kWh)
2021	41.641,00	957.945,14
2022	43.817,00	1.354.607,00
2023	55.217,00	1.933.374,37
Total	140.675,00	4.245.926,51
Average	46.891,67	1.415.308,84
1m3 = 10,55 kwh	494.707,08	kWh

Table: Average Energy consumption between 3 years (according to the invoice of natural gas and electrical energy)

ENERGY CONSUMPTION OF THE MUNICIPAL BUILDING BY USING THE INVOICE OF NATURAL GAS AND ELECTRIC ENERGY

- The total energy consumption for heating in the winter for 3 years would be received from the invoices of natural gas of Beykoz municipal building is about 140675 m^3 and the average natural gas consumption is 46892 m^3.
- After converting the unit of kWh, that is multiple with 10,55 and the energy consumption would be 494707 kWh.
- In Beykoz Municipal Building, 36% of the total energy consumption is for cooking, hot water and other purposes in the winter.
- That's why, according to the bills of the Energy Comsumption of Beykoz Municipal Building is about 316613 kWh for only heating.
- Comparing the energy consumption for heating by using Bin method with the invoice of the energy consumption of Beykoz Municipal Building, there is not much difference where using bin method could be calculated about 319139 kWh.

CONCLUSIONS

- Energy consumption in the building sectors increasing progressively as the increasing of world populations and also developing the living standards.
- Due to the limitations of energy resources in Türkiye, energy and fuels are imported from other countries, such as; Russia, Azerbeijan, and so on.
- In the public buildings, the most energy consumption systems would be seen in heating, cooling, ventilation and air conditioning systems.
- In this study, the municipality building we discussed in Istanbul; the pearl of Marmara, serves a total population of 245 647 people, according to the 2023 Turkish Statistical Institute reports.
- In this study, Beykoz municipality building would be discussed. There are a total of 68 public buildings managed by the Municipality within the borders of this municipality.
- All these 68 public buildings dealing with Beykoz municipality, the main municipal building has already been chosen for this study.
- In Beykoz Municipal Building, 36% of the total energy consumption is for cooking, hot water and other purposes in the winter.

CONCLUSIONS

- The total energy consumption yearly for heating has been calculated as shown in table 4 and receving the amount of the total energy consumption per year for only heating in this municipal building be 319139kWh.
- The total energy consumption of average 3 year has been calculated as shown in table 9 and receving the amount of the total energy consumption per year in this municipal building be 484707kWh including heating, cooking, hot water and other purposes.
- In Municipal Building, just only 64% of the energy consumption could be determined for heating which is about 316613 kWh.
- The thickness of the outter layer with insulation makes saving energy.
- In order to compare the energy consumption for heating by using bin method and the real invoice of the Beykoz municipal building, the amount of the energy consumption receiving from the invoice, there is not much differences.

CONCLUSIONS

- In our study, determination of the energy consumption of public building, we get some information about the energy consumption in building sectors, as well as; how to save energy and use energy efficiently.
- Building energy could be saved depend on the location of building, types and specifications of buildings, thickness and well-insulations are also important factors to determined energy consumption and energy savings.

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