



Driver Fatigue and Behaviors Analysis System

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Purpose and Objectives

- Through this notification system, the aim is to prevent potential accidents and mitigate possible injury, or loss of life incidents and financial loss.
- Additionally, in the event of an accident due to ongoing behavioral violations despite proactive measures, another camera installed inside the vehicle can capture evidential footage for incident investigation.
- These cameras, recording both the interior of the cabin and the road, provide the capability to store footage in the device's internal memory as well as in the cloud for evidence center access
- The recorded images, with a watermark certificate, can be utilized as evidence in potential legal situations that the company may face.
- By doing so, the project not only aims to prevent potential sanctions in both material and moral terms but also contributes significantly to the company's credibility.
- The implementation of the project will undoubtedly be most beneficial by reducing/preventing high-potential incidents and enhancing the company's reputation.



Project Description and Scope

DESCRIPTION:

- A Driver Behavior Analysis camera communicated to the driver through an external R-watch monitor placed inside the cabin. Simultaneously, proactive notifications are sent to the system administrator via email.
 - Lack of seatbelt usage,
 - Fatigue detection,
 - Yawning alerts,
 - Smoking alerts,
 - Phone usage alerts,
 - Leaving the cabin while the vehicle is running.
- In addition to the Driver Behavior Analysis camera, the installation of interior and road monitoring cameras ensures the observation and recording of external factors that may be encountered during driving.

SCOPE:

The installation of the Driver Behavior Monitoring system has been completed initially for 137 vehicles, including trucks and off-road vehicles, operating in the open pits of Esan Industrial Raw Materials. In the second phase, the plan is to extend the installation to include additional vehicles, such as loaders, excavators, and other trucks, serving in our fields."



Hardware Components



AI DASH CAM MOBILE RECORDING DEVICE
+ INTERIOR ENVIRONMENTAL CAMERA

- AI NVR Recording Device,
- Integrated AI 1080P IP Camera ,
- Internal Recording Feature with 2 SD Card Slots,
- Online Monitoring with 4G Support ,
- Built-in GPS ,
- Interior IP Camera ,
- 720P Recording.



DSM & RWATCH CAMERA



"(DSM) Driver Behavior Analysis Camera and R Watch Features:

- Facial Recognition,
- Seatbelt Detection,
- Fatigue Alarm,
- Collision Alarm,
- Yawning Alarm,
- Driver Absence Warning,
- Smoking Alarm,
- Phone Usage Alarm

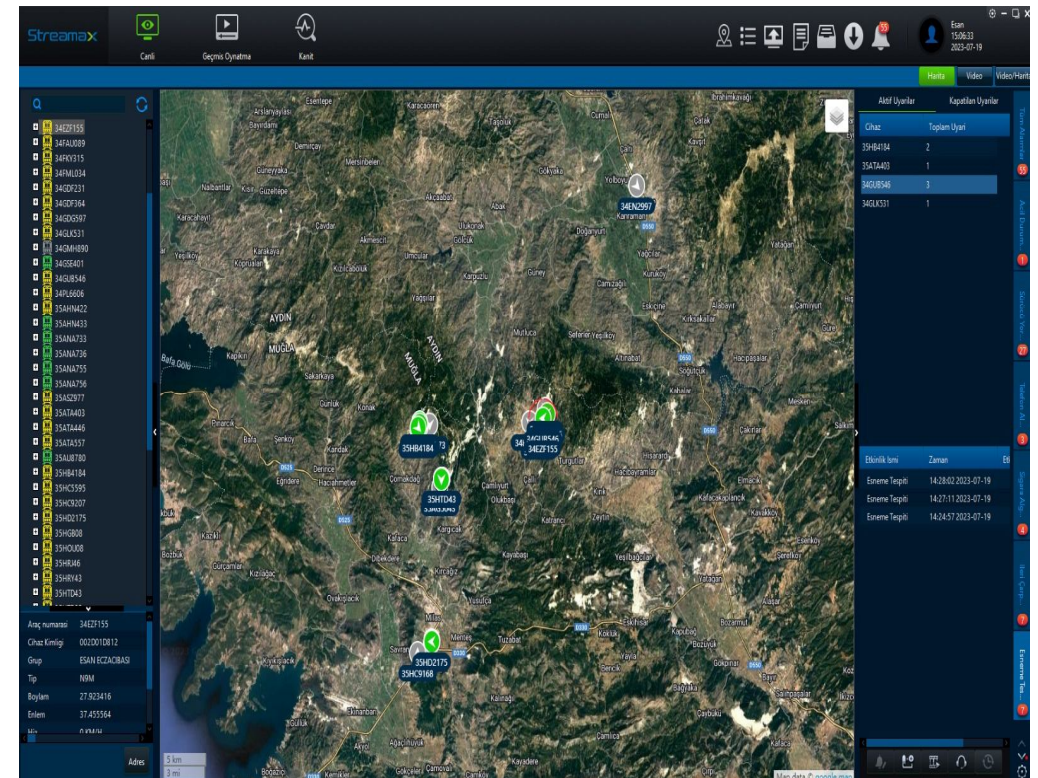
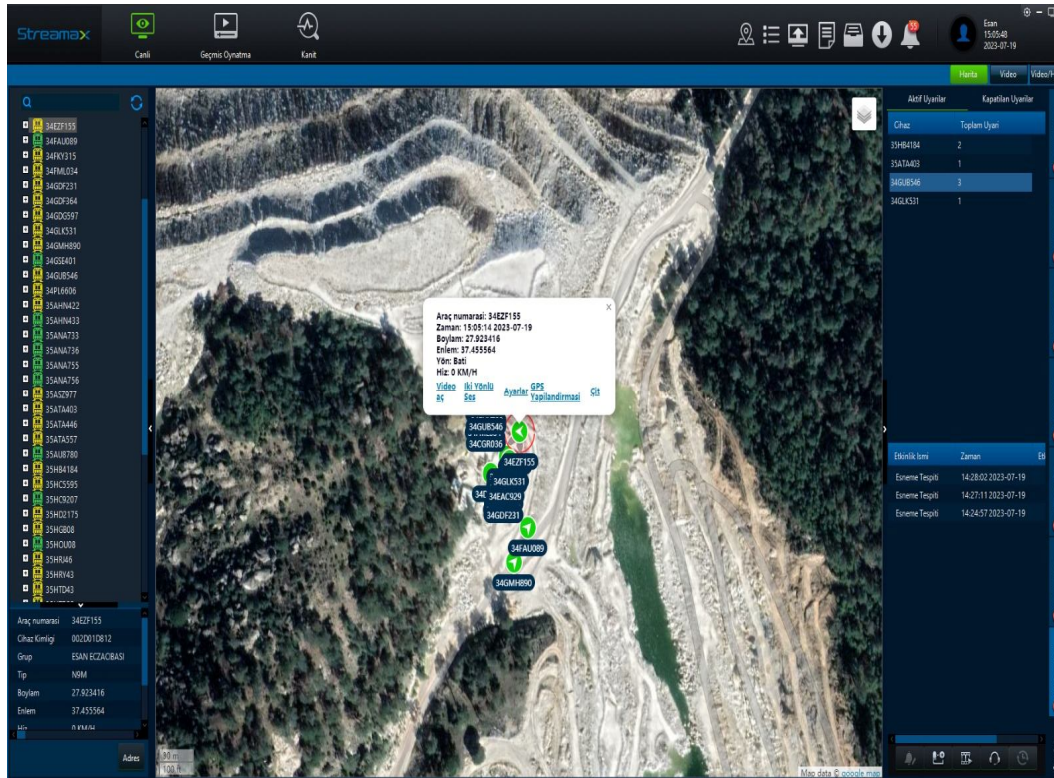
Improvement and Enhancement

The screenshot displays the Streamax software interface. On the left, there is a sidebar with a search bar and a list of vehicle IDs. The main area is a grid of 36 live video feeds, each showing a different vehicle. A central map shows the location of the vehicles with green markers. On the right, there are two tables: 'Aktif Uyarılar' (Active Alerts) and 'Kapatılan Uyarılar' (Closed Alerts).

Cihaz	Toplam Uyan
35HB4184	2
35ATA403	1
34GUB546	3
34GLK531	1

Etkinlik Ismi	Zaman	Et
Esname Tespiti	14:39:24 2023-07-19	
Esname Tespiti	14:38:42 2023-07-19	

The tracking of 137 vehicles is performed in real-time through the system.



The current location, coordinates, and real-time information of the vehicles in operation can be tracked through the system using the integrated maps feature.

Streamax

Canlı Geçmiş Oynatma Kanıt

Esan 15:07:21 2023-07-19

Kanıt arama

Plaka No. Q lütfen anahtar kelimeyi girin Arama Gelişmiş Arama

<p>İleri Çarpışma Uyarısı 35ATA557</p> <p>Oluşum zamanı: 2023-07-19 15:03:14 Rapor zamanı: 2023-07-19 15:05:19</p> <p>Kanıt yeri: 37.411736 27.791605</p> <p>Kanıt boyutu: 11.8(M)</p> <p>Kanıt süresi: 11</p> <p>İndir</p>	<p>Emniyet Kemer Algılama 35HD2175</p> <p>Oluşum zamanı: 2023-07-19 15:02:24 Rapor zamanı: 2023-07-19 15:05:40</p> <p>Kanıt yeri: 37.292212 27.778947</p> <p>Kanıt boyutu: 9(M)</p> <p>Kanıt süresi: 11</p> <p>İndir</p>	<p>İleri Çarpışma Uyarısı 35HD2175</p> <p>Oluşum zamanı: 2023-07-19 15:01:30 Rapor zamanı: 2023-07-19 15:06:02</p> <p>Kanıt yeri: 37.290478 27.778128</p> <p>Kanıt boyutu: 8.95(M)</p> <p>Kanıt süresi: 11</p> <p>İndir</p>	<p>Emniyet Kemer Algılama 35HD2175</p> <p>Oluşum zamanı: 2023-07-19 15:01:04 Rapor zamanı: 2023-07-19 15:06:32</p> <p>Kanıt yeri: 37.291353 27.778514</p> <p>Kanıt boyutu: 9.73(M)</p> <p>Kanıt süresi: 11</p> <p>İndir</p>	<p>İleri Çarpışma Uyarısı 35HC9207</p> <p>Oluşum zamanı: 2023-07-19 14:57:16 Rapor zamanı: 2023-07-19 14:59:13</p> <p>Kanıt yeri: 37.420703 27.801501</p> <p>Kanıt boyutu: 8.85(M)</p> <p>Kanıt süresi: 11</p> <p>İndir</p>
<p>İleri Çarpışma Uyarısı 35HTD43</p> <p>Oluşum zamanı: 2023-07-19 14:56:34 Rapor zamanı: 2023-07-19 14:58:08</p> <p>Kanıt yeri: 37.415017 27.799689</p> <p>Kanıt boyutu: 10(M)</p> <p>Kanıt süresi: 11</p> <p>İndir</p>	<p>Acil durum alarmı 35HD2175</p> <p>Oluşum zamanı: 2023-07-19 14:56:10 Rapor zamanı: 2023-07-19 15:06:54</p> <p>Kanıt yeri: 37.293708 27.779007</p> <p>Kanıt boyutu: 8.73(M)</p> <p>Kanıt süresi: 11</p> <p>İndir</p>	<p>Esneme Tespiti 35ATA403</p> <p>Oluşum zamanı: 2023-07-19 14:53:29 Rapor zamanı: 2023-07-19 14:57:02</p> <p>Kanıt yeri: 37.408748 27.792116</p> <p>Kanıt boyutu: 11.02(M)</p> <p>Kanıt süresi: 11</p> <p>İndir</p>	<p>Sigara Algılama 35AU8780</p> <p>Oluşum zamanı: 2023-07-19 14:53:00 Rapor zamanı: 2023-07-19 15:03:06</p> <p>Kanıt yeri: 37.41468 27.798148</p> <p>Kanıt boyutu: 11.78(M)</p> <p>Kanıt süresi: 11</p> <p>İndir</p>	<p>Emniyet Kemer Algılama 35AS2977</p> <p>Oluşum zamanı: 2023-07-19 14:50:04 Rapor zamanı: 2023-07-19 14:51:25</p> <p>Kanıt yeri: 37.413947 27.798359</p> <p>Kanıt boyutu: 8.63(M)</p> <p>Kanıt süresi: 11</p> <p>İndir</p>
<p>İleri Çarpışma Uyarısı 34DLK531</p> <p>Oluşum zamanı: 2023-07-19 14:49:07</p>	<p>İleri Çarpışma Uyarısı 34DLK531</p>	<p>İleri Çarpışma Uyarısı 34DLK531</p>	<p>İleri Çarpışma Uyarısı 34DLK531</p>	<p>İleri Çarpışma Uyarısı 34DLK531</p>

Toplam 578 Sayfa 8670 Parça <Önceki sayfa 1 2 3 4 Sonraki Sayfa> Git Sayfa

In the evidence center located on the cloud system, 11-second evidence videos, information about the vehicle where the violation occurred, date, time, coordinates, and evidence class (such as smoking detection, fatigue, etc.) are recorded based on violations reported by the vehicles.

Additionally, with the memory card on the device, access to all records from the past 15 days is available.

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Emniyet Kemerı Algılama-Kanıt merkezi

ESAN ECZACIBASI

35ANA756

Emniyet Kemerı Algılama

6KM/H

2023-07-19

14:16:15

37.450339,27.758523

Sürücü adı:

İletişim detayları:

Ehliyet kodu:

Uygulayıcı sertifikası:

İşleme personeli:

İşlem süresi:

İşleme metodu:

İçerik işleniyor:

Hiçbir

İndir

Paylaş

Oynat/durdur

00:01/00:11

35ANA756 2023-07-19 14:16:11 7KM/H

CH1

35ANA756 2023-07-19 14:16:11 7KM/H

CH2

ikiztaş

Metadere

Efsane:

Sürüş parkurundan

5 dakika önce ve

1 km

Sol Sinyal: OFF

Sağa dönüş sinyali: OFF

Gaz pedali: 0%

Fren pedali: 0%

Hız: 7.00 KM/H

Dönme hızı: 0 RPM

Edinilmedi

Hız

Dönme hızı

180

150

120

90

60

30

0

Hız

Dönme hızı

Seatbelt Detection evidence generated by system.

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(Video)

Smoking Alarm and Phone Usage Alarm Example



Yawning Detection

ID	İsm	Tip	Teti

Cihaz	Toplam Uyan
35HB4184	2
35ATA403	1
34GUB546	3
34GLK331	1

Etkinlik İsmi	Zaman	Etkinlik Durumu
Esname Tespiti	14:28:02 2023-07-19	
Esname Tespiti	14:27:11 2023-07-19	
Esname Tespiti	14:24:57 2023-07-19	

Araç numarası: 34GDF364
 Cihaz Kimliği: 002D01DE64
 Grup: ESAN ECZACIBASI
 Tip: N9M
 Boylam: 27.923915
 Enlem: 37.464355

By creating a digital geofence within the system, it is possible to track vehicles and generate an alarm in case they enter or exit predefined areas.

High-speed alarm Alarm



Streamax Ceiba Center <kane980103@gmail.com>
Kime ● Emrah Gures



20-Jun-23 Tue 2:43 PM

[EXTERNAL- TOPLULUK DIŐI]

License plate number	Time	Alarm Type	Alarm Description	Evidence Video
35ATA427	2023-06-20 14:26:45	High-speed alarm	Current speed: 37.0 KM/H (0.0 KM/H-33.0 KM/H)	Open video

"The system, upon detecting any issue, stores the corresponding video evidence in the evidence center and simultaneously sends real-time notifications via email to the designated system users. In areas with internet connectivity issues, the system retains the generated alarm in memory and sends users the evidence notification at the first available signal."



(Video)

R-Watch device located inside the cabin, warning the drivers in Turkish for relevant improprieties. This **proactive approach** enables the driver to address the issue immediately, without waiting for the system administrator to receive a notification and warn the driver.

Additionally, system users can establish real-time communication with the driver through the installed device inside the vehicle, allowing them to deliver instant warnings via voice communication."

Esan - 2023-07-19 15:23:47

Ev GPS konumu istatistikleri Alarm istatistikleri Aşırı Hız Raporu

Grup adı Carlinense Chaz No


Ana filo	Plaka No	Seri numarası	Hız(KMH)	Konum	Rakım(M)	Yön	Rapor zamanı	Sunucu zamanı
ESAN ECZACIBASI	34EL060	002D01D65A	83		0	Doğu	2023-07-19 08:50:04	2023-07-19 08:50:02
ESAN ECZACIBASI	34EL060	002D01D65A	84		0	Doğu	2023-07-19 08:50:35	2023-07-19 08:50:33
ESAN ECZACIBASI	34EL060	002D01D65A	83		0	Kuzeydoğu	2023-07-19 08:57:08	2023-07-19 08:57:06
ESAN ECZACIBASI	34EL060	002D01D65A	85		0	Doğu	2023-07-19 09:03:34	2023-07-19 09:03:32
ESAN ECZACIBASI	34EL060	002D01D65A	82		0	Doğu	2023-07-19 09:04:23	2023-07-19 09:04:21
ESAN ECZACIBASI	34EL060	002D01D65A	83		0	Doğu	2023-07-19 09:05:07	2023-07-19 09:05:05
ESAN ECZACIBASI	34EL060	002D01D65A	82		0	Doğu	2023-07-19 09:06:26	2023-07-19 09:06:24
ESAN ECZACIBASI	34EL060	002D01D65A	81		0	Doğu	2023-07-19 09:06:49	2023-07-19 09:06:47
ESAN ECZACIBASI	34EL060	002D01D65A	81		0	Doğu	2023-07-19 09:07:11	2023-07-19 09:07:09
ESAN ECZACIBASI	34EL060	002D01D65A	81		0	Doğu	2023-07-19 09:08:06	2023-07-19 09:08:04
ESAN ECZACIBASI	34EL060	002D01D65A	84		0	Doğu	2023-07-19 09:09:43	2023-07-19 09:09:41
ESAN	34EL060	002D01D65A	80		0	Doğu	2023-07-19 09:12:17	2023-07-19 09:12:15

Toplam: 28, Şuradan gösteriyor 1 ile 20

Esan - 2023-07-19 15:24:37

Ev GPS konumu istatistikleri Alarm istatistikleri Aşırı Hız Raporu

Grup adı Carlinense Chaz No



Ana filo	Plaka No	Seri numarası	Hız(KMH)	Konum	Rakım(M)	Yön	Rapor zamanı	Sunucu zamanı
ESAN ECZACIBASI	34EL060	002D01D65A	83		0	Doğu	2023-07-19 08:50:04	2023-07-19 08:50:02
ESAN ECZACIBASI	34EL060	002D01D65A	84		0	Doğu	2023-07-19 08:50:35	2023-07-19 08:50:33
ESAN ECZACIBASI	34EL060	002D01D65A	83		0	Kuzeydoğu	2023-07-19 08:57:08	2023-07-19 08:57:06
ESAN ECZACIBASI	34EL060	002D01D65A	85		0	Doğu	2023-07-19 09:03:34	2023-07-19 09:03:32
ESAN ECZACIBASI	34EL060	002D01D65A	82		0	Doğu	2023-07-19 09:04:23	2023-07-19 09:04:21
ESAN ECZACIBASI	34EL060	002D01D65A	83		0	Doğu	2023-07-19 09:05:07	2023-07-19 09:05:05
ESAN ECZACIBASI	34EL060	002D01D65A	82		0	Doğu	2023-07-19 09:06:26	2023-07-19 09:06:24
ESAN ECZACIBASI	34EL060	002D01D65A	81		0	Doğu	2023-07-19 09:06:49	2023-07-19 09:06:47
ESAN ECZACIBASI	34EL060	002D01D65A	81		0	Doğu	2023-07-19 09:07:11	2023-07-19 09:07:09
ESAN ECZACIBASI	34EL060	002D01D65A	81		0	Doğu	2023-07-19 09:08:06	2023-07-19 09:08:04
ESAN ECZACIBASI	34EL060	002D01D65A	84		0	Doğu	2023-07-19 09:09:43	2023-07-19 09:09:41
ESAN	34EL060	002D01D65A	80		0	Doğu	2023-07-19 09:12:17	2023-07-19 09:12:15

Toplam: 28, Şuradan gösteriyor 1 ile 20

The reporting screen of the system can provide various outputs, such as:

- Which vehicle has committed which violations?
- Which violations have occurred more frequently?
- In which date range have more violations occurred?
- What are the locations of the violations that have occurred? Etc.

System Alarm History



The commissioning completed and system put into use

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Phone Usage Alarm History

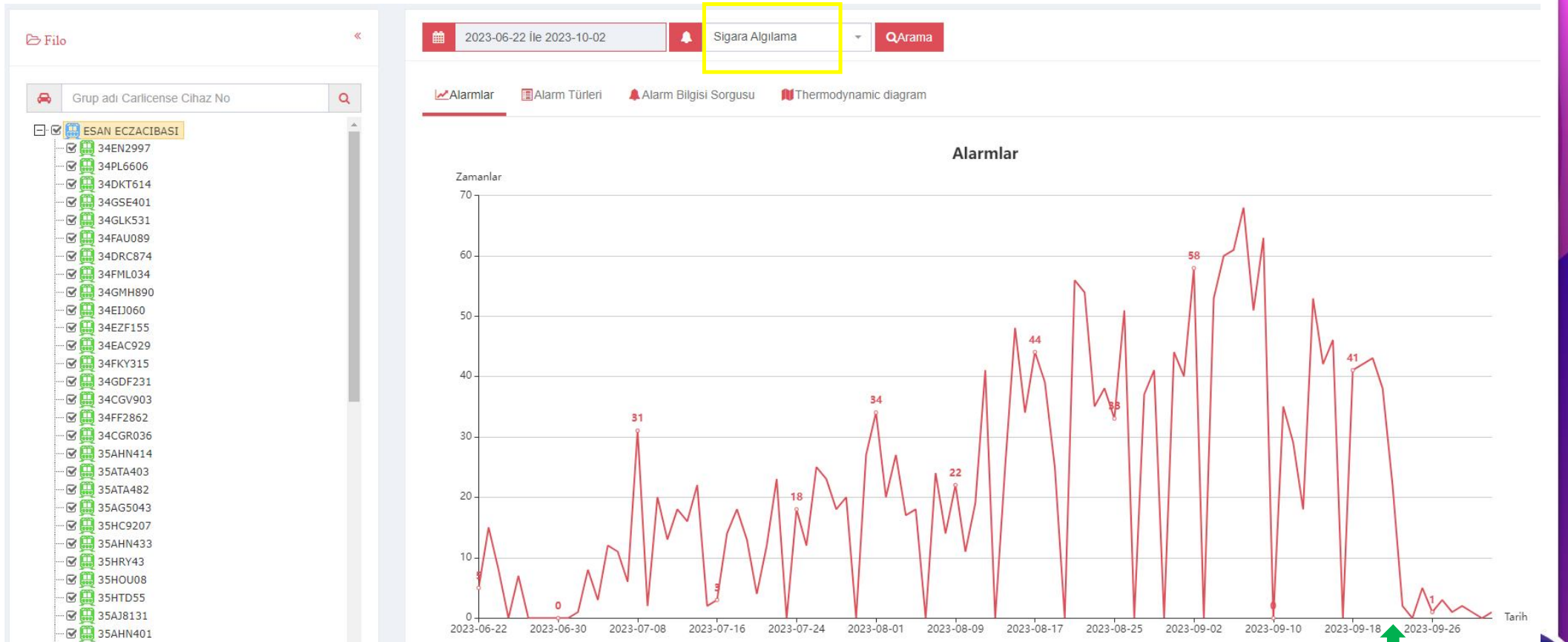


The commissioning completed and system put into use

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Smoking Detection Alarm History

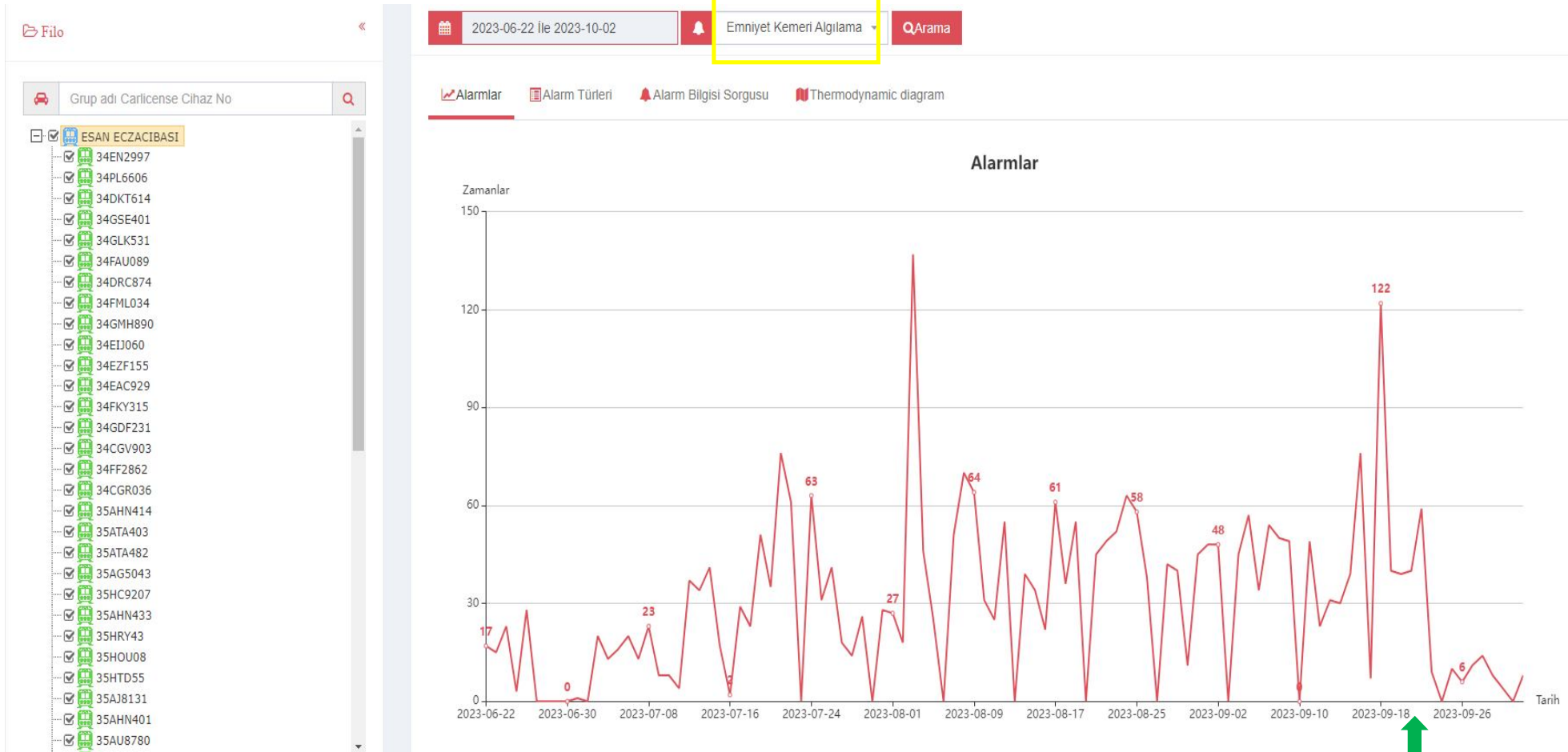


The commissioning completed and system put into use

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Seat Belt Alarm History

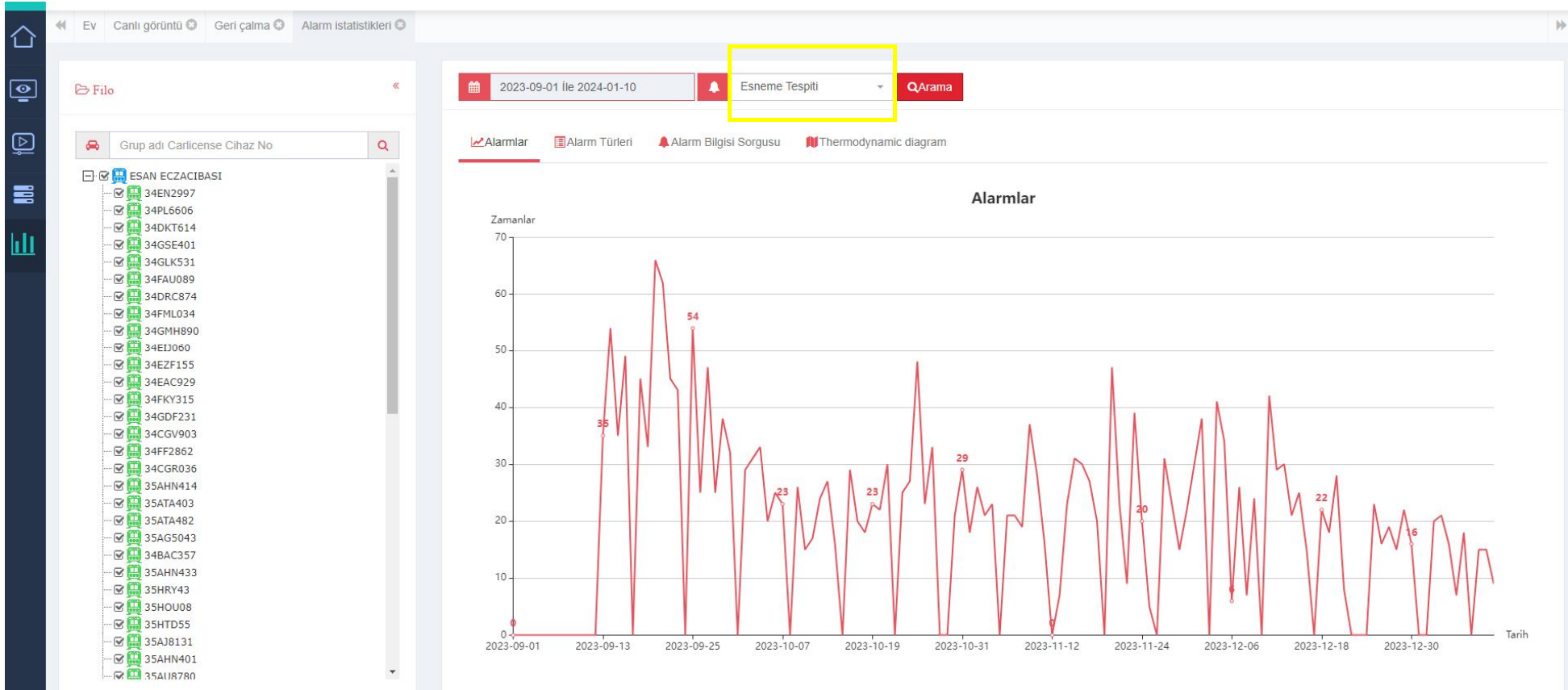


The commissioning completed and system put into use

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Yawning Detection Alarm History



Fatigue Detection Alarm History



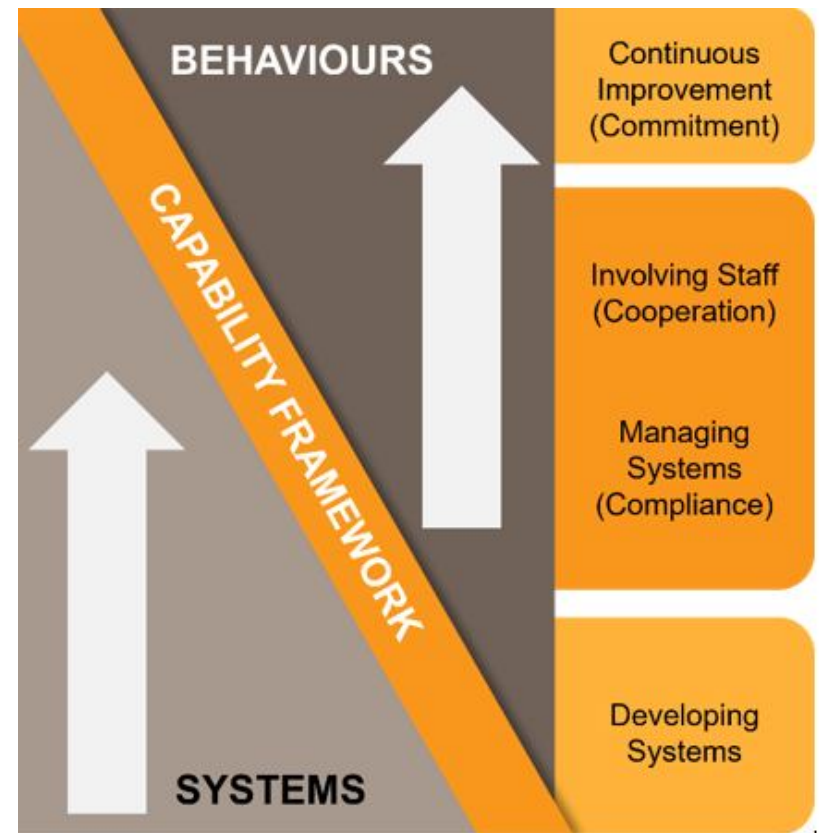
Limitations

Before the relevant project was commissioned, the most significant constraint that needed to be overcome was the processing of images within the scope of the Personal Data Protection Law (KVKK).

Following extensive discussions with the legal unit, a Consent Statement outlining the installation purpose was prepared and communicated to all relevant employees, thus overcoming this constraint.



"The data on the previous slide indicates that as systematic approaches are implemented to enhance behavior-oriented occupational safety culture, employee behaviors change in parallel with these applications."



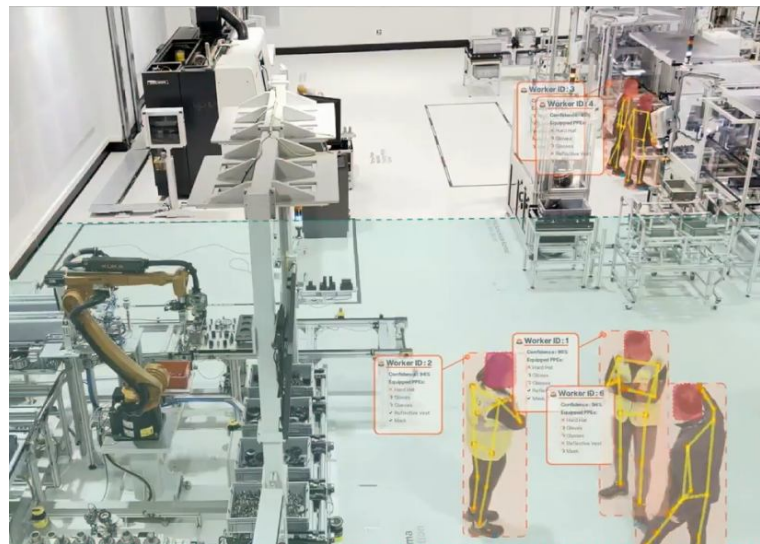


Artificial Intelligence Supported OHS Platform

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Artificial Intelligence Supported OHS Platform

- A proactive approach to identifying and effectively monitoring potential hazardous situations and behaviors in relevant work areas will be implemented before accidents occur.
- In these monitored work areas 24/7, positive behavioral changes in employees' occupational health and safety awareness are observed, thereby creating a healthier and safer working environment.
- The implementation of the project will undoubtedly be most beneficial by reducing/preventing potential accidents, contributing significantly to the company's credibility."



The system's detected improperties are as follows.

 **PPE**

Hard Hat
Hand Gloves
Eye Protect
Arm Rest
Ear Protection
Reflective Clothes
Respiratory Protection
Overall

 **Area Controls**

Maximum limit of workers in a confined space
Minimum limit of workers in a confined space
Lifting Area
Restricted Machine Area
Static Restricted Area
Time Restricted Area
Light Controls
Line of Fire
Machine Control Area

 **Behavioral Safety**

Pedestrian way violation
Grouping
Climbing
Working at Height
Contact in electrical field
Using handrails
Running

 **Housekeeping**

Proper pedestrian way
Proper vehicle way
Leakage
Thrown object
Open/Close door

 **Pandemic Controls**

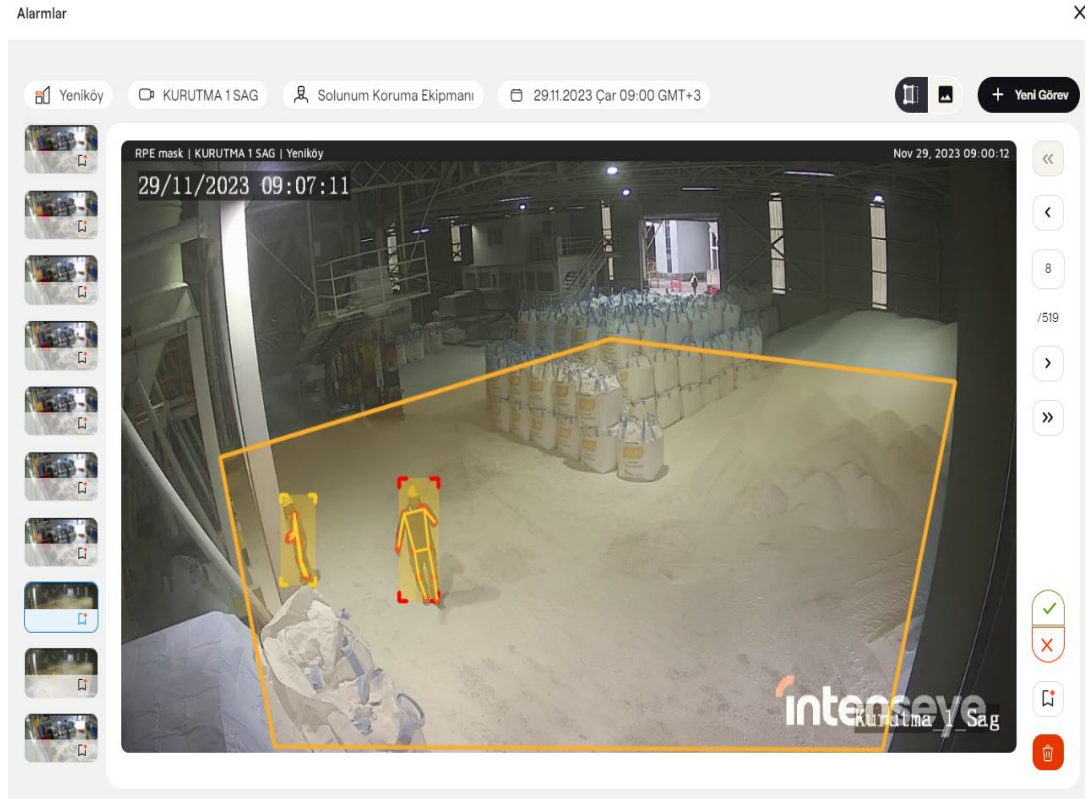
Mask
Social Distance

 **Vehicle Controls**

Vehicle-vehicle interaction
Vehicle-pedestrian interaction
Vehicle restricted area
Vehicle working area
Speed limitation
PPE usage in vehicle
Traffic Way



An example visual and detection of an employee not using handrails while ascending stairs.



Employee without respiratory protection equipment in the designated area

Thank You

