



R&D Grant Projects Specialist
Büşra Kandemir Şahin
Toksan Automotive



Toksan Otomotiv A.Ş. is an automotive tier1 supplier within the Küçüköğlü Holding founded in 1985.

Within its 20,000 m2 of covered area factories in Kocaeli and Bursa Toksan A.Ş. has been serving to the main global OEMs with development and production of shaped metal sheet parts and mechanism parts .

Toksan A.Ş, is executing product development with part design ,CAE analyses ,prototype production and testing activities in R&D center since 2011 in line with customer expectations.



➤ CAD:

- Catia V5 R2020(15 stations)
- NX 13

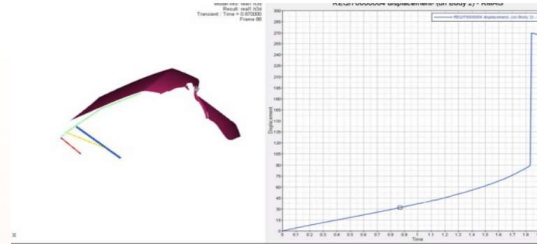
➤ FEA: HYPERWORKS 19 and NX

- Meshing : Hypermesh
- Structural Analysis: Radioss
- Kinematic Analysis: MotionSolve and nXMotion
- Forming Analysis : HyperForm
- Optimization: Optistruct

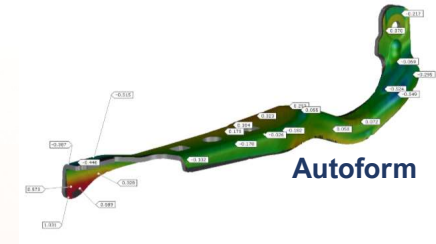
➤ FEA: FORMING SUIT

- Fast Blank:Blank Optimization
- Fast Form:Forming Analysis

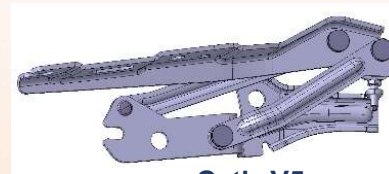
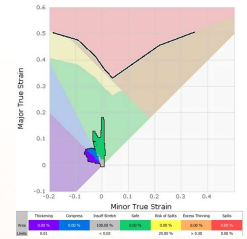
➤ AUTOFORM



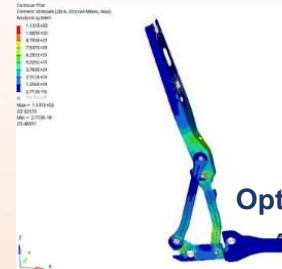
Motion Solve



Autoform



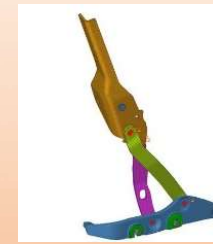
Catia V5



Optistruct



Forming Suit



Hypermesh



R&D Design Flow

Motion Analysis on The Motion

3D Design

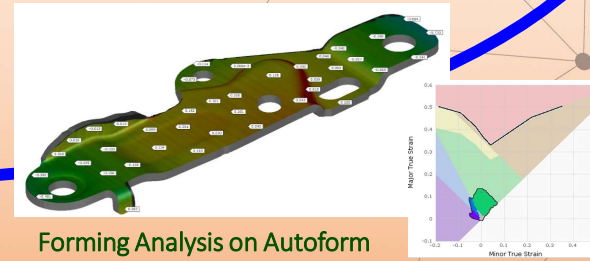
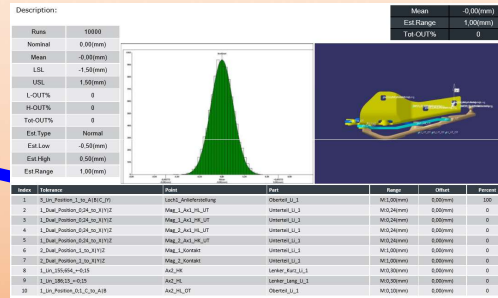
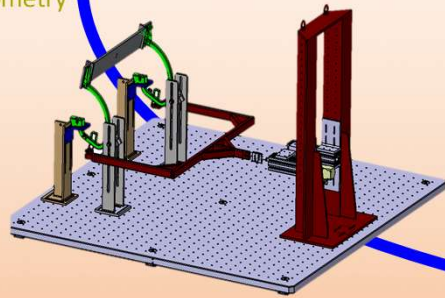
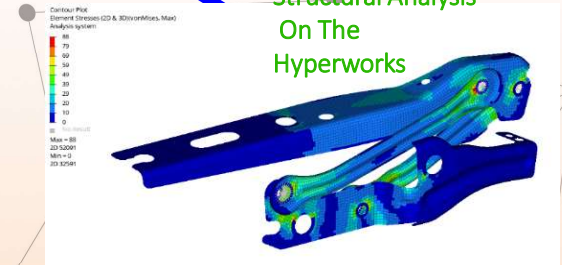
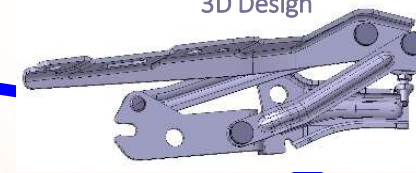
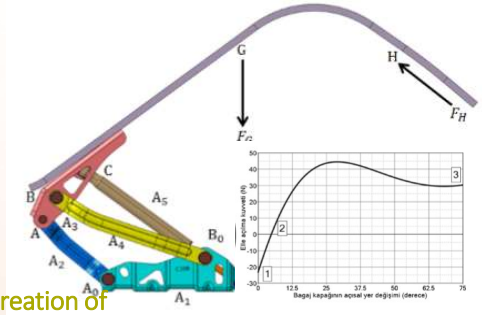
Structural Analysis On The Hyperworks

Forming Analysis on Autoform

Creation of mathematical models of draft design geometry

Physical Tests

Tolerance Analysis



Tests Capability

✓ Structural Test

- Resistance to mounting stop to overpressing: Force: 100 N
- Lift-out resistance: Force : 200N, 300 N
- Transverse stiffness: Force: 200 N

✓ TorqueTest

✓ Durability

- Temp.: -35 °C, RT, +80 °C
- Cycle: 10.000 cycles
salt spray application and
dust application
(salt spray test acc. to ISO
9227)

CAPABILITY

✓ Structural Test

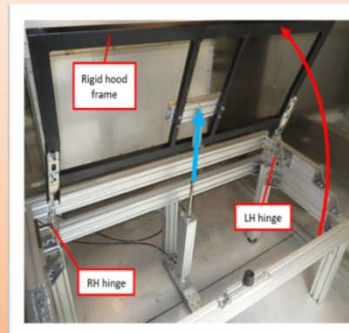
- Load cases up to 14 KN
- Electric linear actuators
- Real-time measurement of forces and displacements

✓ Friction/TorqueTest

- Servo drive with integrated angle measurement

✓ Durability test

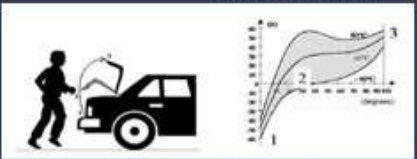
- Chamber 1: -40°C ~ 100°C , 8 m3, 5 ~ 95% humd.
- Chamber 2: -40°C ~ 170°C , 1 m3, 5 ~ 95% humd.
- Chamber 3: -40°C ~ 180°C , 1 m3, 5 ~ 95% humd.



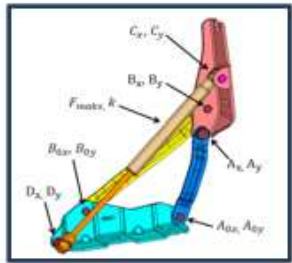

Ministry of Science, Industry and Technology - Industry Theses Project Cooperation with Uludağ University

Aim of the project : to provide the desired movement of the hood , optimization algorithm with the size synthesis is developed instead of the classical design and analysis methods

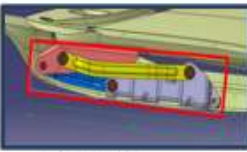
CONSTRAINTS



Displacement-Force Curve

Trunk lid positions



Constraints

TRADITIONAL DESIGN

```

graph LR
    V[Variables] --> D[Design]
    C[Constraints] --> D
    D --> A[Analysis]
    A --> FD[Final Design]
    A --> V
    
```

OPTIMUM DESIGN

```

graph LR
    V[Variables] --> ALG[Algorithm]
    C[Constraints] --> ALG
    ALG --> OPT[Optimization]
    OPT --> OD[Optimum design]
    
```

OPTIMISATION

Variables	Lower Limit	Initial Value	Upper Limit	Optimum Value
A_{0x}	3150	3165	3175	3159
A_{0y}	810	825	835	817.574
B_{0x}	3266	3280	3290	3274.876
B_{0y}	820	834	845	839.327
C_x	3115	3129	3145	3131.295
C_y	840	850	865	855.486
F_{maxk}	860	910	980	905.658
k	3.2	3.5	4.5	3.73

PATENTED

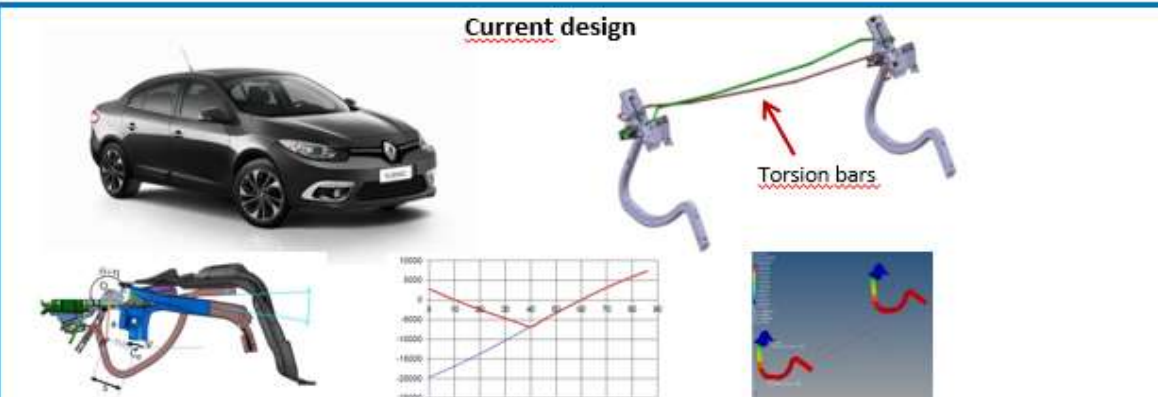
Achieve an optimum hinge design that can realize the movement of the hood along the predetermined set of 3 positions by optimization algorithm developed in MATLAB. The optimization algorithm determines the connection points and dimension of the hinges. The mechanism that provides the closest curve to the manual opening force curve between the mechanisms that provide dimension synthesis and the design boundary condition is determined by the algorithm as the optimum mechanism.

The developed algorithm saves time as %40 in design stage with eliminating trial and error loop

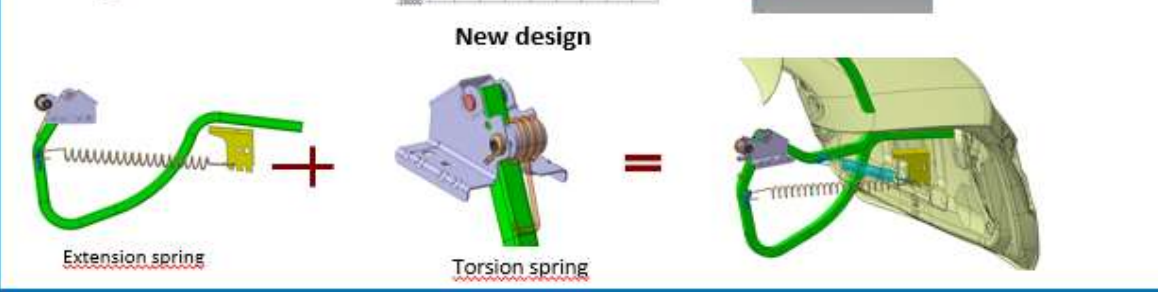
Scientific and Technological Research Council of Turkey - Industry Support R&D Cooperation with Oyak Renault

Aim of the project : This project focused on developing a new gooseneck hinge system for Renault Fluence. Although torsion bars are used widely in sedan vehicles, they have some disadvantages such as noise, heavy weight due to the connected brackets and occupies much trunk space.

Current design



New design



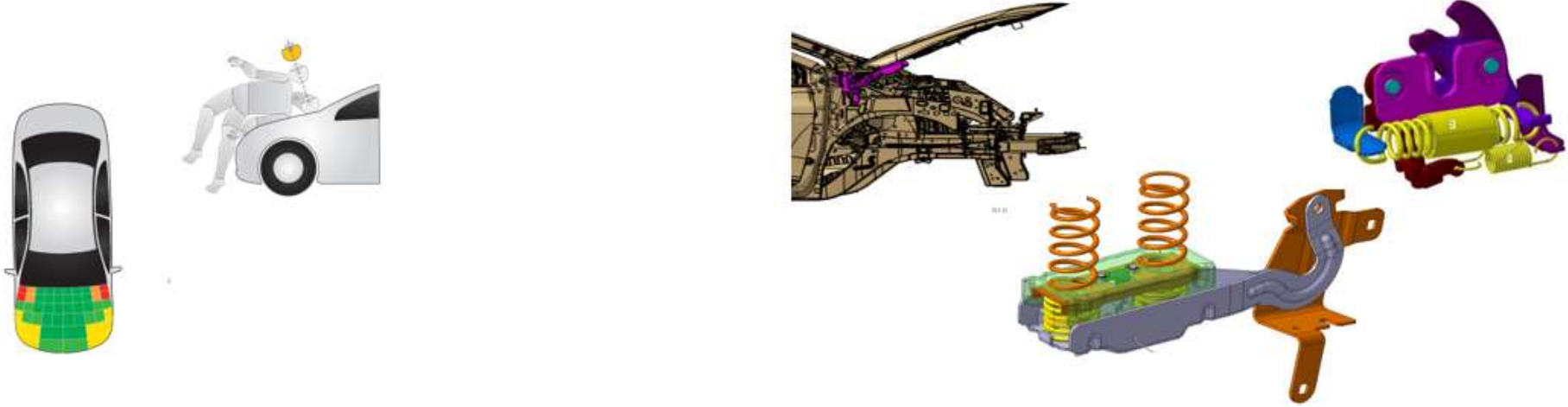
Gooseneck Hinge		Current	New
Profile	Material	St14	St37
	thickness (mm)	25x25	21x21
	length (mm)	850	840
Small bracket	weight (gr)	1187	948
	Material	XES	7136
	thickness (mm)	2	1,6
	weight (gr)	254	206
Link bracket	Aweight (gr)	112	0
Big bracket	weight (gr)	293	0
Pin-Bush	weight (gr)	10	10
Nut	weight (gr)	20	15
Total weight (gr)		1876	1179
Operation time (s)		135	65
Total weight reduction(gr)/vehicle		1394	
Operasyon time reduction(s)/vehicle		140	

A new gooseneck hinge system is developed including torsion and extension springs instead of using torsion bars enabling % 37 weight reduction and %52 operation time reduction.

Scientific and Technological Research Council of Turkey - Industry Support R&D Cooperation with Oyak Renault

Aim of the project : This project focuses on design and production of low-cost and reversible active bonnet system for pedestrian safety.

PATENTED

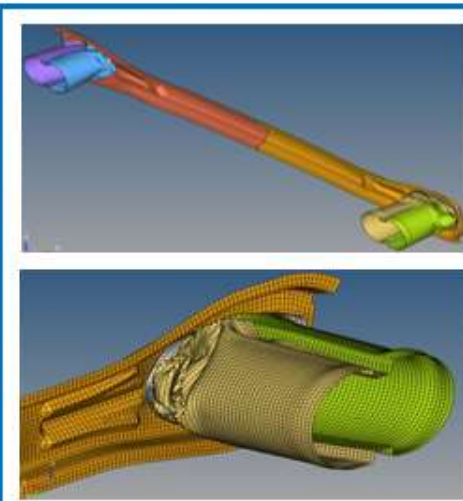
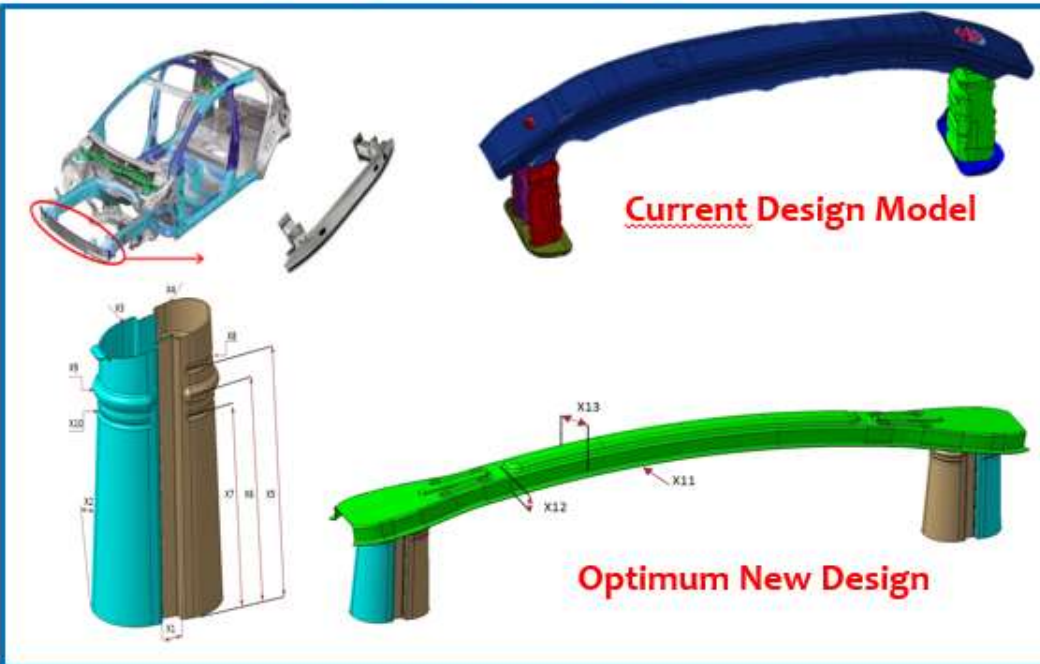


In line with the Renault Clio 4 of the mid-segment vehicles, design criteria have been determined, 3D designs have been realized, kinematic and structural analyzes have been completed and test studies were carried out.

When the pedestrian strikes the vehicle, the hood system has a reversible opening value of 94 mm within 40ms specified as the target values.

Ministry of Science, Industry and Technology - Industry Theses Project
Cooperation with Uludag University

Aim of the project :to perform a new energy absorber and bumper model which has better collision performance, higher efficiency and weight saving than the base model by the numerical analyses results. Their model's parameter specifications carried out to be able to do optimisation running and models was created by using Taguchi method. Optimum impact absorber and bumper model was created with the respons surface approachment equations that using differential evolutionary algorithm.



Design variables

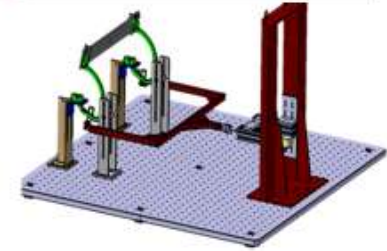
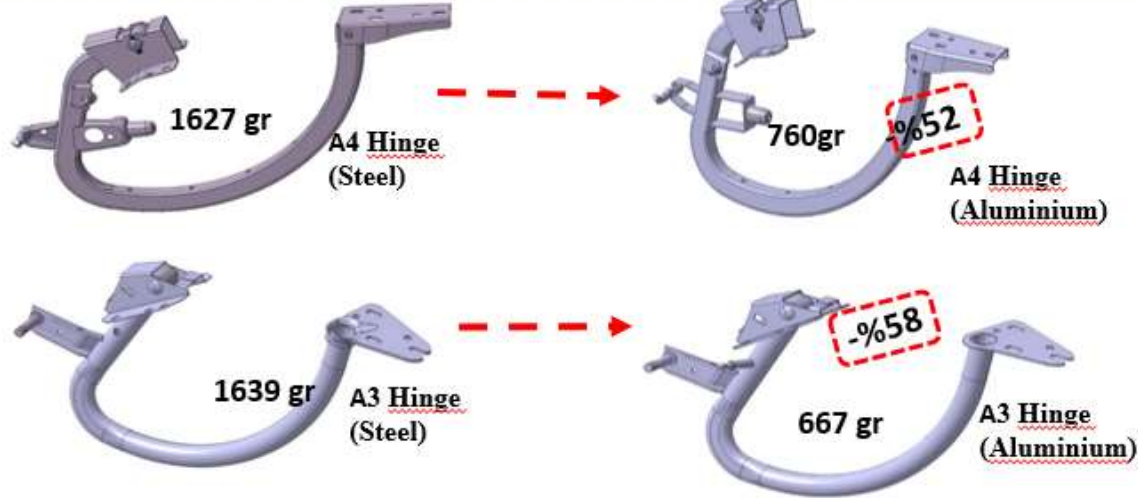
Design Variables(mm)	Lower limit	Initial design	Upper limit
X1	15	20	22
X2	0,5	1	5
X3	1,5	1,8	1,9
X4	1,5	1,6	1,9
X5	190	192	202
X6	168	172	178
X7	135	140	154
X8	2	4	5
X9	2	5	5
X10	2	3	5
X11	1,7	2	2,1
X12	18	26	32
X13	60	80	83

	Total Displacement	Total Peak Force	Total Energy Absorption	Efficiency	Specific Efficiency	Weight
Optimum	165	127	13,45	64%	32%	4132
Yaris	131	205	13,5	50%	18%	7314

The part reduced from 7314 grams to 4132 grams by new design and optimisation algorithm. Also, the efficiency is increased to %64.

Scientific and Technological Research Council of Turkey - Industry Support R&D

Aim of the project : Weight reduction of the steel luggage hinges. The production of luggage hinges by 6XXX aluminium alloys is investigated for the weight reduction of a car.



PATENTED

In order to improve the shaping behavior of the aluminum alloys, the heat treatment procedure was performed so that bending and pressing operations of the hinge parts in the desired geometry were provided. In order to improve the strength properties expected to be reduced by MIG welding and to provide equivalent strength properties to the steel hinge, strength improvement approach studies were carried out. The hinges, which were heated at 200C with 1 hour heat treatment, successfully passed the performance tests (wind, lateral strength, gas spring and life test) specified in the customer specifications.

The aluminum hinges produced in equal resistance to the steel hinge, %52-%58 weight reduction gained and a fuel saving of 0.001 L / km.

PRODUCTION

Sheet Metal Processing Capacity

Plant	Capacity
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- | | |
|----------------|-------------|
| • Toksan Bursa | 35.000 Tons |
| • Toksan Gebze | 30.000 Tons |

Overall Press Capacity

We have more than 45 Stamping Presses varies in between 250 tons to 1000 tons in our production facilities

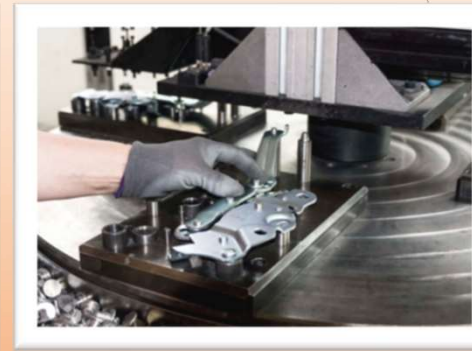
Welding Capacity

- 29 Arc Welding Robot
- 33 Spot Welding Robot

Spot Welding Line

Assembly & Bending Capabilities

Capacity with our bending machines
5.000.000 mt / year



To join as a Partner

Research Interests in keywords:

Design, automotive, light material, metal joining methods, steel, aluminum, AHSS (Advanced High Strength Steels), material, mechanized part development, automotive component design, sheet metal forming, hinge, pedal.

The main activities of TOKSAN are as follows:

1. Design development studies for project-specific parts by making a design partnership,
2. Strength testing and analysis of parts with simple design,
3. Equipment design and manufacture.
4. Research and analyses-oriented activities: co-designer, product analysis



Calls for Partnership

- **HORIZON-CL4-2021-TWIN-TRANSITION-01-01:** AI enhanced robotics systems for smart manufacturing
- **HORIZON-CL4-2021-TWIN-TRANSITION-01-02:** Zero-defect manufacturing towards zero-waste
- **HORIZON-CL4-2021-TWIN-TRANSITION-01-07:** Artificial Intelligence for sustainable, agile manufacturing
- **HORIZON-CL4-2021-TWIN-TRANSITION-01-17:** Plastic waste as a circular carbon feedstock for industry
- **HORIZON-CL4-2021-TWIN-TRANSITION-01-17:** Plastic waste as a circular carbon feedstock for industry
- **HORIZON-CL5-2021-D6-01-10:** Testing safe lightweight vehicles and improved safe human-technology interaction in the future traffic system



Contact

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