

JD SOLUTION

Company Introduction

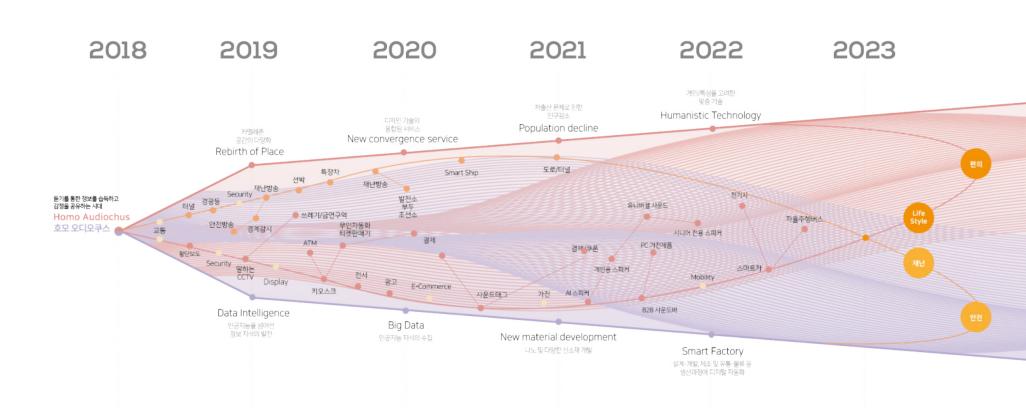


JD SOLUTION

Company Profile 2020

Sound Changing the World

Sound Solution Specialty Companyengaging in Smart Sound business Which is safe, convenient, and useful for disaster based on product and service applied with clear/directional soundwave technology





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JD SOLUTION

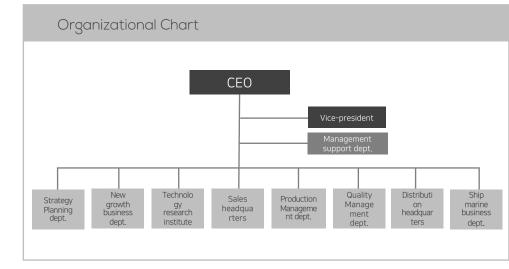
Company Profile 2020

Ol

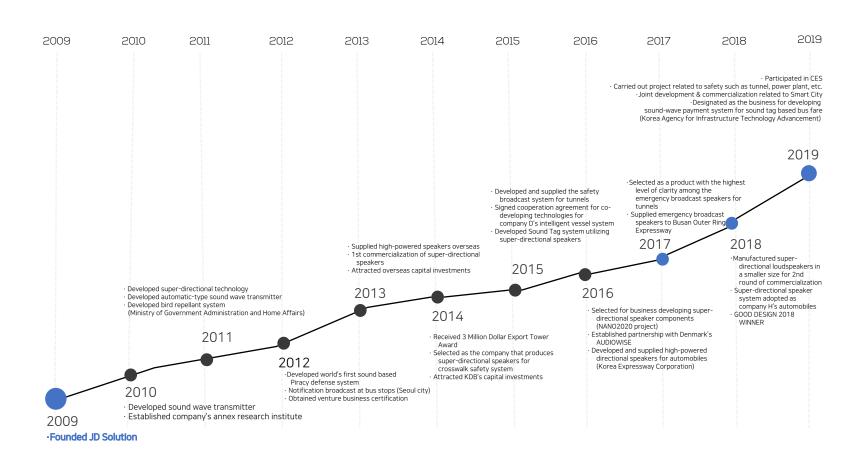
Company Overview



General Status Company JD Solution Name CEO Je Young-ho Date of Jul. 10, 2009 Foundation • High-powered: Tunnel/ Plant / Mobility, etc. Business • Super directional: Smart security / traffic Area light, etc. No. of 30 (As of 2020) employees 1,755,663,500 KRW (As of 2020) Capital



(2) Company History

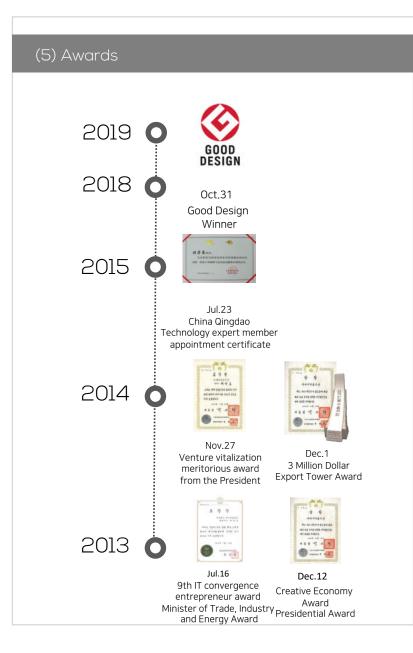


(3) Global Networ



(4) Partners

Traffic Safety			Automobiles			
← ≭ 한국도로공사 K令 ₽/	ML 조달청	경찰청	(조) 현대자동차	POSCO	MOBIS	JINO MOTORS
Security			IT/Electronics/Commu	nication		
● 한진중공업 ● 한진중공업 ● 한화테크윈 ○ 한화테크윈 ○ 한화테크윈	등에요》 서해이엄관리단	POSCO INTERNATIONAL N HANSHIN LECTRORIES 에스원	SAMSUNG 심성전자 HYOSUNG WOOREE NEWOPTICS	© LG전자 CJ	Tencent 腾讯 PHONESOAP ANAM	Singtel SENSORTEE BUMAGHE STROM TECHNOLOGY
Shopping/Entertainment			Smart Home/Health car	re		
HYUNDAI	CGV [®] LOTTE	CINEMA	coway		≥ BODYFRIEM	lD



2013

- Minister of Trade, Industry and Energy Award at IT Convergence Entrepreneur Award
- Received Young Entrepreneur Award
- Received IT Convergence Entrepreneur Award of the Year
- Received Presidential Award at Korea Creative Economy Awards

2014

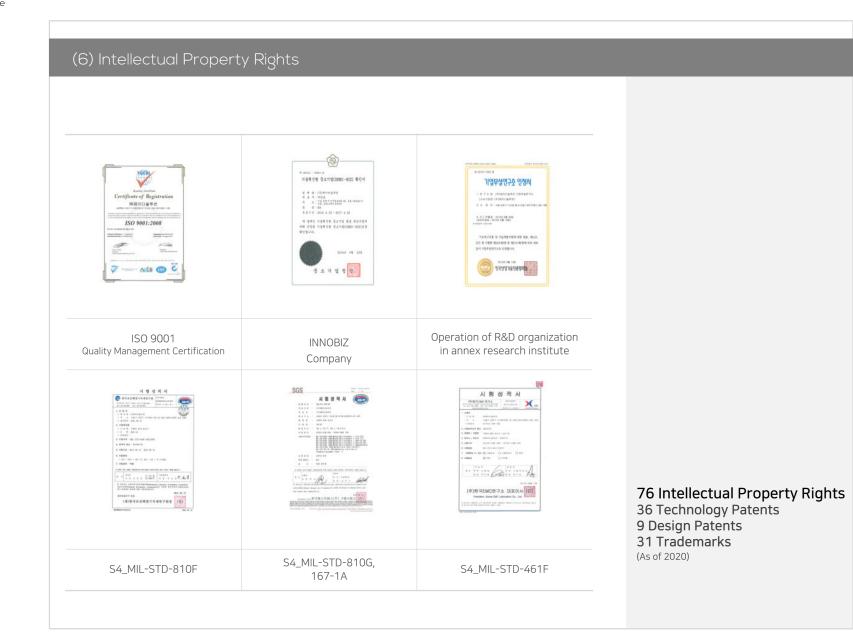
- Received Venture Vitalization Meritorious Award from the President
- Received 3 Million Dollar Export Tower

2015

 Received Qingdao(China) technology expert member appointment certificate Received Global Service Award

2018/2019

Good Design Award Winner for 2 consecutive years





02 Technology & Strength

Technology & Strength

(1) Possessed Technology and R&D Performance Status



Clarity Technology

- Compressed driver design technology
- Sound synchronization technology
- Amplifier technology



Directional Technology

- Mixed design technology
- Signal processing algorithm

Piezo-electric element technology.

- Microphone array technology



Sound Tag

- DSP based sound platform Space recognition & person detection SoDAR technology (Sound Detection & Ranging)
- Sound Tag SDK for Mobile/PC



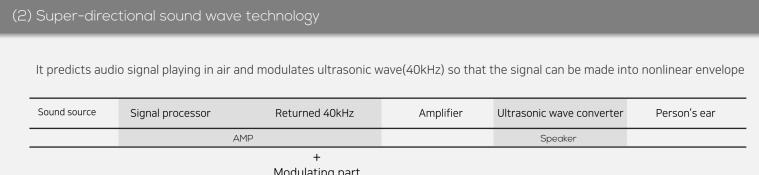
System Convergence Technology

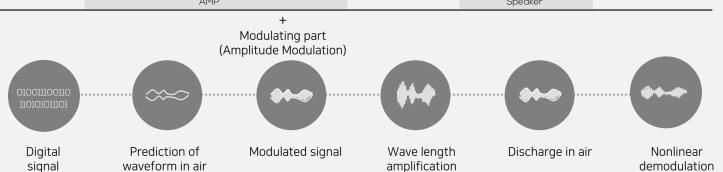
- Intelligent system Discrimination algorithm
- SI technology

R&D Performance & Commercialization Performance

- Jan. 2010 ~ Dec. 2011: High-powered directional speaker
- Jan. 2010 ~ Dec. 2013 : Super-directional speaker
- Jan. 2012 ~ Dec. 2013: Intelligent security surveillance system
- Jul. 2014 ~ Jun. 2016: Global system based on super-direction speakers to assist the mobility handicapped board or unboard a vehicle and provide navigation information (Ministry of Science, ICT and Future Planning)
- May 2015 ~ Dec. 2016: Voice-guided information system for tunnel safety and accident control
- Jun. 2016 ~ May 2019: Developed PFC super-directional speaker utilizing an envelope-type signal processing algorithm and nano pattern transcription technology (Nano-Convergence Foundation)
- Apr. 2019 ~ Dec. 2021 (Ongoing) : Development of sound tag-based Cardless bus fare integrated automatic payment system (Korea Agency for Infrastructure Technology Advancement)
- Dec. 2019 ~ Oct. 2021 (Ongoing): Development of super-directional speaker system for automobiles for playing coherent sound source (Hyundai Motors)
- Mar. 2020 ~ (Ongoing) : Registration of excellent procurement by Public Procurement Service regarding smart crossing safety voice guidance auxiliary device

O2 Technology & Strength





Principle of super-directional sound wave technology

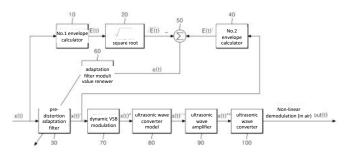
- Sound source playing part: Analyzes sound source and predicts wave pattern in which audio signal forms in the air
- Amplifier: Modulates and amplifies using 40kHz so that predicted wave pattern can come out in the form of an envelope
- Speaker Discharges modulated sound source signal in the air
- Person's ear: A person's ear cannot hear 40kHz as it is an inaudible range, and hears only wave pattern made in envelope form (A person's ear automatically filters out inaudible range(40kHz) and recognizes only sound)

O2 Technology & Strength

(3) Distinctiveness of Super-directional Technology

JD SOLUTION (KOREA)

Successfully commercialized super-directional speaker!



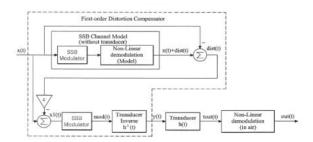
VSB(Vestigial Side Band) modulation method

- Calculates moduli value applied to pre-distortion adaptation filter (fast calculation)
- Calculates adaptation filter moduli value and applies it to the current input signal
- Dynamic VSB modulation
- Applies moduli value suitable for ultrasonic wave converter characteristic

Advantages

- Applies pre-distortion compensation in real-time
- Simplifies design hardware (price competitiveness)
- · Improves super-directional speaker sound quality with VSB method

TurtleBeach (US)



SSB(Single Side Band) modulation method

- Calculates ideal envelope modulation signal wave pattern (a large amount of calculation)
- Calculates error by comparing with actually modulated signal
- Compensates the distortion of the sound quality by repeating the process of compensating the signal before modulation several times

Drawbacks

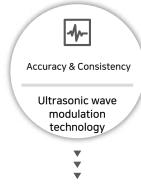
- No real-time compensation on high frequency distortion, poor sound quality
- Hardware design is very complicated
- Increase in delay due to signal processing
- High distortion due to incompleteness of SSB filter

02 Technology & Strength

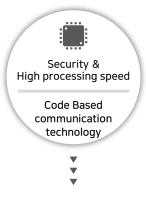
(3) Distinctiveness of Super-directional Technology: non-audible sound wave technology based sound tag

Principle of sound tag technology

It is a "Useful Sound Technology' that can send data using sound wave of inaudible region(exceeding 18~20) using super-direction sound wave technology possessed by the company. It can be grafted to various industries including coupon service for advertisement/promotion, mobile sound wave payment, mobile certification, etc.



- Specific space area communication technology: Ultrasonic wave direction range
- Secured communication integrity resistant to noise
- : Ultrasonic wave region loss < auditory perceptive region loss
- Secure spatial distance : Long distance transmission of small sound through sound/communication modulation
- 3 stage communication region setting (close range/intermediate range/long range)
 - : Parametrization such as transmission carrier, etc.



- Secured data integrity
 - : Code real-time Matching algorithm
- Powerful security
 - : Certification Code personalization & immediate issuance
 - Strengthened security through (OTP), etc.
- Improvement of data processing speed
- : Improved communication processing data speed with expansion of Code Based channel



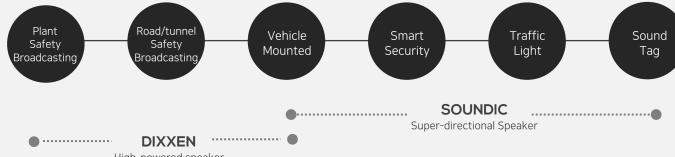
- Ultrasonic wave sensor control technology
 - Omnidirectional ultrasonic wave area
 - General speaker area
 - Separate communication on entire area or specific area by using directional ultrasonic wave



Product

Advantages of Major Products





High-powered speaker

- Clearly delivers high-pressure sound far away
- Can be used in environments with high reverberation and low audibility
- Can be connected to various devices (video, radar, etc.) and perform intelligent analysis
- Delivers clear sound to the target area (people)
- Virtually zero echoes and no sound leakage
- Capable delivering sound(sound source) and data

Brand & Business DIXXEN

DIXXENT Series





DIXXENT

DIXXEN T-H3

- Minimizes echoes using directional technology * Directional speaker clearly heard even in noisy area / howling area
- Uses frequency with excellent voice clarity * Broadcasting system satisfying voice clarity standard(STI) over 0.46, which is Korea Expressway Corporation's standard
- Optimized to Ministry of Land, Infrastructure, and Transport's emergency broadcasting equipment speaker standard (waterproof outdoor installation type, over 90dB/W/m)
 ※ Refer Ministry of Land, Infrastructure and Transport Regulation No.139 Road Tunnel Disaster Prevention Facility Installation & Management Guidelines

DIXXEN A3 Series



- Maximum 136dB @1m front (Peak)
- Delivers up to 300m
- Various applications via multiple coupling and network connection (plant, etc.)



A3-DT

- Maximum 140dB @1m front (Peak)
- Delivers up to 600m
- Easy setting of speaker direction and broadcasting via remote control inside vehicle or ship



A3-DT(c)

- Maximum sound pressure 140dB @ 1m front (Peak)
- Delivers up to 600m
- Provides convenient User Interface

DIXXEN S4 Series



- Transmits a clear warning broadcast to a long distance target up to 3km away with maximum sound pressure of 154dB, located within 1m front (Peak value)
- Capable of realizing long distance over 3km with installation of multiple units
- Military Standard certified (High durability)



S4R

- Transmits a clear warning broadcast to a long distance target up to 3km away with maximum sound pressure of 154dB, located within 1m front (Peak value)
- Linkage with other system software (Radar, AIS, etc.)
- Fully Automatic Tracking & Surveillance & Monitoring & Broadcasting System
- Capable of realizing integrated security monitoring/broadcasting system with insta llation of multiple units
- Secures real-time video image (day/night)
- Military Standard certified (High durability)

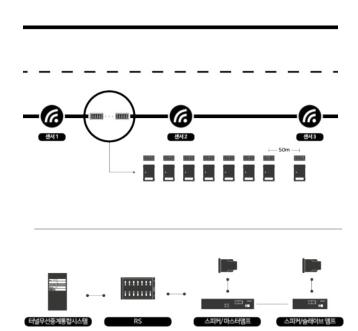
Business



Tunnel/Road Broadcasting Announcement Broadcasting & Warning Broadcasting System

Clear voice broadcasting within road and tunnel with poor sound environment

System



As an emergency broadcasting speaker linked with radio rebroadcasting system of tunnel, it is a broadcasting system satisfying voice clarity index(STI) over 46, the Korea Expressway Corporation standard, unlike conventional broadcasting system

Clear broadcasting delivery is possible in entire section of the tunnel, and overcome the poor sound environment within the tunnel by installing Speaker and 1 amplifier sequentially per 50m, and connecting to the main device of the tunnel radio rebroadcasting system

Applicable Product	Features & Recommended Installation Measure		
DIXXEN T	Inside/outside the tunnel (General)		
DIXXEN T-H3	Exclusively for inside the tunnel (mirroring technology applied)		

Business



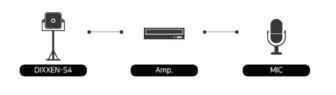
Ship mounted

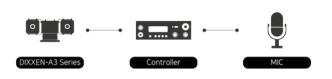
Announcement Broadcasting & Warning Broadcasting System

Ship collision accident prevention / support survivor search in case of marine accident / control of domestic fishing boat, support of crackdown on illegal fishing boats

System







- O1 Transmission of long distance broadcasting with high clarity and high power
- O2 Prevents collision accident between ships due to Non response to VHF communication
- O3 Transmission of clear instructions when marine Accident occurs
- O4 Support control of domestic fishing boats, and Crackdown operation on illegal fishing boats

Applicable Product	Features & Recommended Installation Measure		
DIXXEN S4R	 Linked to Radar for ships (S,X-Band) AIS linked Real-time monitoring (day/night) Medium/Large Ship 		
DIXXEN S4 DIXXEN S4T	 Left/Right Rotating Turntable (applicable to only DIXXEN-S4T) Medium/Large Ship 		
DIXXEN A3-DT	Left/right rotating turntable Medium/Small Ship		

Business

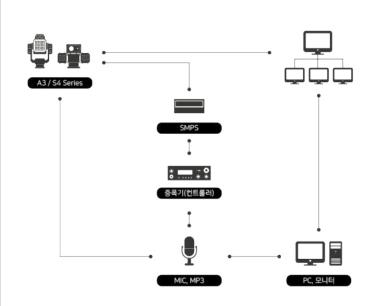


Seashore & Security Area

Announcement Broadcasting & Warning Broadcasting System

Evacuation broadcasting / civil defense warning broadcasting when natural disaster, man made disaster occurs

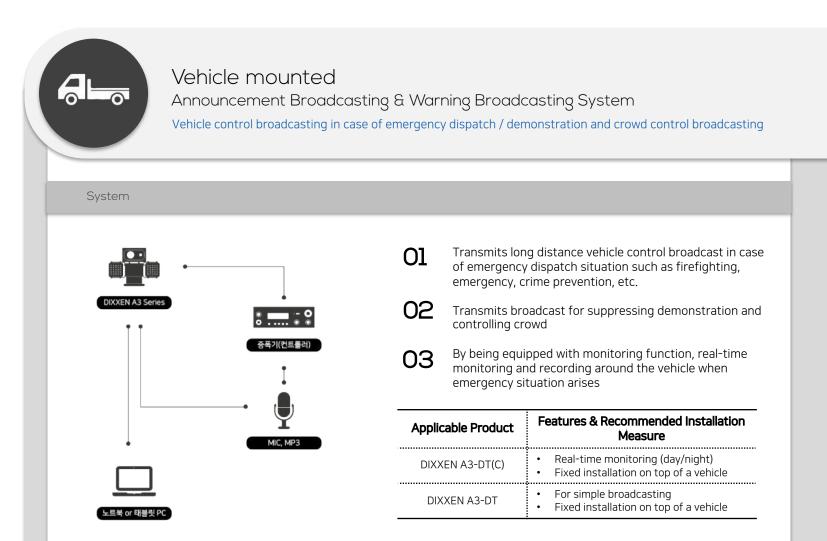
System



- When natural disaster or man made disaster occurs, it transmits long distance high-powered broadcasting and supports evacuation amid situation where dispatch of personnel is difficult
- O2 Installed on seashores close to border and transmits prior warning broadcast to ships violating EEZ and going north or south over the border
- Transmits warning broadcast to person approaching area bordering military unit

Applicable Product	Features & Recommended Installation Measure		
DIXXEN A3-DT(C)	Real-time monitoring (day/night)Fixed and installed on top of a pole		
DIXXEN S4 DIXXEN S4T	 Left/Right Rotating Turntable (applicable to DIXXEN-S4T) Fixed installation on ground or installed on top of a pole 		

Business



DIXXEN **Business**



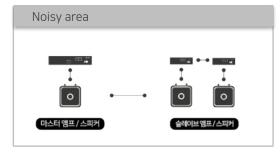
Industrial Facility

Announcement Broadcasting & Warning Broadcasting System

Security system connected to monitoring system and speaker Major industrial facility (power plant, plant, etc.) internal/external warning & announcement broadcasting

System







Noisy area Arranges multiple directional speaker at regular intervals and synchronizes sound

Outdoor area: Minimizes spread of surrounding noise by applying high-powered long distance directional speakers

O3 Capable of controlling and monitoring broadcasting service area and sound when constituting all speakers into a network

Applicable Product		Recommended installation area & composition
Speake	DIXXEN A3(100W)	Noisy indoor area, long distance outdoor broadcasting, other poor reception area
' r	S4(600W)	 long distance outdoor broadcasting Land :100~500m Marine : 500~1Km
Amplif ier	DIXXEN JDM100 (Master Amplifier)	Amplifier for double use as control and network terminal for DIXXEN-A3 speaker
	DIXXEN JDS100 (Slave Amplifier)	 Extends broadcasting service area by constituting in series by connecting with DIXXEN- JDM100 master amplifier
	DIXXEN SA1800	Amplifier for double use as control and network terminal for JDS-S4 speaker
0/S	DIXXEN PAS	O/S dedicated to directional warning broadcasting system

DIXXEN Business

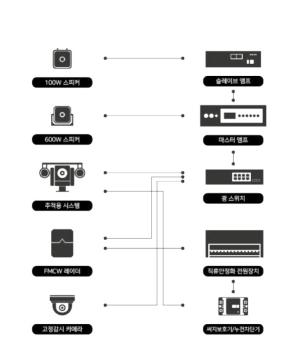


Security & Surveillance

Surveillance/ Security Broadcasting System

Security system connected to monitoring system and speaker Major industrial facility (power plant, plant, etc.) internal/external warning & announcement broadcasting

System



01

Linked to surveillance camera and radar, automatic broadcasting system

02

Minimizes spread of surround noise and broadcasts warning with a clear voice to trespasser

03

Capable of controlling and monitoring each broadcasting service area which has canceled radar link mode, and volume by constituting a network (Broadcasting control is simply constituted with general PC, server and O/S)

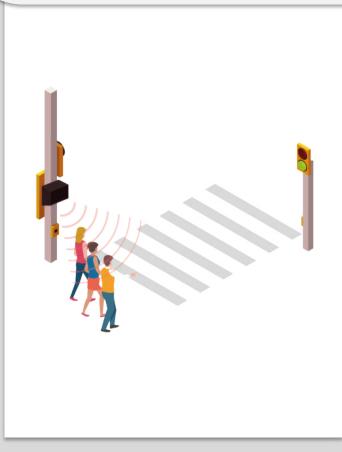
Applicable Product		Recommended installation area & composition		
Speake	DIXXEN A3(100W)	Noisy indoor area, long distance outdoor broadcasting, other poor reception area		
' r	S4(600W)	• long distance outdoor broadcasting - Land :100~500m - Marine : 500~1Km		
Amplif ier	DIXXEN JDM100 (Master Amplifier)	Amplifier for double use as control and network terminal for DIXXEN-A3 speaker		
	DIXXEN JDS100 (Slave Amplifier)	 Extends broadcasting service area by constituting in series by connecting with DIXXEN- JDM100 master amplifier 		
	DIXXEN- SA1800	Amplifier for double use as control and network terminal for JDS-S4 speaker		
0/S	DIXXEN PAS	O/S dedicated to directional warning broadcasting system		

- Delivers clear sound on certain section using ultrasonic wave characteristic
- Applies modulation signal suiting the characteristic of element such as Piezo ceramic Ultrasonic wave modulation algorithm technology
- Delivers clear sound up to maximum of 20m(circle) to 100m(clarielle) in constant sound pressure unlike general speakers with envelope modulation method
- Can be used by combining with various products and space
- Performance usable in all indoor/outdoor environment





Pedestrian signal voice guidance auxiliary device



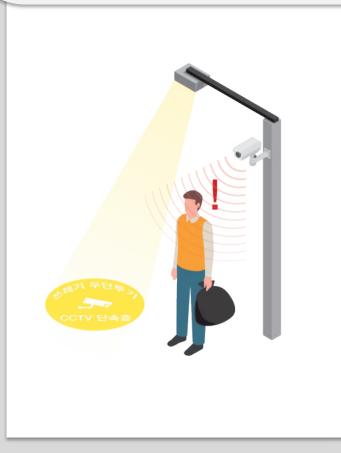
- Ol Voice guidance system for preventing traffic accident of pedestrians within standby area of crosswalk
- **O2** Improves durability and detection accuracy by applying fixed scanning infrared sensor
- O3 It does not generate noise at private houses and shopping area by applying super-directional speakers which does not echo and delivers sound to only a specific area
- O4 There is no need for a separate installation cost unlike competing product as it is attached to the upper part of the traffic light pole (Bollard is not used)

*Bollard: detection sensor support fixture

05 It does not cause discomfort to pedestrians as an attached type



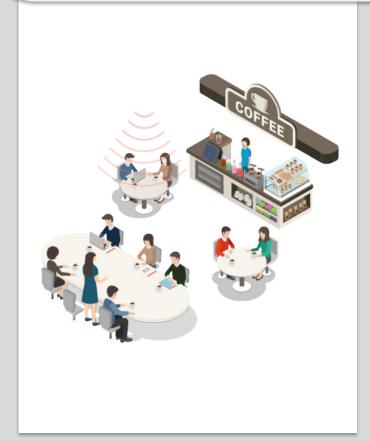
CCTV video recognition based broadcasting system



- **O1** Recognizes violator within restricted area and delivers guidance/warning broadcast
- **O2** Effective guidance effect to people disposing trash illegally, and people smoking in non-smoking area
- O3 It does not generate noise at private houses and shopping area by applying super-directional speakers which does not echo and delivers sound to only a specific area
- **O4** Enhances accuracy with video recognition technology detecting a person who comes into a set area



Advertisement PR solution utilizing spot sound



- Ol Solution applied to various spaces such as commercial space, public transportation, etc.
- **02** It can be applied in various ways such as delivering necessary information or decorating a space with the sound of nature
- **03** It does not generate noise at private houses and shopping area by applying superdirectional speakers which does not echo and delivers sound to only a specific area
- **O4** Various installation cases in places such as department stores, cafes, museums, movie theaters, etc.



DIXXEN : Marine System





KOTC (Kuwait Oil Tanker Company) crude oil carrier Anti Piracy System DIXXEN S4R



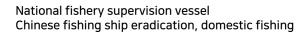


ROK Navy next generation landing ship maritime operation ship-to-ship broadcasting system DIXXEN S4

DIXXEN : Marine System







boat guidance broadcasting DIXXEN S4T





Brunei Navy training ship maritime operation ship-to-ship broadcasting system DIXXEN S4

DIXXEN : Marine System





Mokpo National Maritime University training ship Marine safety monitoring & broadcasting system DIXXEN S4R

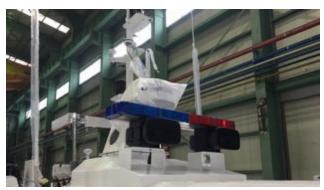




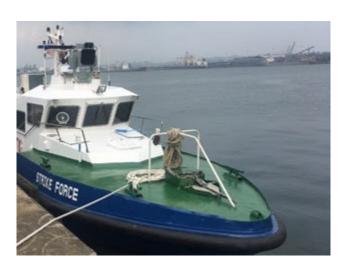
Korea Coast Guard patrol ship Domestic fishing boat guidance broadcasting system DIXXEN A3-DT

DIXXEN : Marine System





Korea Coast Guard coastal rescue vehicle Coastal safety broadcasting system DIXXEN A3-D





Malaysia Bintulu port Port security & fishing boat guidance system DIXXEN S4R

DIXXEN : Vehicle type





Indonesian Police Barricade Truck
Demonstration suppression monitoring & warning broadcasting system
DIXXEN A3-DT(C), DIXXEN A3-D





Chinese police special vehicle

DIXXEN A3

DIXXEN: Wild animal protection/sonic wave repeller system



Fruit farm sonic wave bird repeller system DIXXEN S2R



Sonic wave harmful bird repeller system DIXXEN S2R

DIXXEN : Security area broadcasting





Submarine Force Command Fishing boat severe pressure warning broadcast DIXXEN S2R





ROK Marines Marine broadcasting system DIXXEN S4H

DIXXEN : Tunnel broadcasting system





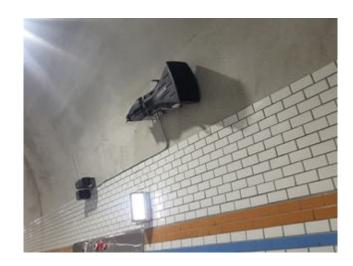




Emergency broadcasting speaker Busan Outer Ring Expressway(Jinyeong Tunnel, Hanlim Tunnel, Saenglim Tunnel) DIXXEN A3

DIXXEN : Tunnel broadcasting system









Emergency broadcasting speaker Busan Outer Ring Expressway(Sangdong Tunnel, Shineosan Tunnel, Geumjeongsan Tunnel, Cheolma Tunnel)

DIXXEN A3/ T-H3

Project	Client	Remarks
KOTC crude oil carrier *DIXXEN S4R	DSME	18 units
Fruit farm bird repeller system *DIXXEN S2R	Gimje City Hall Yeoncheon County Office	12 units
ROK Navy next generation landing ship *DIXXEN S4	Hanjin Heavy Industries Hyundai Heavy Industries	4 units
National fishery supervision vessel *DIXXEN S4T	West Sea Fisheries Management Service	1 unit
Brunei Navy battleship *DIXXEN S4	Brunei Navy	1 unit
Submarine Force Command *DIXXEN S2R	Navy Submarine Force Command	1 unit
Mokpo National Maritime University training ship *DIXXEN S4R	Hanjin Heavy Industries	1 unit
Korea Coast Guard patrol ship *DIXXEN A3-DT	Korea Coast Guard	6 units
Korea Coast Guard coastal rescue vehicle *DIXXEN A3-D	Korea Coast Guard	4 units
Incheon International Airport Corporation sonic wave bird repeller *DIXXEN S4	Incheon International Airport Cor poration	1 unit
Seaweed fulvescens sonic wave bird repeller *DIXXEN S4	University Industry Liaison Office of CNU	1 unit
Malaysia Bintulu Port *DIXXEN S4R	Bintulu Port Holdings Bhd.	1 unit
Indonesian Police Barricade Truck *DIXXEN A3-DT(C)	PT. Jesbright Ansanti Solusindo	8 units
Indonesian Police Barricade Truck *DIXXEN A3-D	JINO Motors	24 units
Royal Thai Police SWAT Team *DIXXEN A3-DT(C)	Techna Distriserv Pte. Ltd.	1 unit

JD SOLUTION Company Profile

04 Reference

Project	Client	Remarks
Safety broadcasting system (Dunnae/Bongpyeong Tunnel) * DIXXEN T-H3 speaker	Korea Expressway Corporation	32 units
Safety broadcasting system (Inje Tunnel) * DIXXEN T-H3 speaker	Korea Expressway Corporation	20 units
Safety broadcasting system (Girin 6/Hwachon 9/Seoseok Tunnel) * DIXXEN-H3 speaker	Korea Expressway Corporation	21 units
Safety broadcasting system (Geumjeongsan /Sineosan Tunnel) * DIXXEN T-H3 speaker	Korea Expressway Corporation	24 units
Emergency broadcasting speaker (All Tunnels of Busan Outer Ring Expres sway, Shineosan Tunnel pilot project included) * DIXXEN A3 speaker	Korea Expressway Corporation	805 units
Drowsiness notifier (Seoul Ring Expressway Suri Tunnel) * DIXXEN T-H3 speaker	Korea Expressway Corporation	3 units
Speaker linked to radar detection system for foggy section (Busan Outer R ing Expressway Daepocheon Bridge) * DIXXEN A3 speaker	Korea Expressway Corporation	18 units
Emergency broadcasting speaker for rebroadcasting maintenance project (Approx. 28km section of nationwide tunnel extension) * DIXXEN-T/T-H3 speaker	Korea Expressway Corporation	561 units
Emergency broadcasting speaker for rebroadcasting maintenance project (Seoul-Chuncheon Expressway section tunnel) * DIXXEN-T speaker	Korea Expressway Corporation	594 units
Directional warning broadcasting system for preventing safety accidents (Coal facility-Hadong Power installation) *DIXXEN A3 99 units/S4 4 units	Korea Southern Power	103 units

SOUNDIC





Seoul City Hall LOBY Sound Spot / Information Sound / Nature Sound





JTBC(Head Office_Sangam) JTBC Gallery

Sound Spot / Interactive New Media

SOUNDIC





DDP
DDP Sound Sign
Sound Spot / Information Sound / Nature Sound

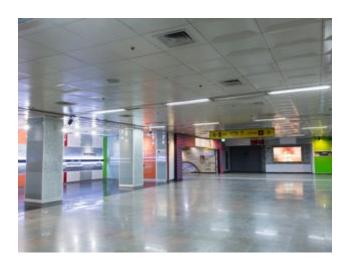




Gwacheon National Science Museum Exhibition Room

Sound Spot / Information Sound / Interactive New Media

SOUNDIC





Subway Line No.4 Seoul Racecourse Park Station passageway

Sound Spot / Information Sound / Nature Sound





Smart Pedestrian Safety Service Traffic light speaker

Sound Spot $\,/\,$ Information Sound

SOUNDIC





CGV(Gangbyeon) FILM & MEMORY

Sound Spot / Interactive New Media





LOTTE CINEMA NOW SHOWING

Sound Spot / Interactive New Media / Proximity Sensor

SOUNDIC





Starfield(Goyang, Hanam) Baby Circle

Sound Spot / Nature Sound / Proximity Sensor





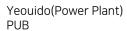
Gangnam Station (Shinbundang Line, Seoul Racecourse Park station, etc.) Voice guidance solution

Kiosk / Sound Spot / Information Sound

SOUNDIC







Sound Spot / BGM Sound



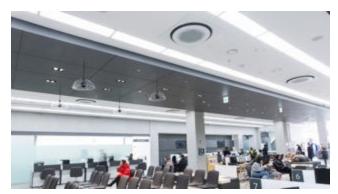


Hyundai Department Store (Cheonho) Food hall

Sound Spot / Information Sound / Nature Sound

SOUNDIC





Samsung Electronics Service Center Yongin branch Sound Spot / Information Sound / Healing Sound





Guidance solution for illegal disposal of trash (Multiple areas including Seoul city & Incheon city, Suwon city, etc.)
Warning broadcasting solution

Sound Spot / Information Sound

SOUNDIC





Korea Automotive Technology Institute 2019 Motor Show

Sound Spot / Information Sound

JD SOLUTION Company Profile

04 Reference

Project	Client	Remarks
Lotte Cinema 'Now Showing'	Lotte Cinema	40 units
Gwacheon National Science Museum exhibition room	Gwacheon National Science Museum	20 units
Gangnam Station voice guidance solution	Seoul Metro	10 units
DDP	DDP	4 units
Subway Line No.4 Seoul Racecourse Park	Seoul Racecourse Park Station	Type 1
Seoul City Hall	Seoul City Hall	Type 1
CGV Gangbyeon 'Film & Memory'	CGV	4 units
JTBC Gallery	JTBC	30 units
Starfield Hanam / Goyang Baby Circle	Shinsegae	6 units
Yeouido Power Plant	OTD	Type 1
Hyundai Department Store Cheonho Food Hall	Hyundai Department Store	8 units
Samsung Electronics Service Center	Samsung Electronics	6 units
Lotte Mart	Dream ICT	40 units
Oneulan Dental Clinic_Sound Design	Oneulan Dental Clinic	10 units
Seoul Design Foundation Exhibition	Seoul Design	20 units



Thank you

JD SOLUTION

Company Profile 2020