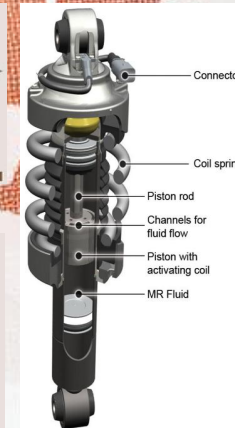
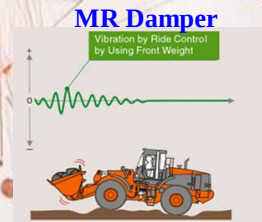
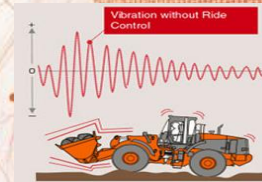
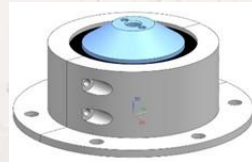
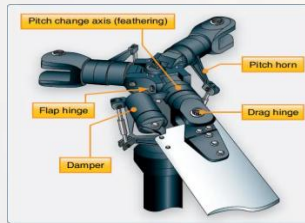


High Efficiency, Vibration Attenuation Solution for Performance Tunable using Smart material based On-Device AI



1. Technology(Product) Overview & Completeness

2

Damper(Shock Absorber), Mount

: A core component that improves product performance and safety by reducing vibration, shock occurs in various industrial fields



✓ System Control, performance tunable & enhancement(using On Device AI, Smart Materials)

Enhanced, Improved system & components in Life span for Various Industrials field

Background

1) Failure to properly install dampers(mounts) can lead to serious personal & Property damage and increased costs.

2) Major (or Important) Cases

※ Dec. 24, Jeju Air accident at Muan Airport

- Aircraft landing due to landing gear failure caused by a damper failure

- 댐퍼 미작동에 의한 FedEx 항공기 충돌 사고

- 과도한 진동 증폭에 의한 교량 안전 문제 폐쇄(댐퍼 설치로 해결)

2002년 3월 11일

대한항공 KE631편 착륙사고 발생

착륙 기어 댐퍼의 고장

과도한 진동 발생 및 충격 흡수 장치 미흡

착륙사고로 인해 기체와 활주로 손상

2020년

부산 도시철도 추돌사고

제동 장치와 댐퍼의 미작동

급정거로 인한 차량 운행 스케줄 통제 불가

열차 추돌, 승객 부상 및 수리와 보상 비용 발생

2019년

서울 지하철 탈선 사고

댐퍼의 정비 불량 이상 발생

열차 차량 탈선 발생

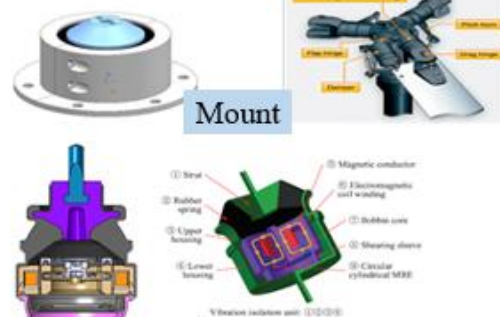
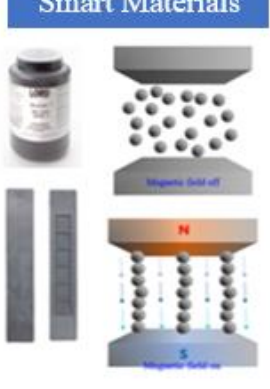
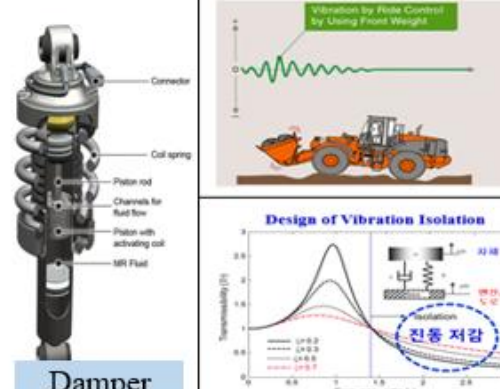
다수의 승객 부상 및 사고로 인한 운행중단 발생

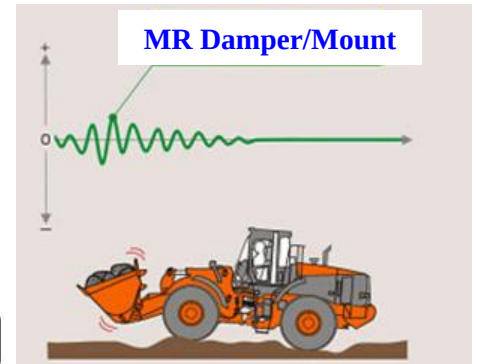
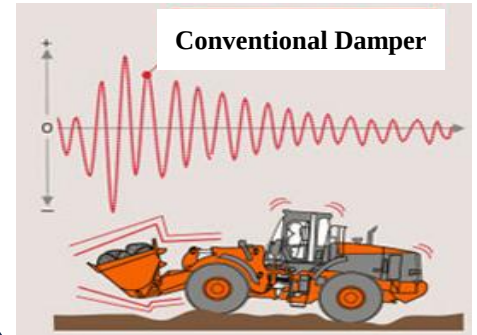
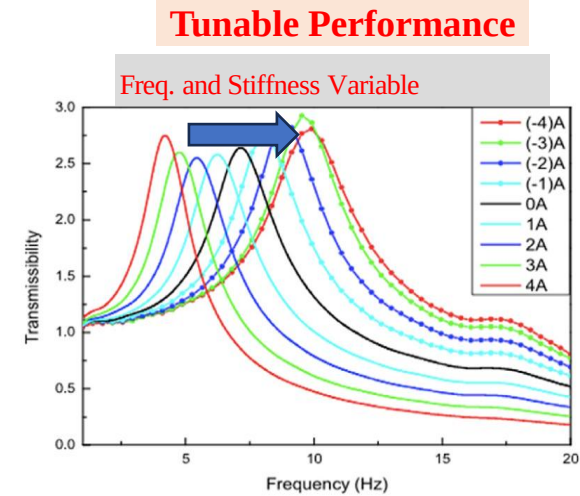
1. Technology(Product) Overview & Completeness

3

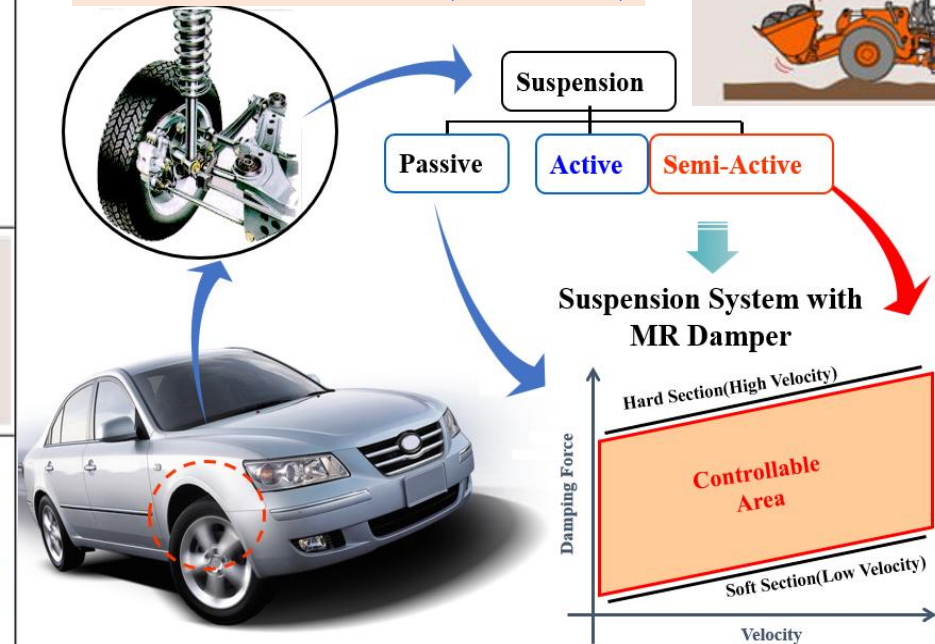
Summary of Technology & Solution

- ◆ Vibration Attenuation using performance tunable characteristics of magnetorheological materials responding to magnetic fields
- ◆ Based on On Device AI, dampers, and mount products for Urban Air Mobility(UAM) drive systems, xEVs, and autonomous vehicles.

Name	1.UAM Propeller Operating System 2.On Device AI Tech. 3.xEV, Transportation Vib. Attenuation Application	Category	1.Future Mobility(UAM) Tech. 2.AI Technology 3.xEV, Automotive Transportation
UAM, xEV, Railway, PM	AI, Smart Materials	Performance variation of Applications	
	On Device AI  명령 ↔ AI 추론/제어	Mount  ① Steel ② Rubber spring ③ Upper bearing ④ Lower bearing ⑤ Magnetic conductor ⑥ Electromagnetic coil winding ⑦ Solenoid valve ⑧ Shearing sleeve ⑨ Circular cylindrical MRD Vibration isolation unit: (1)(2)(3) Vibration absorption unit: (4)(5)(6)(7)(8)	
	Smart Materials  Magnetic field off H S Magnetic field on	Damper  Connector, Coil spring, Piston rod, Channels for fluid flow, Piston with actuating coil, MR Fluid Vibration by Ride Control by Using Front Weight Design of Vibration Isolation 진동 저감	



Performance Controllable (Semi-Active)



2. Technology(Product) Excellence, Differentiation

These prices will be referred to for Automotive MR Suspension(on Device AI, SDV Function)

➤ Dev. Product differentiation

MR 유체 Application 개발 기술 보유

01



Lord Parker Inc. Monopoly 985\$/1L

→ **180\$/1L (250,000원/KRW)**

MR 유체의 침전 안정성, 재 분산성 원천 기술 보유
공급 협약(JV 설립 or M&A)

양산 및 상용화 기술 확보

(2024년 xEV 차량용 Suspension)



전기/수소, ICE 차량 적용시 제조 원가 절감 가능
(Lord 사 MR 유체 적용 대비)

제품 상용화를 위한 내구 성능 확보, 양산 체제 수립

03



AI 기반 xEV, 자율 주행 차량 제어 기술 확장

**Vehicle Safety and Upgrade Drive feeling
based on Device AI**

04



다양한 기술 응용 분야로 시장 확장성

E-bike, e-Mobility 공유/퍼스널 모빌리티, 수송 수단,
UAM(미래항공 모빌리티), 가전, 세탁기
제조 생산, 산업용 기계/바이오 헬스 의료 영상기기

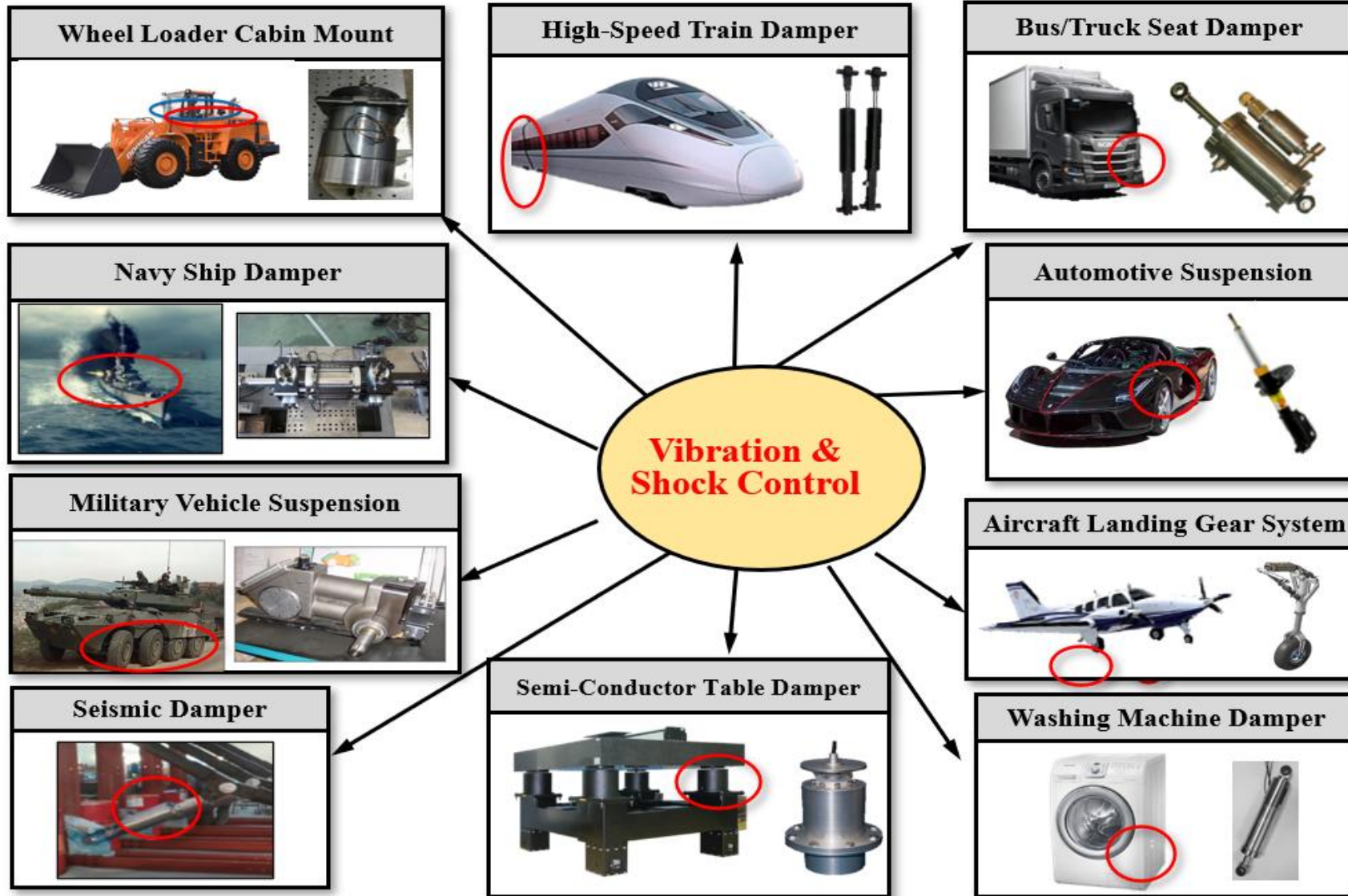
➤ Competitive Analysis

ezntec. system Inc. : MR Damper Application Dev., Mass production + **On Device AI, SDV**

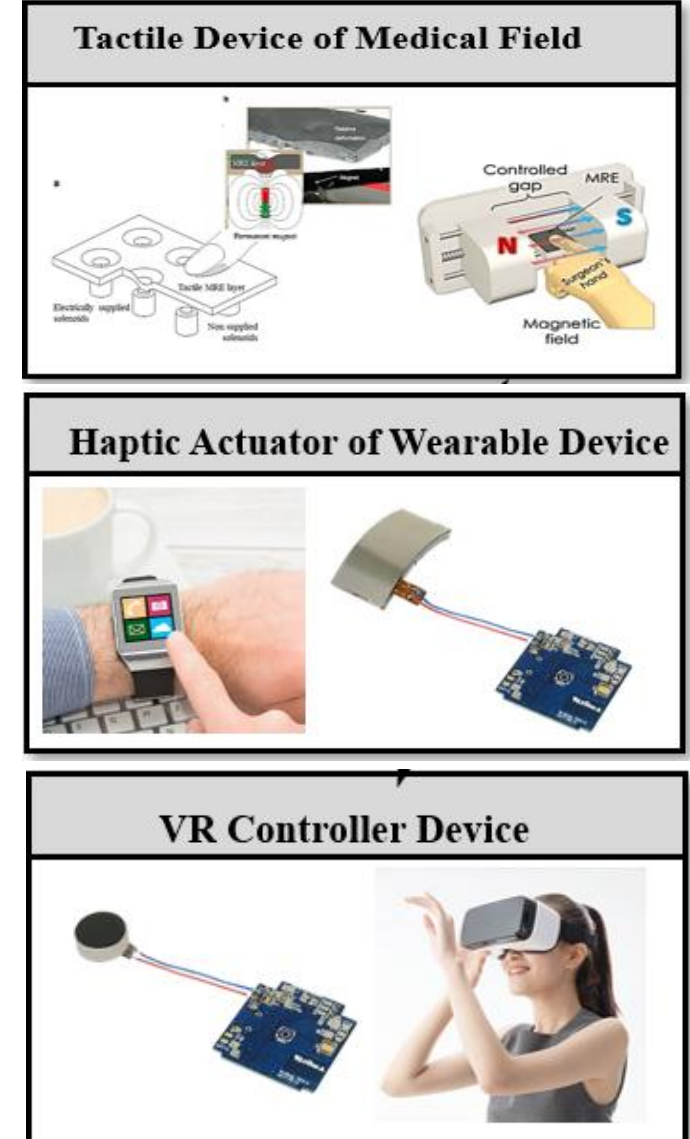
Items	ezntec system Inc.	C. Inc.	Domestics (R Inc.)	Global Lord Inc. / Magna Ride
MR 유체 공급 가격	250,000원/(1L) (국내 생산 제조 공급)	290 \$/1L (400,000원)	360 \$/L(500,000원)	985 \$/1L (1,380,000원)
MR Damper, Suspension 공급 가격	100 ~ 150 만원/EA	없음 (소재 개발 업체)	-	1,440~1,800 \$/EA (200~250만원)
성능	다양한 주행 조건에서 최적 성능 만족 (100%) 내구 성능 개선, 고객 실증	선진 기술 동등 수준 (MR 유체)	선진 기술 대비 90 %	다양한 입력 조건에서 성능 만족, 내구 성능 일부 미흡
반 능동형 성능 특성	간단한 센서로 구성 On Device AI 기반 SDV, 차량 제어/Fail Safe 기능	소재 개발 구현 기능 없음 (소재 전문 업체)	선진 기술 대비 90 %	시스템 구성 복잡, 제어기 불안정성, 제어 기능 오류 Fail Safe 기능 오류
적용 사례 (개발 사례)	중소형급 xEV MR Damper, 휠 로더 캐빈 MR Mount MRE 서스펜션 Bush, Mount	MR 유체 샘플 공급 수준 (현대차, 로템 등)	건물, 산업용 MR Damper 일부 적용 중	고급 차량용 MR 서스펜션 (럭셔리 승용, 스포츠카, 군용)
적용 현황	Application 양산 기술 확보 (설계, 제조, 품질) On Device AI, SDV 적용 2026년(하) 상용화 예정	MR 유체 소재 물성 연구 및 제조 공급사	국내 일부 건물에 MR Damper 적용 중 기술 컨설팅 적용 중	고급 스포츠카, 럭셔리 승용차 양산 적용 중 (2002~ 현재)

3. Target Market & Customers

➤ MR Damper, Mount Applications (Optimization Solution based “On Device AI”)

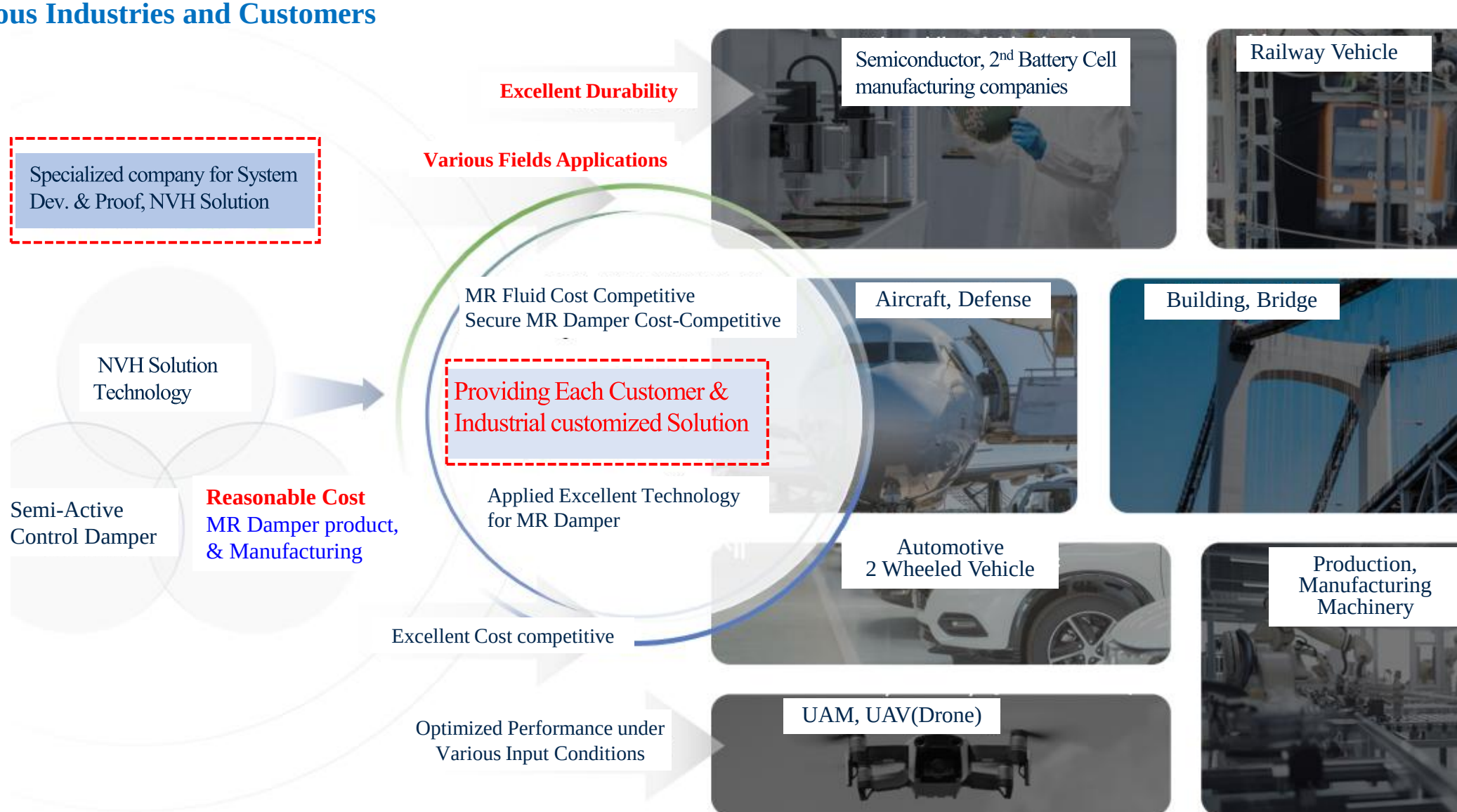


Vibration & Stiffness Control with VR, Haptic, and Bio-medical Device)



3. Target Market & Customers

➤ Customized Solution MR Damper, Mount Applications in Various Industries and Customers



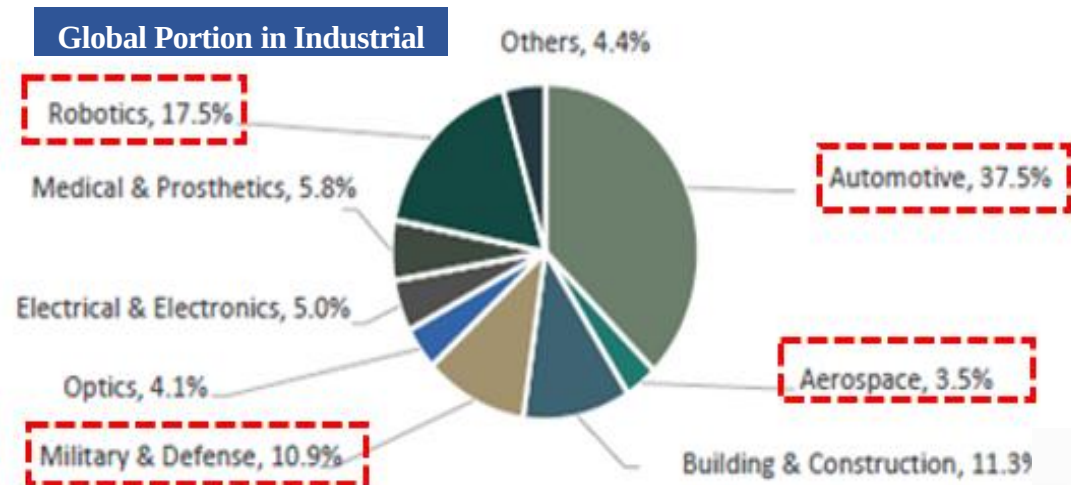
4. Market Status & Outlook

※ MR Fluid & Application, Future Mobility(UAM) Field

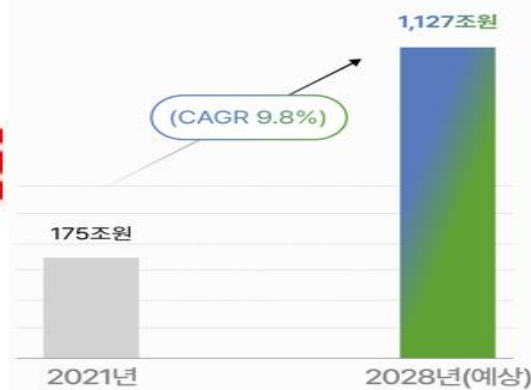
➤ MR Fluid Global Market Size

: Analyzed for the MR **Fluid** Application market

(Sources: Global MR Fluid Market, Breakup by Application, 2020)



Global MR Fluid Market
2021년 6,844만 달러에서
2028년 1억 3,195만 달러 예상
(CAGR 9.8%)



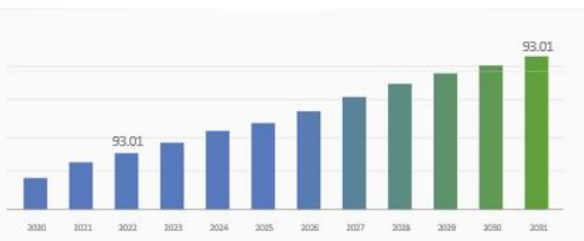
Global MR Damper Market

➤ Analyzed for the MR Damper, Application market

Market Outlook for the Global MR Damper Application 10 Thousand(USD)

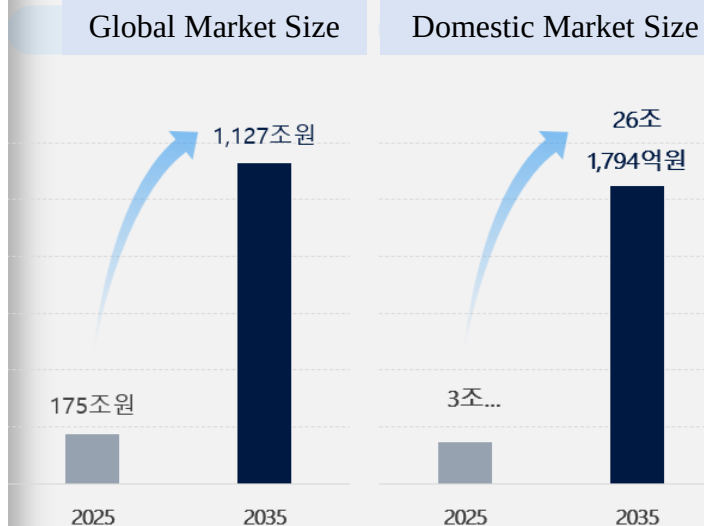
Year	2023	2028	2030	2031	CAGR ('23-'31)
Market Scale	5,000	7,600	8,700	9,301	6.5%

※출처 : Research Rocket, Business Research Insight, Market Data Library 3개사 평균)



➤ Global Autonomous Vehicle Market Size

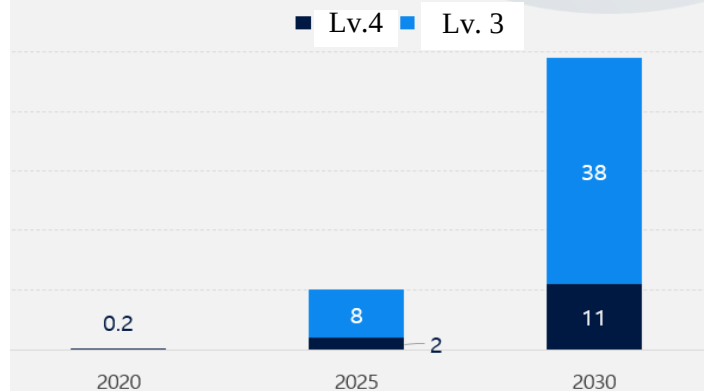
Global Autonomous Vehicle Market Size



2030년 신차 중 자율주행차 판매 비중

(출처 : 네비건트리서치, 단위 : %)

Autonomous Vehicle Level



4. Market Status & Outlook

※ MR Fluid & Application, Future Mobility(UAM) Field

➤ xEV Mobility, Damper, Suspension Market Size

TOM

83.8 Trillion (KRW)

Domestic Vehicle, Mobility Market: 60B(\$)

- 1) 국내 자동차 시장 규모 : 76조 5,990억
- 2) 개인 및 공유 전동 킥보드 약 60만대 추산 : 3,362억 2,000만원
- 3) 전기 이륜차 시장 규모 : 532억
- 4) 국내 전기 자전거 시장 규모 : 약 500억
- 5) 국내 자전거 인구 1,340만명 x 일반 자전거 평균 가격 : 50만원 = 6조 7천억원

SAM

880 B (KRW)

Domestic Vehicle Damper/Suspension Market: 6.3B(\$)

- 1) 2021년 기준 국내 프리미엄 수입차량 판매 수 : 18,800 대 / 평균 1억 가
- 2) 2021년 기준 국내 프리미엄 국산차량 판매 수 : 200,000대 / 평균 0.8억 가
- 3) 수입 및 국산 프리미엄 차량 판매 수 : 218,800대 x 댐퍼 가격 : 480만원 [1대당 서스펜션 4개(120만원/1ea)]

SOM

320 B (KRW)

Mini-Sized EV Damper/Suspension Market: 2.3B(\$)

- 1) 2021년 기준 국내 소형 차량 판매 수 : 96,842대 / 평균 1,900만원
- 2) 2021년 기준 국내 전기 차량 판매 수 : 10,0681대 / 4,400만원
- 3) 국내 소형 및 전기 차량 판매 수 : 197,523대 x 댐퍼 가격 : 총 280만원 [1대당 서스펜션 4개(70만원/1ea)]

➤ Future mobility(UAM) Market Status & Tech. Analysis

◆ UAM(Urban Air Mobility) Future Urban, Eco-friendly Transportation

1) Start with Commercialized in 2025, Expected Explosive growth prospects

- 2030yr 320B(\$), 2035yr 640B(\$), 2040yr 1.47T(\$)
scale(CAGR 43.3%)

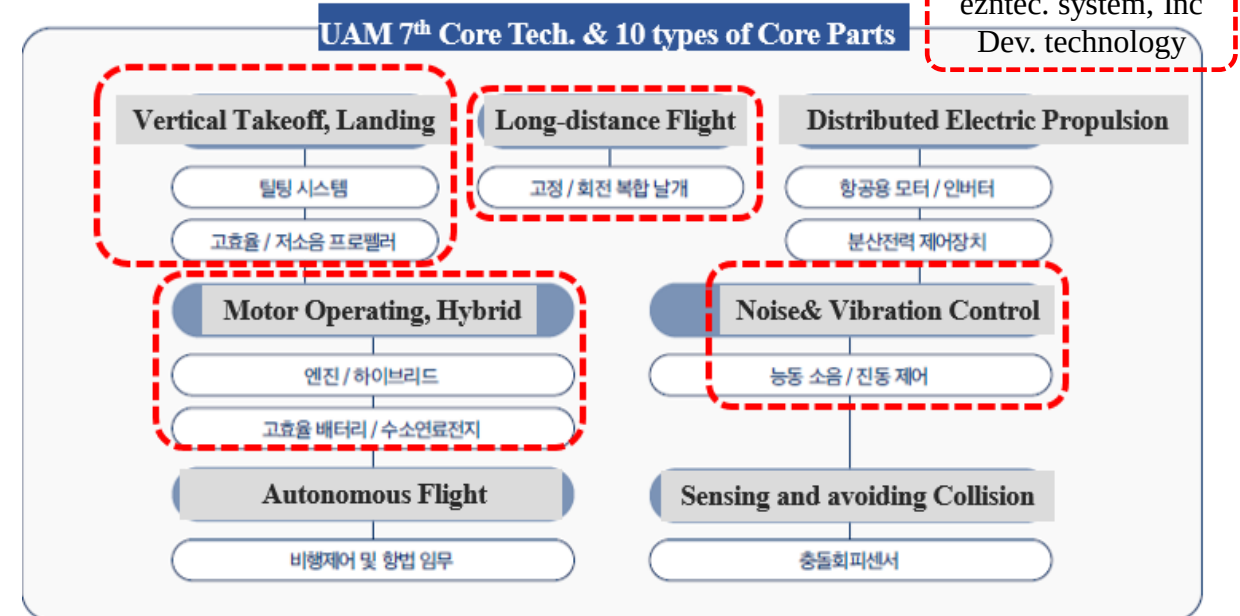
구분	시장규모 (2022 기준)	예상 시장 규모 (USD 기준)				
		2027년	2028년	2030년	2035년	2040년
Global	27억 \$	167억 \$	212억 \$	3,200억 \$	6,400억 \$	1조 4,740억 \$
Domestic	8.3억 \$	29억 \$	49억 \$	83억 \$	167억 \$	283억 \$

※ Source : 1) UAM Market trends(Exception for UAV, Military field)

2) UAM policy, Industrial trends and issues(ETRI, 2023)

2) Aircraft & Mobility, ICT platform fields (Joby Aviation(USA), Volocopter(Germany))

3) Commercial Core Issues for UAM tech.



5. Market Entry & Expansion Strategy

- Expanding market demand by Tech. implementation
(Securing diverse customers)

코로나19 이후 본격적인
기술개발/제품생산

댐퍼의 전체 질량 축소를 위해
경량 부품으로 댐퍼 제작

인프라 수요 및
건설 프로젝트 증가

탄소 배출을 줄이기 위한
경량 부품 제작을 위한 R&D 지출

지진 등의 환경 재해에
대비를 위한 안정성과 견고성
향상

댐퍼의 기술력 향상과
저렴한 생산기술 창출 확대

Changes in awareness & Improvement of MR Damper

Increase demand for precise & efficient MR Dampers
across a wide range of applications, industrial fields

Application 01

Automotive makers, xEV



B2B

Application 02

**PM, Share mobility
E-Bike, MTB, 2-wheel vehicle**



B2B

B2C

Application 03

**Home Application, Industrial device,
Semiconductor manuf. Devices and
Haptic/VR, biomedical devices**



B2B

Application 04

**Transportation, Construction
Vehicle, UAM, UAV(Drone)**



B2B

5. Market Entry & Expansion Strategy

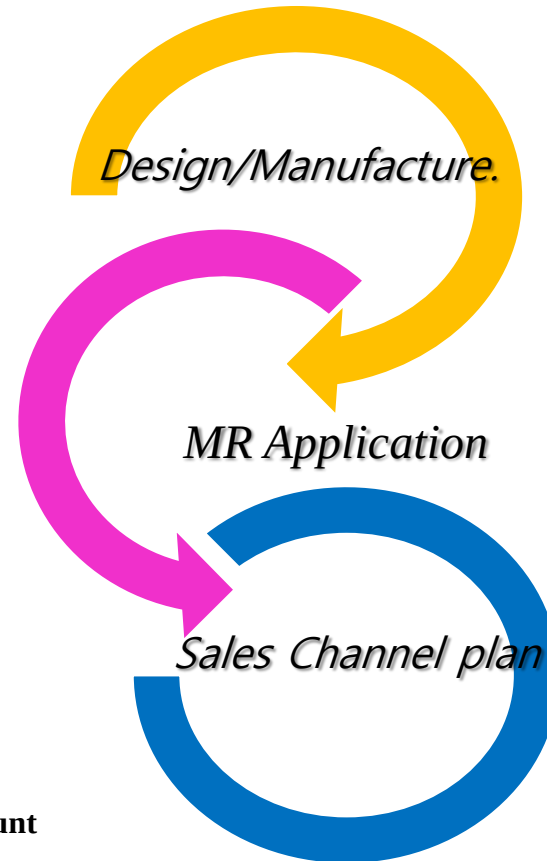
➤ Global Market entry Strategy of MR Application(Damper, Mount)

MR Damper, Mount Application Design/Manufacture
(ezntec system, Seoyoung precisions)

- ❖ Based on the Automotive& Construction vehicle, Aircraft for MR Damper Dev.
 - 1) **UAM, UAV(Drone), & Industrial machinery, Bridge, Building Vib. Attenuation Application Market Pre-emption and Expansion**
 - 2) **Eco-friendly xEV, Autonomous parts modulization, Common Use**
 - Efficiently Vibration attenuation, Ride comfort, Handling, and Drive Feeling Increased
 - Advanced technology and the Luxury of Vehicle control
- ❖ **Product Dev. for MR Mount, Damper Design, performance, durability evaluation**
- ❖ **Global No. 1 Product technology based on Automotive & their components and system development technology.**

MR Damper, Mount Marketing Strategy

- ❖ **Product promotion to Domestic, Overseas Customers**
 - Product range, Expansion Customer, provide MR Damper, Mount (Elbit Systems(Israel), CTECH(Turkey), Hanhwa, LIG Nexone, ADD, etc.
- ❖ **Establish the Global sales network, promotion, and Marketing network.**
- ❖ **Secure the Product Quality by Technical Certification, Raising the company awareness**



MR Application material(Corporate)

- ❖ **MOU for Supply and Product MR Fluid**
- ❖ **Research and product for MR Elastomer**
- ❖ **Military product and xEV module components mass production & commercialization.**
- ❖ **Increased productivity, Secure the Zero defect**
 - Quality management
- ❖ **Product and providing in various fields**
 - Expanding the market base for MR Elastomer, MR Fluid market
 - Realized localization & commercialization of MR materials & MR applications

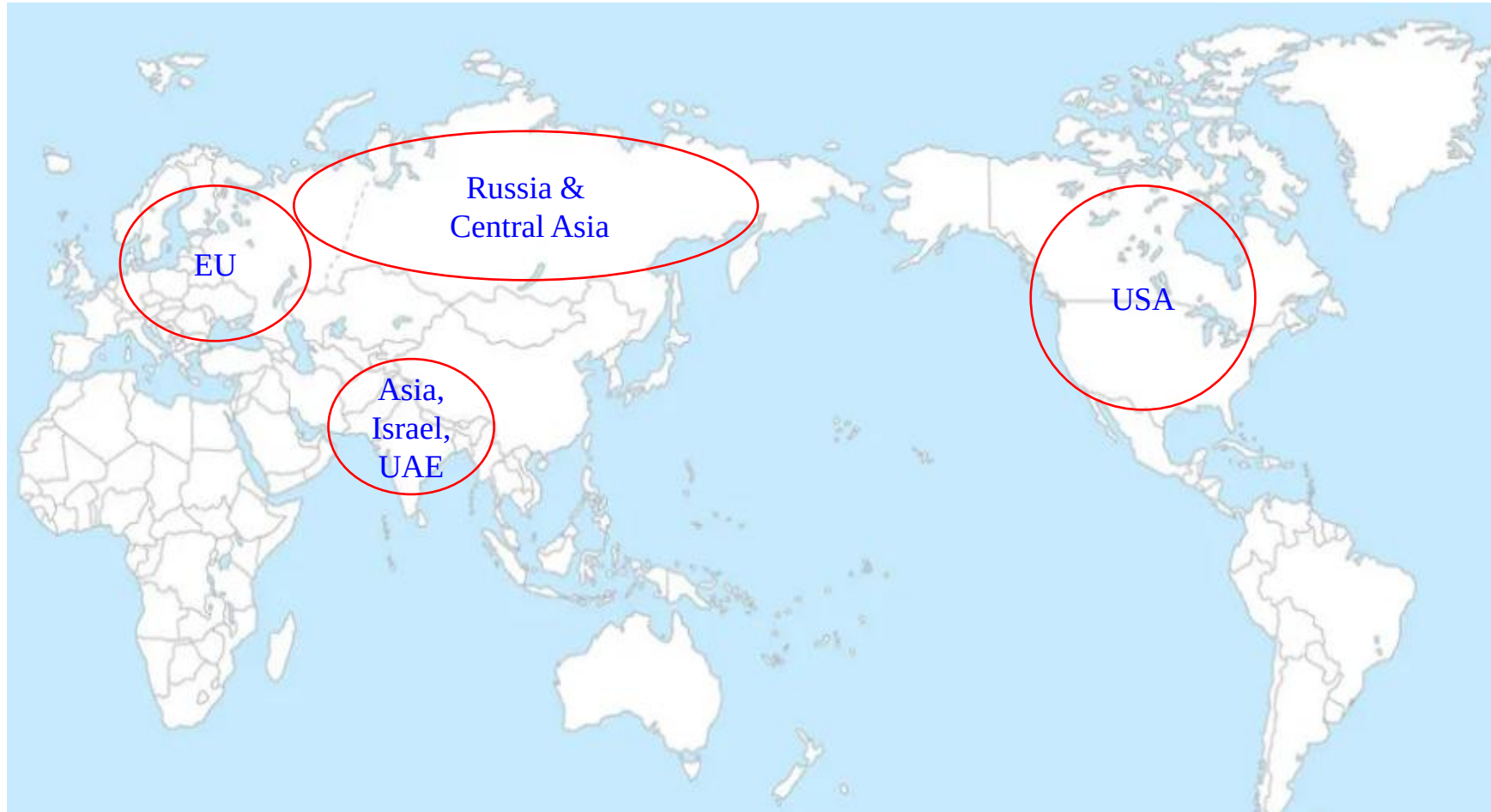
5. Market Entry & Expansion Strategy

➤ Global debouchment of MR Application(Damper, Mount)

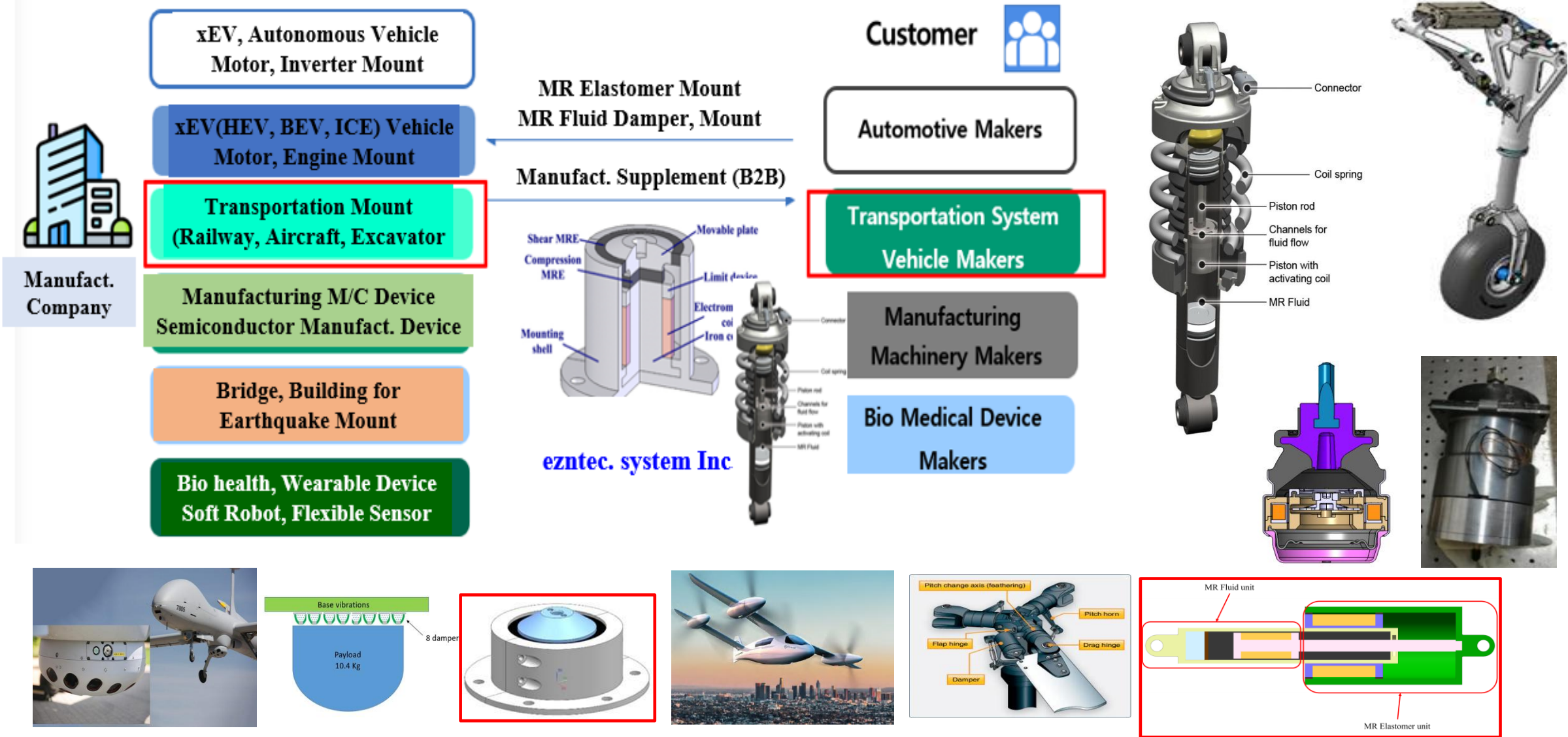
USA, EU(Germany, Finland) & Russia(Central Asia), Asian(Israel, UAE)

1) Provide & Tech. agreement : UAM, UAV(Drone), ELOP Camer module mount

2) Vib. attenuation mount for operating propeller system module of UAM, UAV 3) xEV, Autonomous MR Suspension, Mount



MR Damper & Elastomer Mount B2B Supplement



6. Business Model

Competitiveness Analysis of Product(SWOT Analysis)

➤ Internal Competency Analysis

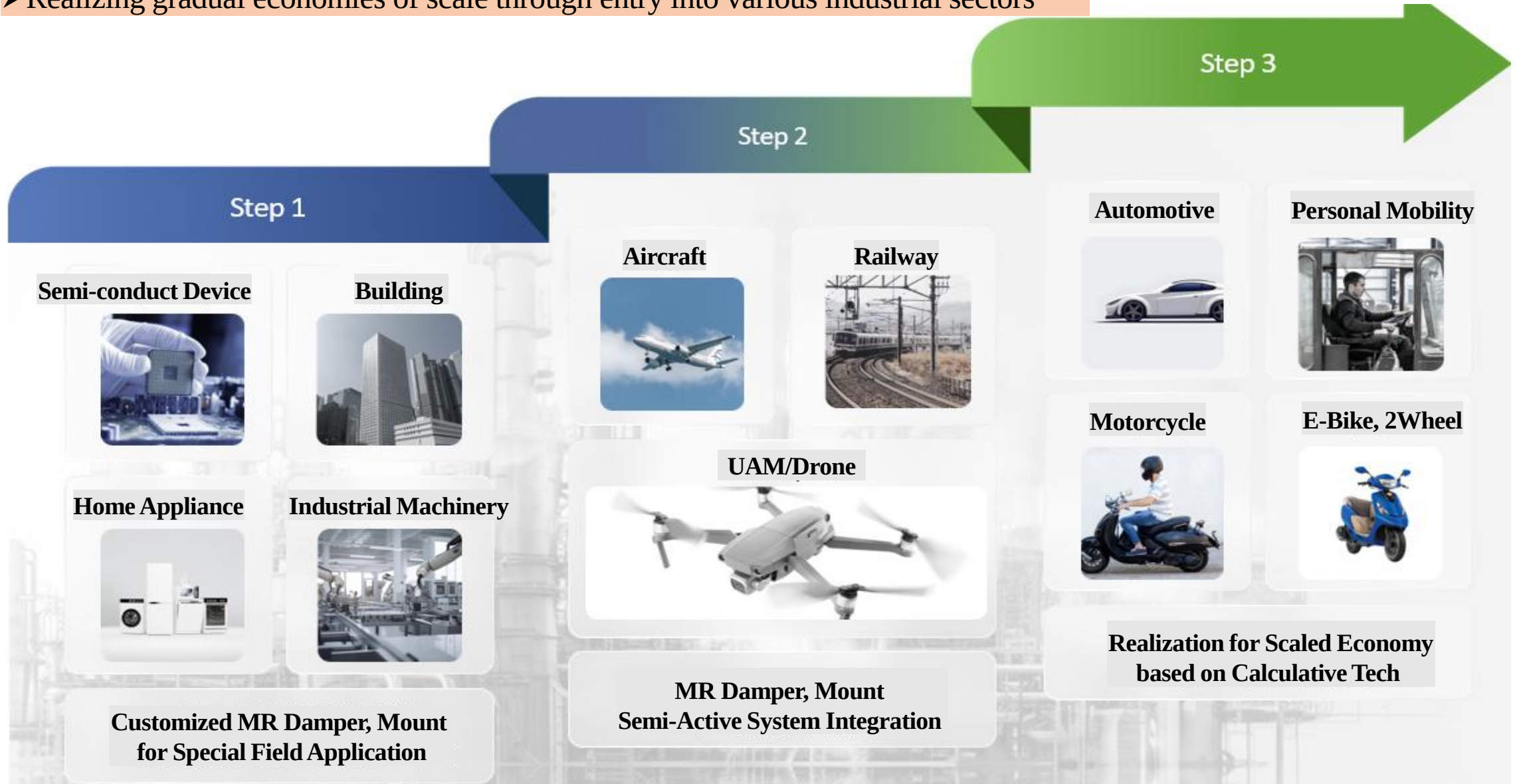
Strength	Weaknesses
[Positive] 1. Based on Dev. of PJT of MR Damper, Mount for Transportation, Aircraft 2. Market Conquest, Possible to preempt for Vibration Attenuation device Defense Air-craft(UAV) 3. MR mount, damper design, performance evaluation, and manufacturing, securing component technology 4. Acquire product controller design, manufacturing technology 5. Secure the Parts Dev. and mass production ability	[Negative] 1. Insufficient customer acquisition for first commercialization attempt 2. Insufficient No. of UAM, UAV/Drone application cases 3. Insufficient mass production standardization of Products for MR Elastomer, MR Damper product (Req. of Mass production Standardization)

➤ External environment analysis

Opportunity	Threat
[Positive external environmental factors] 1. Domestic commercialization of UAM, an explosive growth trend of the global eco-friendly future mobility industry market. 2. Market expansion and increased demand due to the K-defense Industry boom up. 3. Political uncertainty in Korea and the disappearance of the Korea discount.	[Negative External environmental factors] 1. Thorough internal and security management when applied as initial military parts 2. Mass production is not possible due to the initial customer demand and the small size of the annual quantity. Reduced profit margin due to a small quantity

7. Mid-long-term Plan

➤ Realizing gradual economies of scale through entry into various industrial sectors



7. Mid-long term(Final goal) Plan

Exit(M&A) Strategy Plan

Division	M&A Case	Domestic Company	Global Company	Remark
UAM & UAV/Drone	-	H/KMC, Hanhwa Aerospace (Over Air)	Air Bus, Joby Aviation(□) Archer Aviation, Wisk Aero Volocopter(≡), Vertical Aerospace	Noise, Vibration Reduction Ride, Low Freq. Improvement Active Noise Control
Autonomous Traveling	Google's Waymo & Lyft, Amazon & Zoox	Samsung, H/KMC, Mobis, Mando, KG Mobility	Waymo, Tesla GM, Benz, BMW, VW, Siemens, ZF, Continental, Thyssen Krupp	Autonomous Traveling, Data Application
xEV(HEV) FCEV Vehicle	GM & Cruise, Tesla & SolarCity	LG Chemical SK Innovation	GM, Tesla, Benz, BMW, VW, Siemens, ZF, Continental, Thyssen Krupp	MR Suspension 및 MR Mount Battery & xEV Product
Mobility Platform	Uber & Careem, BMW & Daimler	Kakao Mobility T-Map, Nero	Uber, Lyft	Integral Mobility Service
Connected Car	Samsung & Harman	KT & SK Telecom	Harman, Apple	V2X, Connected Car

8. CEO, Team Capability

ezntec
system Inc.

CEO



Seonghwan Kim,
(Ph.D. CEO)

▪ **H/Q, R&D Center : Tel: +82)31-292-9187**

85303, Research & Business Foundation SKK Univ., 2066 Seobu-ro, Jangan-gu, Suwon-Si, Kyoung Gi-do, Rep. of Korea (16419)

▪ **Manufacturing Site: 1F Seoyoung Precision Ltd.**

255-1, Nongdari-ro, Mun Baek Myon, Jincheon-gun, Chungbuk

▪ Educations

- ✓ Ph. D Degree : Mechanical Eng. Inha Univ.(Aug. 2020 / Advisor : Seung Bok Choi)
- ✓ B. S Degree : Mechanical Eng. Sung Kyun Kwan Univ. (Mar.1991~Feb. 1999)
- ✓ M.S Degree : Mechanical Eng. Sung Kyun Kwan Univ. (Oct. 1999 ~ Feb. 2002)

▪ Careers

- ✓ Ezntec System Inc, CEO (Oct. 2021 ~ Nov. 2025. Present)
- ✓ Mando Corporation Brake R&D Center NVH Team, Senior Research Engineer.
- ✓ Institute for Advanced Engineering Noise and Vibration Team

Team Capability

Name	Position	Birth date	Major	Degree	Year	Responsibility
Kim S.H	CEO	720601(M)	Mechanical Engineering	Ph.D.	2020	Total Management, AI Utilization, Design & Test,
Jang J. D	Vice President	580901(M)	Mechanical Engineering	Ph.D.	2014	Design, CAE Analysis
Yoon Y.H	Managing Director	670917(M)	Mechanical Engineering	Ph.D.	2002	CAE Analysis, HILL Test
Kim Y.S	Senior Managing Director	590223(M)	Mechanical Engineering	B.S	1984	Outsourcing Dev. & Part Purchasing
Shin C.S	General Manager	761023(M)	Engineering Design	B.S	2002	3D Product Design, 2D Drawing
Seo W.J	Assistant Manager	970219(M)	Electrical Engineering	Associate Degree	2022	Test, Evaluation & Test Device management

Found. Date

Oct. 2021(Sep. 2020)

Manufacturing. Site



Sung Kyun Kwan Univ. Natural Eng. Campus



▪ Activity

- ✓ KEIT & IRIS Project Audit, Evaluation Committee,(Machine- Materials Div.) (2022~ 2025 Present)
- ✓ TIPA Project Audit, Evaluation Committee(2021~ 2025 Present)
- ✓ Responsible Committee Member for Smart Ship& Marine Structure, Ministry of Oceans (2025.1 ~ Present)
- ✓ KSNVE Member. (2008 ~ 2025 Present) / KSAE member (2004~ 2025 present)

➤ External Technical Advisor Consultant

- ✓ Div. of Product Development Technical Consultant: S. B. Choi, Prof (New York Sunny Univ. Mechanical Eng.)
- ✓ Div. of Test, Evaluation Advisor and Consultant: D. H Sung, Prof. (Suwon Univ. Automotive Eng.)
- ✓ Div. of Manufacturing Production, and Test Evaluation: Master Craftsman Joo-Ho Kim (Hyundai Doosan Infracore, Korea Technology Master Craftsman)

Vision

- Leading company & Hidden Champion for Smart material-based Noise, Vibration Tech
- MR Application based on the Mechanical, Mobility module & System Dev., Total Solution

Business Fields

➤ Smart Material Applications for Vibration Attenuation and Control



➤ Application of Noise and Vibration Attenuation for Mechanical and Automotive Systems



➤ CAE Analysis & NVH Test for Automotive, Mechanical Systems



➤ Sales, Consulting on Noise & Vibration prevention structures, and Product manufacturing sales

※ Current Status of Industrial Property Rights

: Patent Registration 7 EA, Application(Submit) 3EA, Deposit 1EA, Design 1EA

구분	등록번호(출원번호)	기술의 명칭
특허(국내)	제10-2367011호	자기유변유체기반의 가변 감쇠력을 가지는 전기 자전거를 포함한 이륜 차량용 스마트 서스펜션 시스템과 이를 포함하는 이륜차
특허(국내)	제10-2832663호	자기유변유체와 자기유변탄성체를 이용하여 강성과 감쇠를 제어할 수 있는 진동 저감 장치
특허(국내)	10-2024-0115903(출)	자기코어 제조 공정을 포함하는 MR 댐퍼 어셈블리 제조 방법
특허(국내)	10-2025-0084341(출)	가변 강성 및 주파수 가변특성을 가지는 다축 스마트 진동 절연 구조체
특허(국내)	10-2025-0084342(출)	자기장의 세기에 반응하는 자기유변탄성체(MR Elastomer)의 제조 공법 및 물성 평가 방법
임치 기술	2024-02-07-5186	가변 감쇠력을 가지는 노면 입력 감응형 소형급 전기 수소 자동차의 반 능동형 현가 장치 및 댐퍼 요소 기술 개발
실용신안	제 20-0496793호	중장비 캐빈의 진동 저감을 위한 다축 및 횡방향 진동 절연 MR 마운트 구조체
특허(국내)	제10-2195115호	음식물 쓰레기 처리 장치
특허(국내)	제10-2195116호	음식물 쓰레기 처리 장치
특허(국내)	제10-2322619호	음식물 처리기의 제어 시스템 및 그의 제어 방법
특허(국내)	제10-2066980호	토크 컨버터 자동화 제조 시스템, 토크 컨버터의 제조 방법 및 그에 제조방법에 의해 제조된 토크 컨버터
특허(국내)	제10-2066981호	토크 컨버터 자동화 제조 시스템, 토크 컨버터의 제조 방법 및 그에 제조방법에 의해 제조된 토크 컨버터
디자인	제30-1261374호	음식물 쓰레기 처리기

9. Appeal Point

Damper(Shock Absorber), Mount

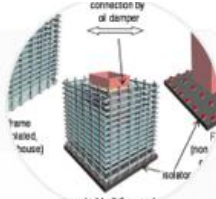
: **A core component that improves product performance and safety** by reducing vibration, shock occurs in various industrial fields

Industrial Manufact. Machinery



기계의 안정성 유지 및 성능 최적화를 위해 사용

High Rise Building



동조 질량 댐퍼(TMD) 설치로, 바람 또는 지진으로 인한 진동 완화

Bridge, Suspension



진동 완화를 위해 설치, 바람이나 지진에 의한 진동 완화

Home Appliances



댐핑 특성을 조절, 유체의 점도 변화를 통한, 진동 제어, 불규칙한 움직임을 효과적으로 감소

Aircraft & Railway



자기유변유체를 이용, 실시간으로 진동과 충격 조절하여 차량의 안정성 향상

Automotive Suspension



승차감 향상 및 차량의 안정성 유지. 유체 압축 및 확장으로 진동 흡수



Propose an optimized Solution for the Industrial fields of the Core Companies

대면적 복합재 제조사와의 협력 네트워크를 이용하여 고객사의 차량용 부품 개발 지원



✓ System Safety and Tunable performance, Vibration Attenuation for Applications

✓ On Device AI & Smart Materials based

✓ Price competitiveness & Quality of MR Damper/Mount Applications

MR 댐퍼
반-능동제어
솔루션

NVH 솔루션 기반
기술개발 발전 및
사업확장 진행

기술적 발전
적응으로 성장

✓ System Control, performance tunable & enhancement(using On Device AI, Smart Materials)

Enhanced, Improved system & components in Life span for Various Industrials field

(Mechanical Future Mobility, Industrial Machinery, Bridge, Social Infrastructure etc.)