



**WORK PACKAGE 6 (WP6)**  
**Communication, dissemination  
and exploitation**

**PROJECT DELIVERABLE 6.5**  
**ORGANISATION OF EVENTS FOR  
PROFESSIONAL AND WIDER PUBLIC**



**FUTUre RAil freight transport: cost-effective, safe, quiet and green! – FUTURA**



The FUTURA project has received funding from the European Union`s Horizon 2020 research and innovation programme under grant agreement No.700985

**December 2017**

## TABLE OF CONTENTS

TABLE OF CONTENTS.....	I
DOCUMENT AUTHORS AND REVIEWERS .....	II
LIST OF FIGURES .....	III
<b>1 INTRODUCTION.....</b>	<b>1</b>
<b>2 MAIN OBJECTIVES.....</b>	<b>1</b>
<b>3 ORGANISATION OF EVENTS .....</b>	<b>1</b>
<b>3.1 Kick-off conference.....</b>	<b>1</b>
3.1.1 Presentation of the FUTURA project (purpose, objectives, scope, time frame).....	4
3.1.2 Presentation of the project partners .....	5
3.1.3 Press conference.....	5
<b>3.2 International professional and interactive conference .....</b>	<b>6</b>
3.2.1 Welcome speech of the manager .....	8
3.2.2 Presentation of the FUTURA project (purpose, objectives, scope, time frame).....	8
3.2.3 Presentation of project partners .....	8
3.2.4 Press conference.....	9
3.2.5 Discussion .....	9
<b>3.3 Open house week with “show room” in Kovis d.o.o.....</b>	<b>10</b>
3.3.1 Welcome speech of the manager .....	11
3.3.2 Presentation of the FUTURA prototypes – show room .....	12
3.3.3 Press conference.....	21
<b>3.4 Final conference .....</b>	<b>22</b>
3.4.1 Presentation of the FUTURA project and main results.....	25
3.4.2 Press conference.....	26
3.4.3 Discussion .....	26
<b>3.5 Lecture at the University of Žilina.....</b>	<b>27</b>
<b>3.6 Czech Raildays event .....</b>	<b>28</b>
<b>3.7 Association of Slovakian laboratories and testing houses.....</b>	<b>31</b>

## DOCUMENT AUTHORS AND REVIEWERS

### Lead Authors

Name	Organization
Karmen Vrtovšnik	KOVIS d.o.o
Andrej Hočevar	KOVIS d.o.o.
Tomáš Dihel	ZX BENET CZ s.r.o.
Zdeňka Poskočilová	ZX BENET CZ s.r.o.
Marie Guřanová	ZX BENET CZ s.r.o.
Barbora Klimekova	OMNIA KLF

### Reviewers

Name	Organization
Alen Šinko	KOVIS d.o.o
Mitja Črpič	KOVIS d.o.o
Ivan Smolej	KOVIS d.o.o
Peter Duchovič	OMNIA KLF
Martin Pormann	ZX-BENET
Petr Beránek	ZX-BENET
Lubomir Palčak	VUD

## LIST OF FIGURES

Figure 1: Participants of the Kick-off conference .....	2
Figure 2: Invitation letter to the Kick-off conference .....	3
Figure 3: Presentation of the FUTURA project .....	4
Figure 4: Presentation of the project partners .....	5
Figure 5: Invitation letter to the International professional and interactive conference .....	7
Figure 6: Presentation of testing in real environment .....	8
Figure 7: Press conference .....	9
Figure 8: Invitation letter to the Open House week .....	11
Figure 9: Show room with all FUTURA prototypes .....	12
Figure 10: Presentation of FUTURA prototypes .....	12
Figure 11: Presentation to the customers .....	13
Figure 12: Presentation to the mayer of Brežice .....	13
Figure 13: Presentation of the initial design .....	14
Figure 14: Presentation of the first FUTURA prototype .....	15
Figure 15: Presentation of the second FUTURA prototype .....	16
Figure 16: Presentation of the third FUTURA prototype .....	17
Figure 17: Presentation of the fourth FUTURA prototype .....	18
Figure 18: Presentation of the fifth FUTURA prototype .....	19
Figure 19: FUTURA prototypes comparison .....	20
Figure 20: TV report by Vaš Kanal .....	21
Figure 21: Participations on the Final 3 <sup>rd</sup> conference .....	23
Figure 22: Conference room for the Final 3 <sup>rd</sup> conference .....	23
Figure 23: Invitation letter to the Final 3 <sup>rd</sup> conference .....	24
Figure 24: Presentation of the FUTURA project .....	25
Figure 25: Mr. Duchovič - an interview for regional television Turiec .....	26
Figure 26: Presentation of the project FUTURA to the students from University of Žilina .....	27
Figure 27: Presentation of the project FUTURA to the students from University of Žilina .....	28
Figure 28: FUTURA day on the KOVIS booth .....	28
Figure 29: FUTURA day on the ZX-Benet booth .....	29
Figure 30: Mounted prototype on wagon .....	30
Figure 31: Results from measurement of wheel profile .....	30

## 1 INTRODUCTION

The scope of the present document is to report and to present the preparation of the organisation of events for professional and wider public, all events within FUTURA action.

## 2 MAIN OBJECTIVES

The main objectives of the events for professional and wider public are to increase awareness of the action and to inform business partners, general and professional public, decision-makers and policy makers, knowledge and research institutions about the FUTURA action, its main milestones and results.

## 3 ORGANISATION OF EVENTS

Under events for professional and wider public, we have organised three (3) conferences and Open House week:

- Kick - off conference
- International professional and interactive conference
- Open House week
- The project-end conference
- Other

### 3.1 Kick-off conference

On 1<sup>st</sup> of December 2016 Kovis organized a Kick-off conference of the project FUTURA in the conference room of the Youth Centre Brežice. With the attend to introduce the first results of the first prototype to the professional and the general public, the kick-off conference was organised nine months after the start of the project.

At the conference all the partners in the project were present – Kovis from Slovenia, Omnia and VUD from Slovakia and ZX-Benet from Czech Republic. The event was also attended by the Mayor of Brežice Ivan Molan, director of Chamber of commerce Posavje, Krško Darko Gorišek,

representative of Regional Development Agency Posavje mag. Nataša Šerbec and headmaster of School Centre Krško-Sevnica Jože Pavlovič and other partners and suppliers.

The agenda of the meeting:

1. Welcome speech of the project manager
2. Presentation of the FUTURA project (purpose, objectives, scope, time frame)
3. Presentation of project partners
4. Press conference



Figure 1: Participants of the Kick-off conference



**PROJEKT FUTURA**  
Glavni cilj predlaganega projekta je izboljšanje kakovosti in varnosti življenja več kot 55 milijonom državljanov EU, ki živijo ali delajo v bližini železniške proge.



**PROJECT FUTURA**  
The main objective of the proposed action is to improve the quality and safety of life of over 55 million EU citizens who live or work near train tracks.

Vabimo vas na  
**KICK-OFF KONFERENCO**  
projekta **FUTURA**

ki bo v četrtek  
**1. decembra 2016**  
ob 10.00 uri

v **Mladinskem centru Brežice**  
Gubčeva 10a, Brežice

Prosimo, da potrdite vašo udeležbo na elektronski naslov:  
karmen.vrtovsnik@kovis-group.com

You are invited to the  
**KICK-OFF CONFERENCE**  
of the **FUTURA** project

on Thursday  
**1<sup>st</sup> of December 2016**  
at 10.00 a.m.

at **Youth Centre Brežice**  
Gubčeva 10a, Brežice

Please confirm your participation to the email address:  
karmen.vrtovsnik@kovis-group.com

**Dnevni red:**

10:00 – 10:30	Pozdravni nagovor vodje projekta
10:30 – 11:30	Predstavitve projekta Futura (namen, cilji, obseg, časovni okvir)
11:30 – 12:00	Predstavitve projektnih partnerjev
12:00 – 12:30	Novinarska konferenca
12:30 – 13:00	Pogostitev

**Agenda:**

10:00 – 10:30	Welcome speech of the project manager
10:30 – 11:30	Presentation of the FUTURA project (purpose, objectives, scope, time frame)
11:30 – 12:00	Presentation of project partners
12:00 – 12:30	Press conference
12:30 – 13:00	Snacks and coffee

Projekt FUTURA je prejel sredstva raziskovalnega in inovacijskega programa Evropske unije Obzorje 2020 pod pogodbo o sofinanciranju št. 700985.



The FUTURA project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 700985

Figure 2: Invitation letter to the Kick-off conference

Mr. Alen Šinko, director of company Kovis and Mr. Ivan Smolej, the project manager of FUTURA welcomed all the present guests. The welcoming speech was intended to motivate participants

(professional and general public) to follow the project and to raise interest. They thanked all for participating on the first conference and invited partners to continuously monitor the project and further develop prototypes. They presented the media where it will be possible to monitor the project during the implementation.

### 3.1.1 Presentation of the FUTURA project (purpose, objectives, scope, time frame)

Basic rules of implementation of the FUTURA project were presented and an overview of the project was carried out. The project had to be implemented in accordance with the Grant Agreement and all its annexes. Also all relevant European and national legislation of each project partner have to be taken into account.



Figure 3: Presentation of the FUTURA project

To the public the significant value added for both operators as well as the owners of freight wagons was presented; improved technical features and a reduction in the disc's weight, result in less wear, lower wagon maintenance costs and reduced noise. All of these advantages have been acknowledged by the European Commission, further to which the FUTURA project, in which Kovis is



a partner, has received additional EU funding for research and innovation. On this occasion the first prototype, findings and results of laboratory tests were presented.

To increased awareness of the FUTURA action the visitors received promotion materials as multilingual leaflets, brochures, roll-up poster and gadgets as USB flash drives, folders, pens...

### 3.1.2 Presentation of the project partners

Each project partner prepared a brief presentation of the company and the role in the project Futura.



Figure 4: Presentation of the project partners

### 3.1.3 Press conference

On the conference the journalist from regional journal Posavski obzornik, Mr. Rok Retelj, was present. Nevertheless a lot about the project was explained on the conference, the journalist asked few additional questions:

1. Where did the idea about the divided brake discs for freight wagons come from?
2. Is there any similar product on the railway market?
3. What will the project contribute to the general public?

The article was published in the journal Posavski obzornik on 8<sup>th</sup> of December.

### **3.2 International professional and interactive conference**

On 13<sup>th</sup> of June 2017 ZX-Benet organised an International professional and Interactive conference in the conference hall at castle of Šilheřovice. The purpose of the conference was to inform academic, technicians, politicians, general and professional public about the FUTURA project. The conference attended Dr. hab. Ing. Janusz Cwiek – Head of department Silesian University of Technology Faculty of Transport, Dr. Ing. Adam Mańka professor of Silesian University of Technology Faculty of Transport, politician of Moravian – Silesian region Ing. Petr Baránek, Petr Kadeřávek – redactor of Czech railway magazine, Kamil Klajman – fleet manager from Railtrans wagon and other related people from railway industry and partners from FUTURA project.

The agenda of the meeting:

- Welcome speech of the project manager
- Presentation of the FUTURA project
- Presentation of project partners
- Press conference
- Discussion



COORDINATOR  


PARTNER 1  


PARTNER 2  


PARTNER 3  


[www.projectfutura.com](http://www.projectfutura.com)

**PROJEKT FUTURA**  
Hlavním cílem navrhovaného projektu je zlepšení kvality života a bezpečnosti více než 55 milionů obyvatel EU, kteří žijí či pracují blízko železničních tratí.



**PROJECT FUTURA**  
The main objective of the proposed action is to improve the quality and safety of life of over 55 million EU citizens who live or work near train tracks.

Rádi bychom Vás pozvali na  
**INTERAKTIVNÍ KONFERENCI**  
**projektu FUTURA,**

která se koná  
13.června 2017  
v 11.00 hod

**Zámek Šilheřovice, Zámecká 1, 747 15 Šilheřovice**

Prosíme o potvrzení účasti na email:  
zxbenet@zxbenet.cz

We are pleased to invite you to the  
**INTERACTIVE CONFERENCE**  
**of the FUTURA project**

on Thursday  
13<sup>th</sup> of June 2017  
at 11.00 a.m.

**Zámek Šilheřovice, Zámecká 1, 747 15 Šilheřovice**

Please confirm your participation to the email:  
zxbenet@zxbenet.cz

**Program:**

11:00 – 11:30	Zahájení a úvod
11:30 – 12:00	Prezentace projektu (účel, cíle, rozsah, časový rozvrh)
12:00 – 12:30	Představení partnerů projektu
12:30 – 13:00	Tisková konference
13:00 – 13:30	Občerstvení

**Agenda:**

11:00 – 11:30	Welcome speech of the manager
11:30 – 12:00	Presentation of the FUTURA project (purpose, objectives, scope, time frame)
12:00 – 12:30	Presentation of project partners
12:30 – 13:00	Press conference
13:00 – 13:30	Snacks and coffee

Projekt FUTURA je financován z programu Evropské Unie pro výzkum a inovace Horizon 2020 v rámci grantu číslo 700985.



The FUTURA project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 700985

Figure 5: Invitation letter to the International professional and interactive conference

### 3.2.1 Welcome speech of the manager

The conference started with the welcome speech of Mr. Martin Pormann, manager of the company ZX-Benet. He was pleased to welcome the general and professional public, business partners and the partners from consortium of FUTURA project.

### 3.2.2 Presentation of the FUTURA project (purpose, objectives, scope, time frame)

The main object of the conference was to present the Divided Rail Freight Brake Disc in real environment to the professional and the general public.

The consortium partners presented their companies and their role in the FUTURA project.

ZX BENET CZ presented to the public the method of carrying out testing of divided brake disc in the real environment and explained the results from testing from the beginning of December till June 2017. The assembly and wear values of the disc in relation to the driven kilometers was reviewed. From the technical side the construction of DRFB disc was discussed.



Figure 6: Presentation of testing in real environment

### 3.2.3 Presentation of project partners

The consortium partners had presented their companies. At first the company KOVIS started, followed by VÚD, OMNIA KLF and finished by ZX BENET CZ.

ZX BENET CZ introduced the divided brake disc, how it was tested in real environment, testing results from the beginning of December to June 2017. Described were the inspections, results from measurements.

### 3.2.4 Press conference

The main discussion was about the new prototypes of DRFB discs that will be produced in July and the results from testing in real environment. After six months of testing, the results are according to expectation. The measurement of roughness friction surfaces, degradation of material/hardness measured by hardness tester MIC, wear rate of disc measurement by Calipri device- wheel set measurement tool and visuals inspection (for foreign matter, firm fit of DRFB disc crown and hub check of connecting elements, for crack and inspection of brake pads).

The academics wondered about the materials of DRFB discs, technicians were interested about the construction of DRFB discs.



Figure 7: Press conference

### 3.2.5 Discussion

After the presentation of the FUTURA project, discussion developed and the academics wondered if it's possible that the university could participate at the testing and developing of new improved materials for the brake discs. Mr. Smolej was invited to present the FUTURA project and DRFB disc at the university. At the end it was found out that on the Polish rail market a lot of potential for DRFB discs exists.

### 3.3 Open house week with “show room” in Kovis d.o.o.

Project FUTURA is near to the end of its action and because of that the coordinator Kovis organised an Open House week where all potential buyers were invited, to present all the prototypes which were developed and tested during the project, its features and advantages. For that purpose a "show room" was arranged.

On 6<sup>th</sup> of November 2017 Kovis opened its doors to the professional public and the general public. To the audience all five prototypes of DRFB discs were presented in the show room. The event took place from 6<sup>th</sup> till 10<sup>th</sup> of November, in the Kovis business unit Velika Dolina. The purpose of the Open House week was the presentation of the last stage of the project of developing Divided Rail Freight Brake Discs.

The agenda of the meeting:

1. Welcome speech of the project manager
2. Presentation of the FUTURA prototypes – show room
3. Open topics



COORDINATOR
PARTNER 1
PARTNER 2
PARTNER 3






[www.projectfutura.com](http://www.projectfutura.com)

**PROJEKT FUTURA**  
Das Hauptziel der vorgeschlagenen Aktion ist die Verbesserung der Lebensqualität und –sicherheit von 55 Millionen EU-Bürgern, die in der Nähe von Eisenbahnstrecken leben oder arbeiten.



**PROJECT FUTURA**  
The main objective of the proposed action is to improve the quality and safety of life of over 55 million EU citizens who live or work near train tracks.

Einladung zur  
**WOCHE DER OFFENEN TÜR  
PROJEKT FUTURA**

in der Woche  
vom 6.-10. November 2017  
zwischen 11.00 und 13.00 Uhr

in der Firma KOVIS d.o.o.  
Geschäftseinheit Velika Dolina  
Velika Dolina 37  
Jesenice na Dolenjskem  
GPS: Breitengrad: 45.851114 | Längengrad: 15.661339

Bitte bestätigen Sie Ihre Teilnahme unter der folgenden Email-Adresse:  
karmen.vrtovsnik@kovis-group.com

You are kindly invited to the  
**OPEN HOUSE WEEK  
OF THE FUTURA PROJECT**

in the week from  
November 6 – 10, 2017  
11.00 a.m. – 13.00 p.m.

at the company KOVIS d.o.o.  
Business Unit Velika Dolina  
Velika Dolina 37  
Jesenice na Dolenjskem  
GPS: Latitude: 45.851114 | Longitude: 15.661339

Please confirm your participation by sending to the email address:  
karmen.vrtovsnik@kovis-group.com

---

**Agenda:**

11:00 – 11:15 Begrüßung durch den Geschäftsleiter

11:15 – 12:00 Präsentation die Prototypen Futura im Ausstellungsraum

12:00 – 12:30 Sonstiges

12:30 – 13:00 Snacks und Kaffee

**Agenda:**

11:00 – 11:15 Welcome speech of the project manager

11:15 – 12:00 Presentation of the FUTURA prototypes – show room

12:00 – 12:30 Open Topics

12:30 – 13:00 Snacks and coffee

---

Das Projekt FUTURA hat unter der Finanzhilfevereinbarung Nr. 700985 eine Finanzierung durch das Forschungs- und Innovationsprogramm Horizon 2020 erhalten.



The FUTURA project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 700985

Figure 8: Invitation letter to the Open House week

### 3.3.1 Welcome speech of the manager

Due to the week event, the main event was prepared on Wednesday, when the general manager Mr. Alen Šinko and R&D manager, Mr. Ivan Smolej, welcomed all the present guests. The presentation of the project FUTURA was done this day. The journalists from the local television Vaš kanal and journalist from the local radio station, Radio Krka were present on the Open House week and both, Mr Šinko and Mr. Smolej, gave the press release.

### 3.3.2 Presentation of the FUTURA prototypes – show room

The purpose of the event was the presentation of all five prototypes of DRFB discs and presentation findings of laboratory tests and tests from the real environment.

All five prototypes were placed in the show room. The R&D engineers presented the advantages of each prototype, improvements, findings and laboratory test results.



Figure 9: Show room with all FUTURA prototypes



Figure 10: Presentation of FUTURA prototypes



The visitors were our potential customers from SŽ-VIT, the mayor of Brežice Ivan Molan, director of Chamber of commerce Posavje Krško Darko Gorišek, director of Regional Development Agency Posavje Martin Bratanič and others coming from professional and general public.



Figure 11: Presentation to the customers



Figure 12: Presentation to the mayer of Brežice

On the Open House days all five prototypes and the initial design were presented. The presentations below were used for demonstration:

## Initial design

Main properties:

- . Mass: 145 kg
- . Air resistance: 475 W
- . Drag brake temp.: 369 °C

Key features:

- . High heat dissipation
- . Higher rotational resistance
- . Medium torque transfer capability
- . Vibrations can appear during operation

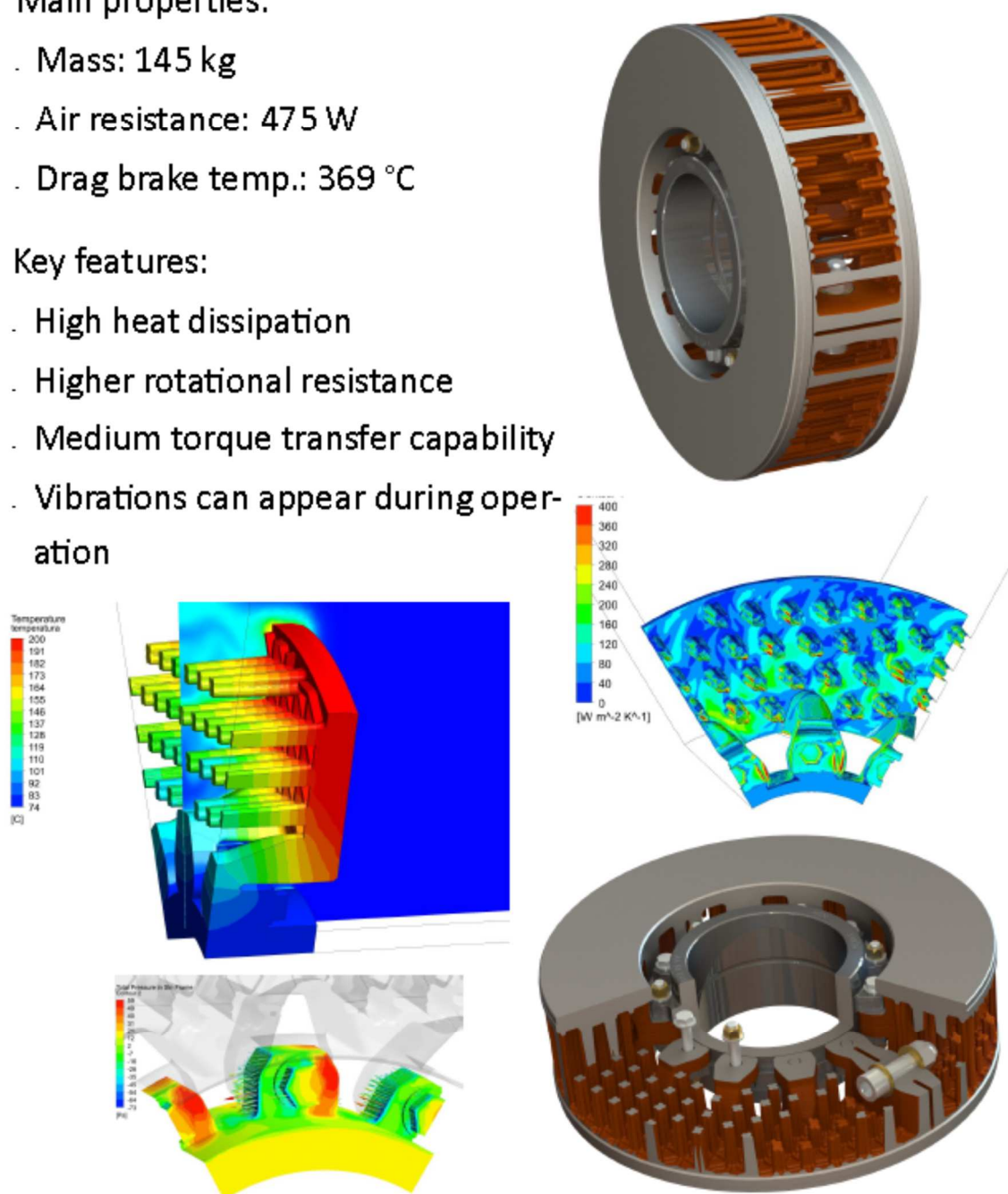


Figure 13: Presentation of the initial design

# Futura 1 prototype

In process of optimization of first prototypes, the focus was on three elements: lowering the mass (by keeping the similar thermal performance), decrease of air resistance (ventilation losses) and increase of heat dissipation. With first prototype, the focus was on decrease of air resistance, as well as reduction of mass of DRFB disc crown. This was achieved with new shape of cooling ribs, which were named "low drag cooling ribs". With 1<sup>st</sup> design, mass was lowered for 8,4%, and air resistance was decreased for 51% in comparison with initial DRFB disc

## Main properties:

- . Mass: 133 kg
- . Air resistance: 230 W
- . Drag brake temp.: 408 °C

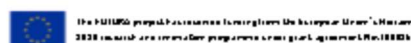
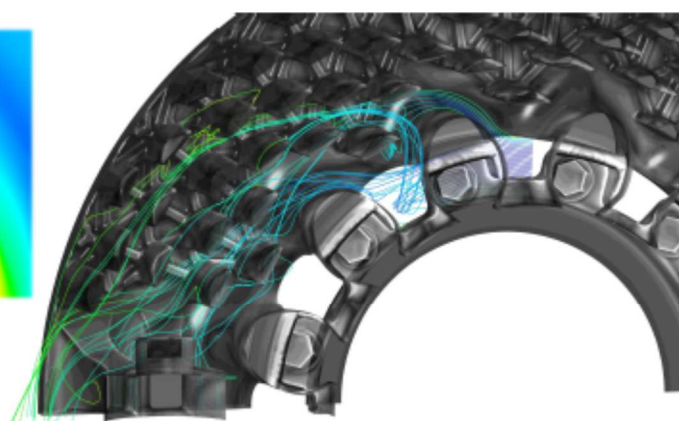
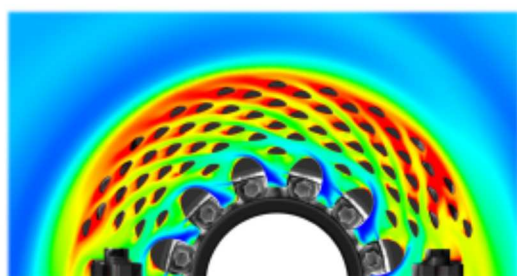
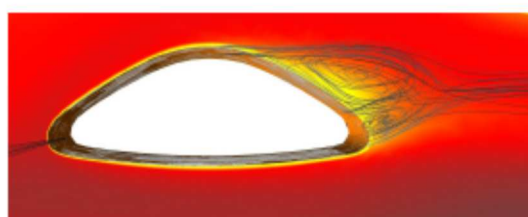
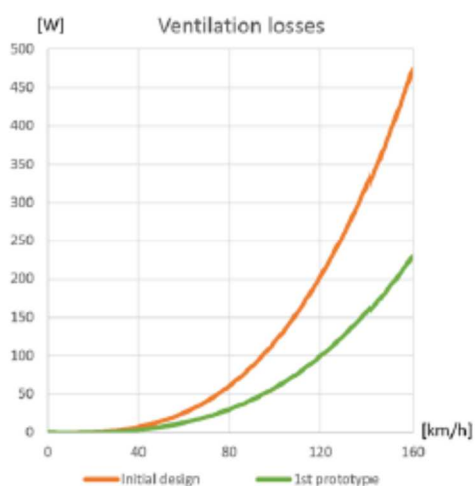
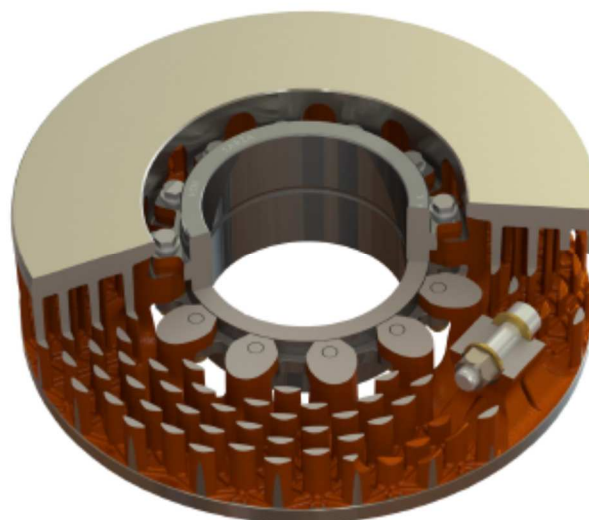


Figure 14: Presentation of the first FUTURA prototype

## Futura 2 prototype

With second prototype, the focus was on increasing thermal power dissipation, as well as reduction of mass of DRFB disc crown. Second design was developed through numerous simulations. Lower mass and good ventilation properties were achieved with new low profile hyperbolic cooling ribs design. Together with high ribs (which connect both friction surfaces), this design has smaller ribs that increase both thermal conduction and convection of the DRFB disc, while at the same time keep the mass of DRFB disc low. The height of small cooling ribs is just enough to maintain good thermal capacity during the braking at the slope and emergency braking.

With 2<sup>nd</sup> design, mass was lowered for 13.7%, and air resistance was decreased for 27% in comparison with initial DRFB disc.

### Main properties:

- . Mass: 125 kg
- . Air resistance: 356 W
- . Drag brake temp.: 406 °C

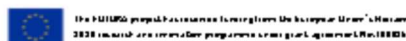
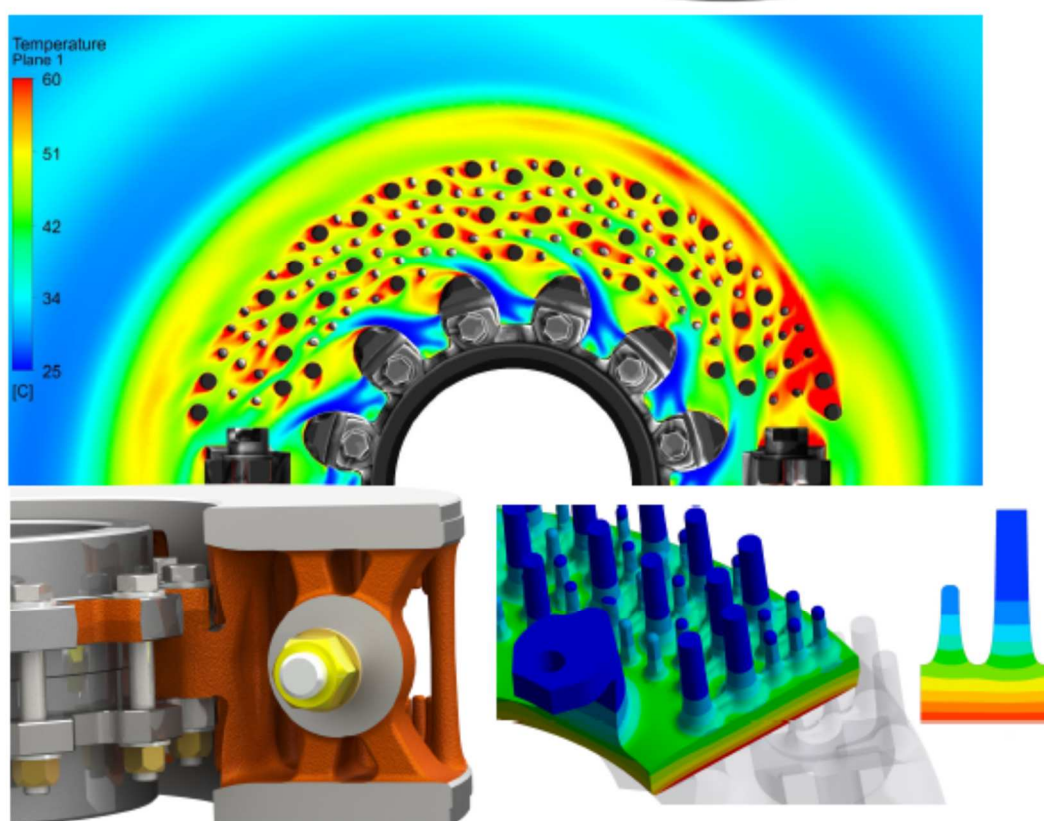
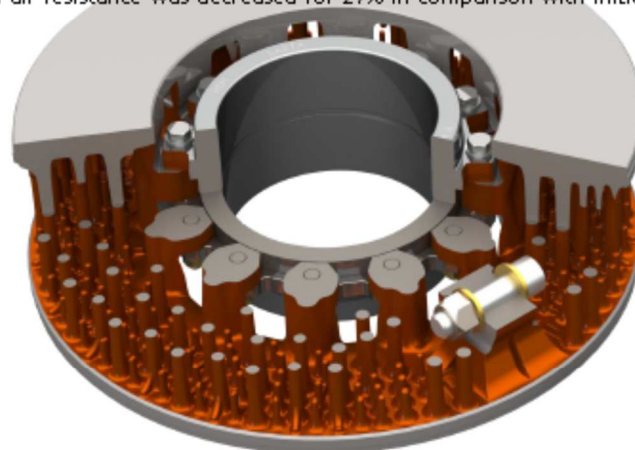


Figure 15: Presentation of the second FUTURA prototype

## Futura 3 prototype

With third prototype, the focus was on safety, thermal performance, as well as reduction of mass of DRFB disc crown. Third design was again developed through numerous simulations of different shapes of cooling ribs. The goal was to combine all good cooling rib properties from previous designs and combine them with a new free-floating six bracket mounting design. Therefore, it features low drag and low profile hyperbolic cooling rib design with net (special design of cooling) system. So far, it has the lowest mass and very good drag and emergency braking temperatures while having relatively low ventilation losses. With third design, mass was lowered for 18.6%, and air resistance was decreased for 27% in comparison to initial DRFB disc.

From safety point of view (possibility to have shorter braking distance and consequently reduce the risk of accidents with casualties), the focus was on higher safety and possibility to transfer higher braking torques. The DRFB disc crown and hub connection was carried out with six bolts and nuts. The bolts are firmly secured in the hub, which then transfers the braking torque via shear strength of the pin. After numerical calculation of maximum transmitted braking torque and exceptional vertical loads of 100G (required by standard when designing the brake discs), for the third prototype, the results of 25000 Nm was obtained.

### Main properties:

- . Mass: 115 kg
- . Air resistance: 346 W
- . Drag brake temp.: 367 °C

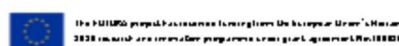
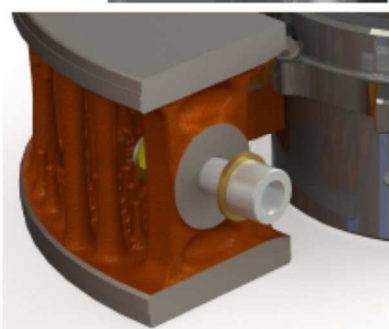
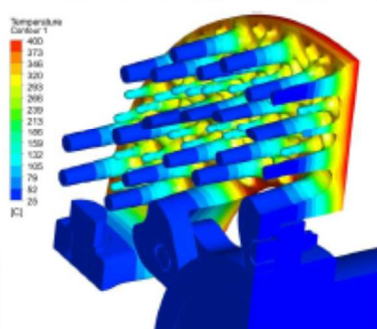
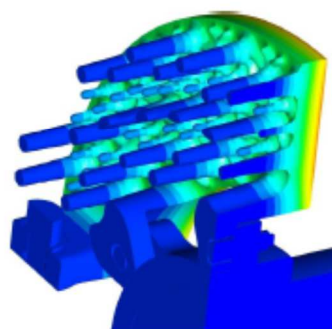
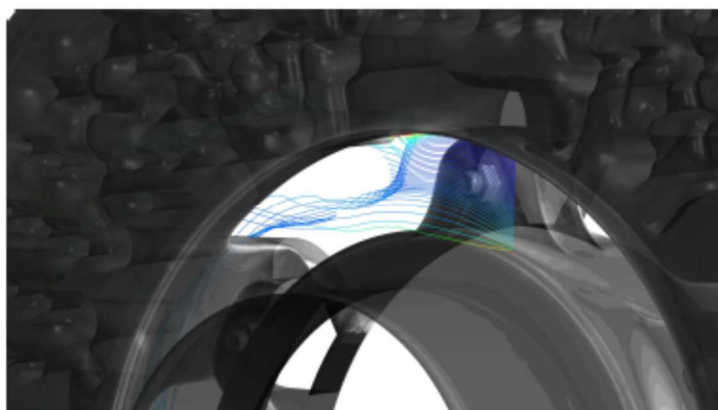
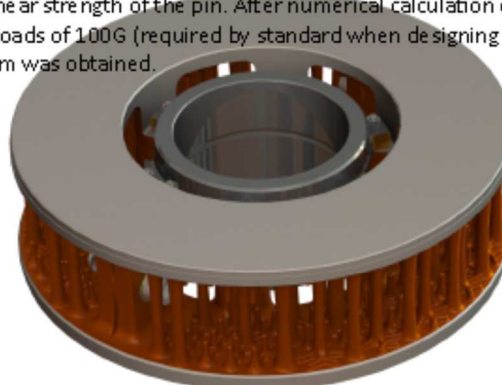


Figure 16: Presentation of the third FUTURA prototype

## Futura 4 prototype

With fourth prototype, the focus was on safety, thermal performance, lowering vibrations due to accurate connection of crown and hub as well as further reduction of mass of DRFB disc. New mounting design, which enhanced torque transfer capability and reduced the possibility of vibrations (caused by unbalance) was introduced. Stresses induced in the brake disc, caused by thermal expansion were reduced, as this design allows expansion in radial direction, thus increasing safety and decreasing stopping distance.

Connection of DRFB disc crown and hub was simplified with use of six bolts and self-centering fits with special shape of connecting ears in between. More low drag cooling fins were used to reduce ventilation losses. As this design has larger air intakes, the air mass flow through the disc is higher, as well as thermal power dissipation. With fourth design, mass was lowered for 22,7%, and air resistance was decreased for 21% in comparison with initial DRFB disc.

### Main properties:

- . Mass: 114 kg
- . Air resistance: 372 W
- . Drag brake temp.: 374 °C

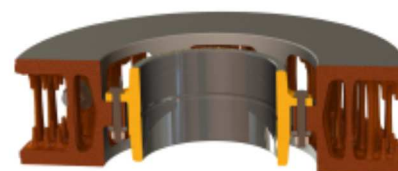
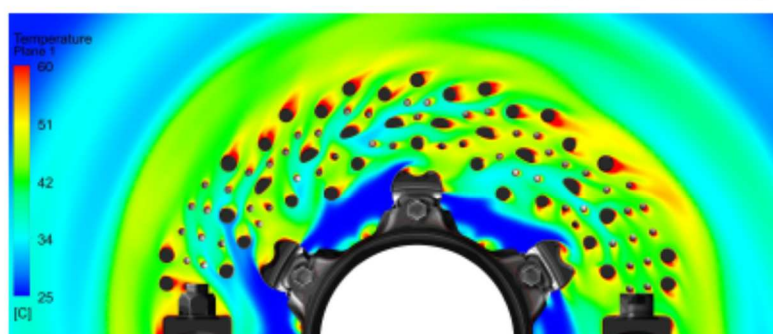
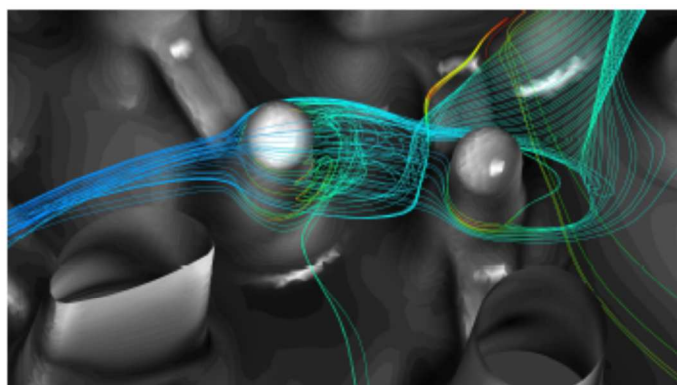
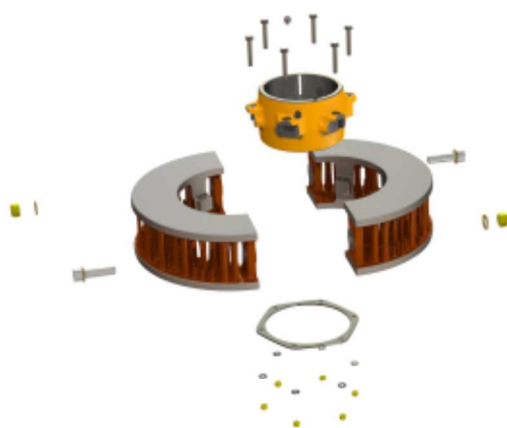
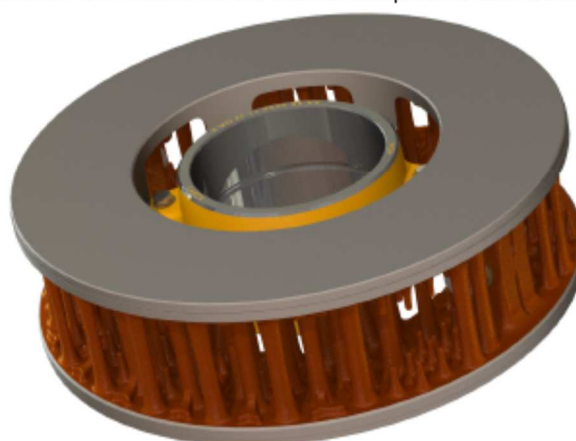


Figure 17: Presentation of the fourthFUTURA prototype

## Futura 5 prototype

From market analysis, face-to-face dialogues with potential buyers and producers of freight wagons, as well as from received information while attending international fairs, we found out that great interest for narrower DRFB disc exists. Based on this research data, the decision was made to design narrower disc of 110 mm with same properties as the one with 170 mm wide. With fifth prototype, the focus was on further reduction of mass of DRFB disc, while maintaining same level of safety and thermal performance. It was a big challenge, because there was a possibility to have worse performance than wider 170mm discs. Followed by construction of narrower discs, the FEM analysis confirmed suspicions. The narrower disc heated more, but still in acceptable range. So the decision was made and the production of fifth prototype, narrower DRFB discs, was realized.

Design of fifth prototype followed the same structure of both DRFB disc crown and the hub as for fourth prototype. FEM analysis showed that fifth prototype heated more while simulating emergency braking run. For example, the average temperature for wider disc was 350°C, while for narrower was 370°C. Whereas, air resistance of narrower disc was 311 W, while on the other hand, wider had value of 372 W. The narrower disc had less air resistance than wider DRFB disc.

With fifth prototype, mass was lowered for 34,5%, and air resistance was decreased for 34% in comparison with initial DRFB disc.

### Main properties:

- . Mass: 95 kg
- . Air resistance: 311 W
- . Drag brake temp.: 463 °C

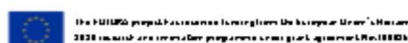
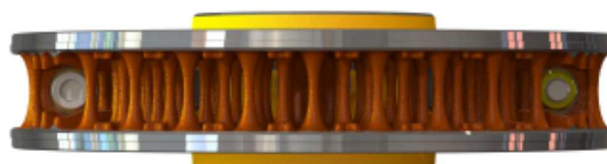
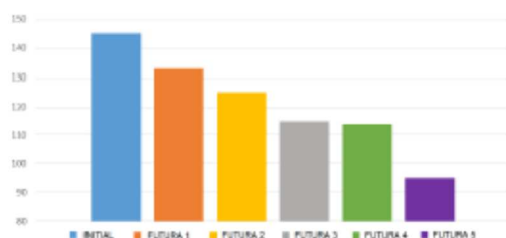
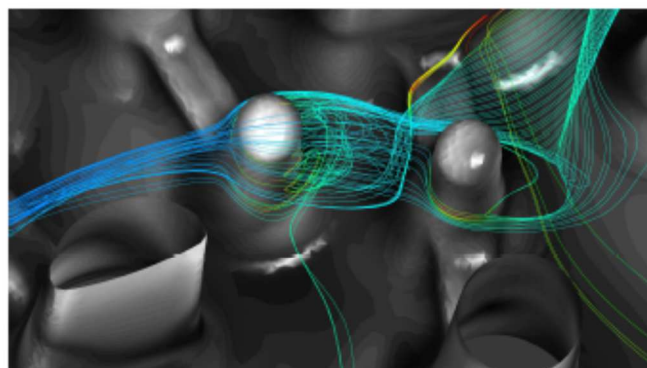
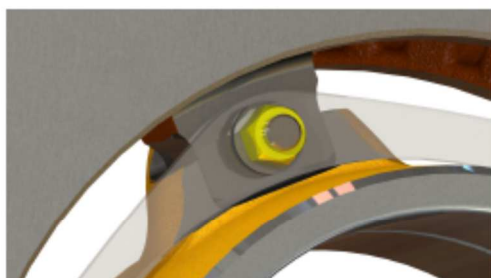
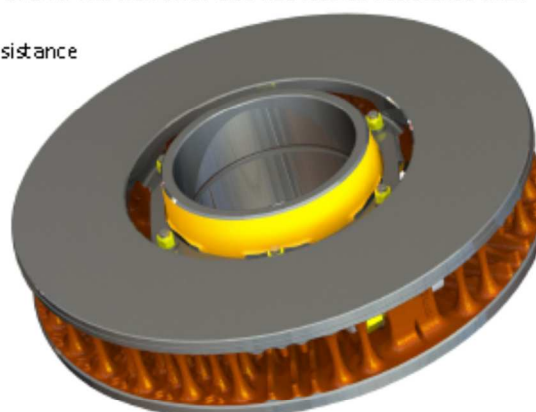
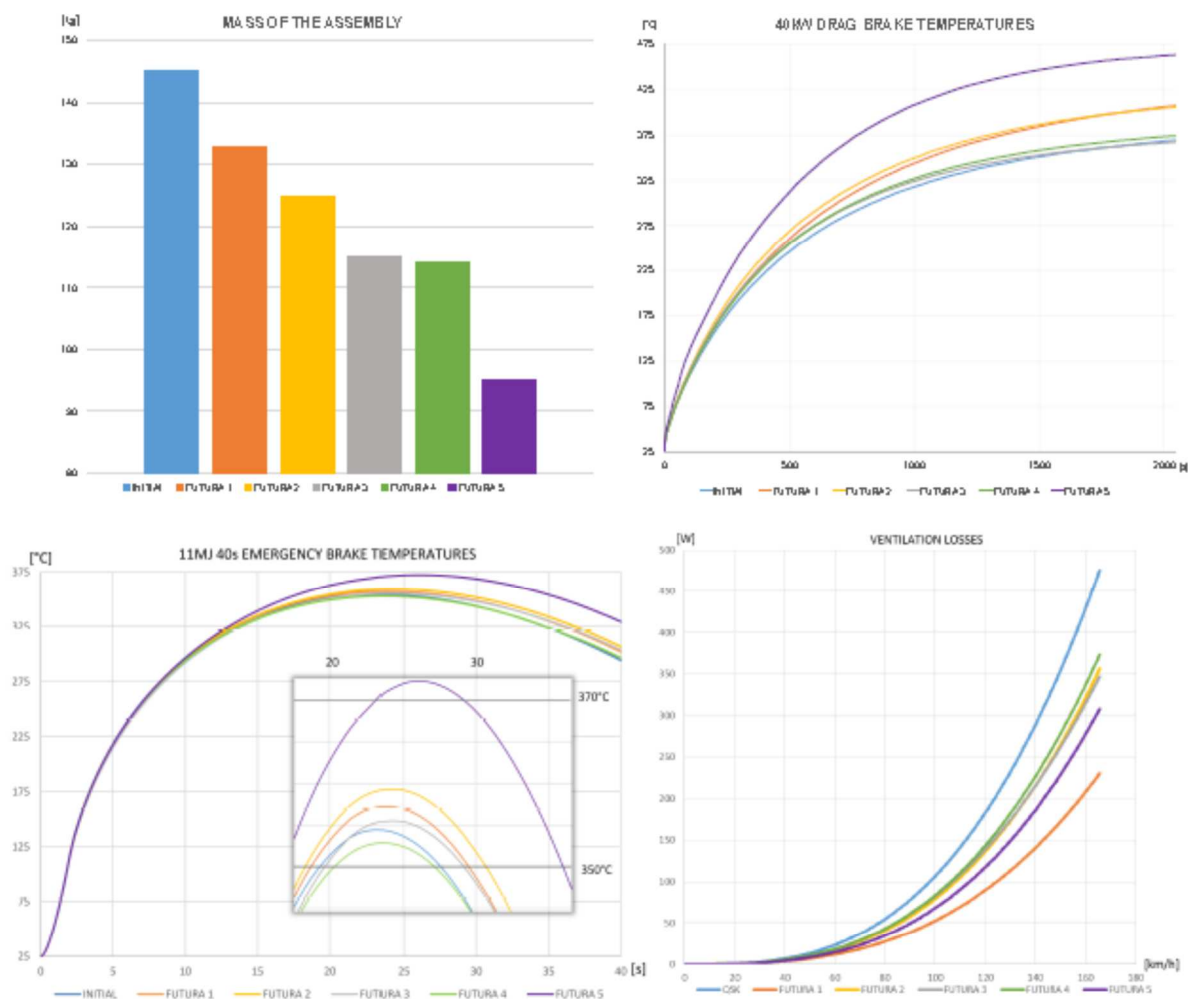


Figure 18: Presentation of the fifth FUTURA prototype

## Futura prototypes comparison



PROTOTYPE	MASS		THERMAL DISSIPATION EFFICIENCY		VENTILATION LOSSES		11 MJ EMERGENCY BRAKE TEMPERATURES	40kW DRAG BRAKE TEMPERATURES
	[kg]	[%]	[W/m² K kg]	[%]	[W]	[%]	°C	°C
Initial	145	100	1	100	475	100	354	369
Futura 1	132,8	-8,3	0,859	-14	280	-51	357	408
Futura 2	125	-13,7	1,157	+15,7	356	-25	359	406
Futura 3	115	-20,7	1,35	+35	346	-27	355	367
Futura 4	114	-21,4	1,173	+17,3	372	-21	352	374
Futura 5	95	-34,5	1,327	+32,7	311	-34	373	453



Figure 19: FUTURA prototypes comparison



### 3.3.3 Press conference

On the event was presented the journalist from regional radio Krka, Mr. Edo Štraus. He took an interview with Mr. Alen Šinko and Mr. Ivan Smolej. Radio interview was broadcasted on the radio on 10<sup>th</sup> of November 2017.



KOVIS  
INTERVJU\_1.mp3

On the Open House week attended the Regional TV Vaš Kanal. The journalist Mr. Marko Mesojedec took an interview with Mr. Alen Šinko and Mr. Ivan Smolej. TV report published on 8<sup>th</sup> of November 2017:

<http://www.vaskanal.com/novice/27606-predstavili-prototipe-projekta.html>



Figure 20: TV report by Vaš Kanal

### 3.4 Final conference

On 14<sup>th</sup> of December 2017 Omnia KLF organised the 3<sup>rd</sup> Final Conference of FUTURA project in the conference room Hotel Bystrička in Martin, Slovakia. The purpose of the conference was to present the results of the development of brake disk prototypes to the academic, technicians, politicians, general and professional public.

The conference were attended by representatives of Kovis as a coordinator and by all partners OMNIA, ZX Benet and VUD.

The conference was attended by Mr. Martin Svoboda from the Ministry of Economy of the Slovak Republic, who is director of the Department of Innovation and Applied Research.

The invitation was received by representatives of the City of Martin, Mr. František Rybárik – Head of the department of road transport and roads and Mr. Rudolf Kollar – Member of the City Council. Representation of the University of Zilina - Associate Professor Jozef Gašparík, Mr. Vladislav Zitrický, Mr. Lumir Pečený – from the Faculty of Operation and Economics of Transport and communications and Associate Professor Kateryna Kravchenko and Mr. Vladimír Hauser from The Faculty of Mechanical Engineering. From the association of the engineering industry, Mr. Hamerlik and Mr. Križan, Automotive Industry Association Mr. Kubička and two representative of DAKO-CZ brake system for railway cars – Mr. Mejtský and Mr. Bartuš. Regional TV Turiec was also present.

The agenda of the meeting:

- Welcome speech of the project manager
- Presentation of project partners (KOVIS, OMNIA KLF, VUD, ZX Benet)
- Presentation of the FUTURA project and main results
- Press conference
- Discussion



Figure 21: Participations on the Final 3<sup>rd</sup> conference



Figure 22: Conference room for the Final 3<sup>rd</sup> conference



COORDINATOR

PARTNER 1

PARTNER 2

PARTNER 3

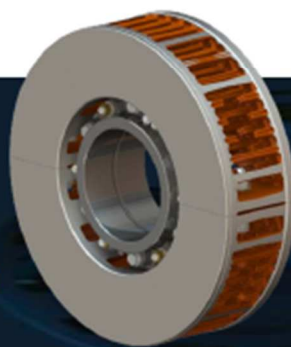


OMNIA KLF®

Z-Benet CZ


[www.projectfutura.com](http://www.projectfutura.com)
**PROJEKT FUTURA**

Hlavným cieľom navrhovaného projektu je zlepšenie kvality života a bezpečnosti viac ako 55 miliónov obyvateľov EU, ktorí žijú alebo pracujú v blízkosti železničných tratí.

**PROJECT FUTURA**

The main objective of the proposed action is to improve the quality and safety of life of over 55 million EU citizens who live or work near train tracks.

Dovoľujeme si Vás pozvať na  
**FINÁLNU**

**3. KONFERENCIU**  
projektu FUTURA,

ktorá sa koná  
14. decembra 2017  
o 11.00 hod

Hotel BYSTRÍČKA, Bystrička 152, okr. Martin,  
038 04 Bystrička

Prosíme o potvrdenie účasti na email:  
klimekova@omniaklf.sk

We are pleased to invite you to the  
**FINAL**

**3rd CONFERENCE**  
of the FUTURA project

on Thursday  
14<sup>th</sup> of December 2017  
at 11.00 a.m.

Hotel BYSTRÍČKA, Bystrička 152, okr. Martin,  
038 04 Bystrička

Please confirm your participation to the email:  
klimekova@omniaklf.sk

**Program:**

11:00 – 11:15 Zahájenie a úvod  
11:15 – 11:30 Predstavenie partnerov projektu  
(KOVIS, VÚD, OMNIA KLF, ZX BENET)  
11:30 – 12:00 Prezentácia projektu  
  
12:00 – 12:30 Tlačová konferencia  
12:30 – 13:15 Diskusia  
13:15 – 13:30 Občerstvenie

**Agenda:**

11:00 – 11:15 Welcome speech of the manager  
11:15 – 11:30 Presentation of project partners  
(KOVIS, VÚD, OMNIA KLF, ZX BENET)  
11:30 – 12:00 Presentation of the FUTURA project and  
main results  
12:00 – 12:30 Press conference  
12:30 – 13:15 Discussion  
13:15 – 13:30 Snacks and coffee

Projekt FUTURA je financovaný z  
programu Európskej Únie pre výskum a inovácie  
Horizon 2020 v rámci grantu číslo 700985.



The FUTURA project has received funding from the  
European Union's Horizon 2020 research and  
innovation programme under grant agreement  
No. 700985

Figure 23: Invitation letter to the Final 3<sup>rd</sup> conference

Mr. Peter Duchovič, director of company OMNIA KLF, a.s., welcomed all the present guests. The welcoming speech was thankful for all presented partners and guests. Mr. Duchovič presented all the guests and summed up previous work on the project. Followed by Introduction of short presentations - KOVIS, OMNIA KLF, VUD and ZX Benet.

### 3.4.1 Presentation of the FUTURA project and main results

The presentation of the FUTURA project with the results has been taken by Mr. Smolej.



Figure 24: Presentation of the FUTURA project

To the public was presented development of individual prototypes with achieved values and results. During the FUTURA project were developed and produced two final prototypes of DRFB disc, the focus was on safety, thermal performance, lowering vibrations as well as further reduction of mass.

#### SPECIFIC OBJECTIVES:

- Enable higher speeds in RFT (160 km/h)
- 11% shorter braking distance and higher safety
- 11% greater efficiency through 15% better heat dissipation and 14% less vibrations
- 21% lower mass
- 10 dB lower noise

- 60% lower maintenance costs
- 13% lower LCC

PROJECT RESULTS - Two final prototypes of DRFB disc:

- 170mm of width – 22,7% lower mass
- 110mm of width – 34,5% lower mass

### 3.4.2 Press conference

On the conference attended the Regional TV Turiec.



Figure 25: Mr. Duchovič - an interview for regional television Turiec

Tv report published on 19<sup>th</sup> of December:

<http://tvturiec.eu/vdaka-medzinarodnemu-projektu-bude-preprava-tovaru-na-zeleznici-bezpecnejsia/>

### 3.4.3 Discussion

After the presentation of the FUTURA project, discussion developed. The professional public was very excited about the DRFB disc and lot of questions were stated. Due to the huge interested from

the side of the manufacturers it has been confirmed that the great product was developed. The final finding was that the DRFB disc has a huge potential on the freight rail market.

### 3.5 Lecture at the University of Žilina

VUD prepared a lecture for the students from University of Žilina, Faculty of Mechanical Engineering.

For the purpose of dissemination of the project students from the University of Žilina were invited to the premises of Skúšobného laboratória pevnostných meraní strojných častí, Výskumný ústav dopravný, a. s., Žilina. The presentation was aimed to acquaint all invited students with the FUTURA project and introduce the testing procedures and tests required, which are necessary to be performed. Their success will be the fundamental condition to obtain type approval of the prototype.

The students were acquainted with the initial material testing.

Thanks to the presentation the students gained an idea about the development of the prototype, of a new generation of brake disks which consist of development process and laboratory tests which are a very important part of approving the final product.



Figure 26: Presentation of the project FUTURA to the students from University of Žilina



Figure 27: Presentation of the project FUTURA to the students from University of Žilina

### 3.6 Czech Raildays event

From 13<sup>th</sup> till 15<sup>th</sup> of June KOVIS and ZX-Benet organised a two days FUTURA event on the Czech Raildays in Ostrava. Czech Raildays is an international trade fair of railway technology, products and services for the rail and city transport.



Figure 28: FUTURA day on the KOVIS booth



Beside the third prototype of the New Divided Rail Freight Brake Disc (DRFB Disc) also findings, results of laboratory tests and first information from testing in real environment were presented to the visitors.



Figure 29: FUTURA day on the ZX-Benet booth

ZX BENET CZ introduced the divided brake disc, how it is tested in real environment, results from testing them from the beginning of December to June 2017. It described the inspections and has shown the results from measurements.



Figure 30: Mounted prototype on wagon

ZX BENET CZ introduced and presented the divided brake disc on the CZECH RAILDAYS in OSTRAVA. We have informed the academic, technicians, general and professional public about the DRFB disc. We answered a lot of question about the prices and for which wagons they will be suitable. Also, when the prototype will be ready for sale.

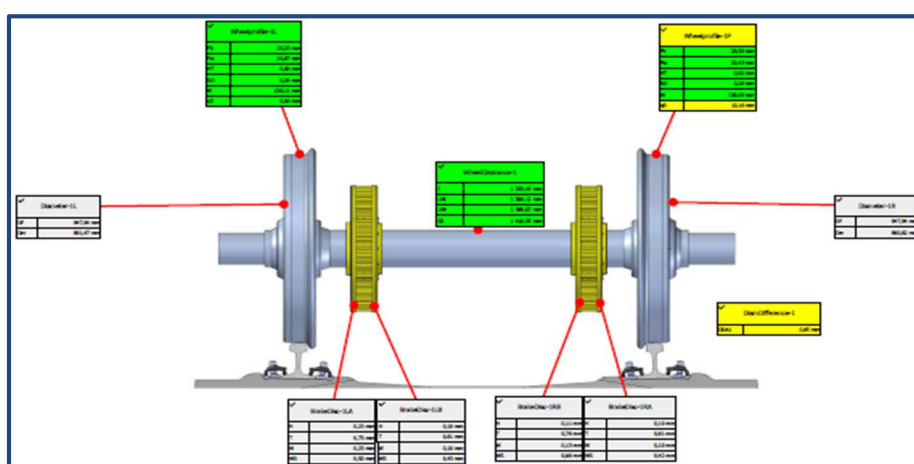


Figure 31: Results from measurement of wheel profile

The markets of Czech Republic, Slovakia, Poland and other surrounding countries are were important for the railway industry. Kovis and ZX-Benet have a lot of customers from those markets and it was extremely important to promote also the prototype of FUTURA project.

### 3.7 Association of Slovakian laboratories and testing houses

Testing laboratory of strength measurements of machine parts (SL) took part in the international conference „Novinky v oblasti skúšobníctva“ (Innovations in the area of testing) at Tále. Within the conference an activity of SL at project FUTURA - „Vývoj novej generácie delených brzdových kotúčov pre železničnú nákladnú dopravu (Divided Rail Freight Brake Disc – DRFB)“ was presented

The presentation was done to participants of the conference. It was not only the orientation of SL, but was also focused on material and prototype tests of new generation of brake discs for rail wagons. Participants of the conference were informed about new trends in the area of mechanic material tests as - tensile test, Charpy impact test, hardness test, fracture toughness test, fatigue material test and prototype tests as - noise and vibrations measurements during braking, temperature measurements during braking, measurement of friction coefficient at material degradation, measuring the wear of material at braking (determining the mass and the volume of used material).

The presentation was also focused on the goals of the project about contributions of the new generations of brake discs in terms of material savings, comfort and safety of transportation, reducing noise and vibration levels, shortening of the braking distance and associated reduction of load damage and increased wheel life.