UNIVERSIDAD DE CANTABRIA

Escuela de Doctorado

EIDEIC 2017

GITECO UC UNIVERSIDAD DE CANTABRIA

DESIGN OF A FLEXIBLE ROCKFALL BARRIER USING EXPLICIT DYNAMIC MODELS IN FEM SOFTWARE

Speaker

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Supervisors

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INTRODUCTION

- Inchalam Bekaert wants to include flexible barriers in its range of products.

- Complexity of the problem
  - High number of elements moving and interacting among them at the same time.
  - Experimental tests imply high costs of material and labor and a big place to carry them out.

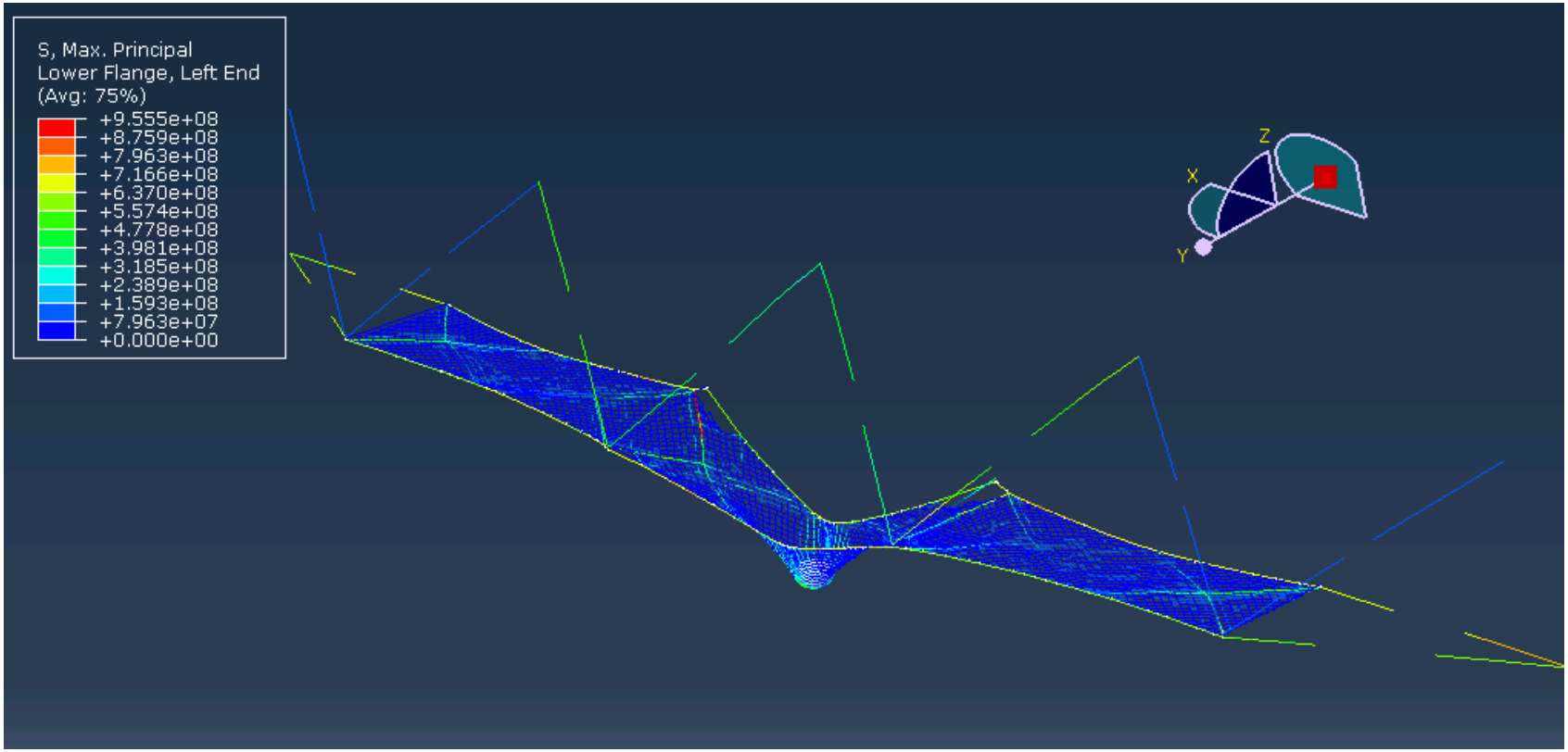
- Solution
  - Finite Element Software /Discrete Element Software

AIMS

- Understanding of the dynamic mechanism of a barrier in a high-velocity impact.
- Selection of the most optimal interception structure among the supplied by the manufacturer, which have never been used with this aim.
- Design of an innovative brake device.
- Design of different alternatives for the posts and anchorage plate.

RESULTS

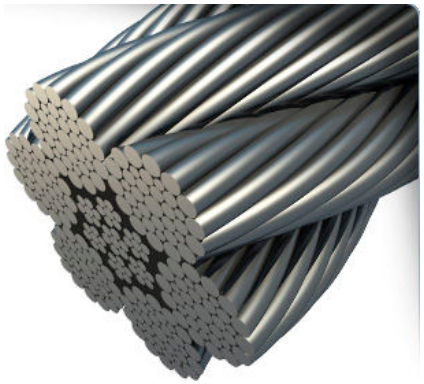
- Full-scale tests on 2 barriers of different geometries were successfully simulated using Abaqus Explicit.

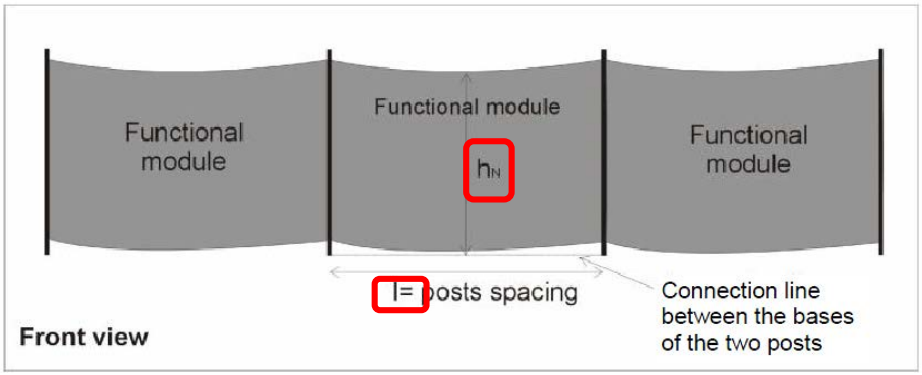


RESULTS

- Parametrical analysis of different geometrical variables → Influence in its energy retention capacity

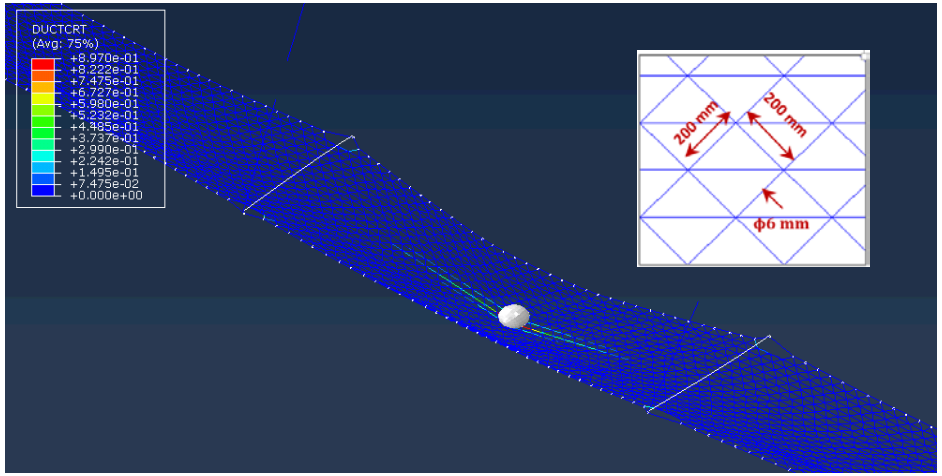
Grid size	Net diameter	Module high	Module length
200x200	ϕ 6 mm	2,5 m	8 m
150x150	ϕ 8 mm	4 m	10 m
300x300	ϕ 10 mm	6 m	12 m

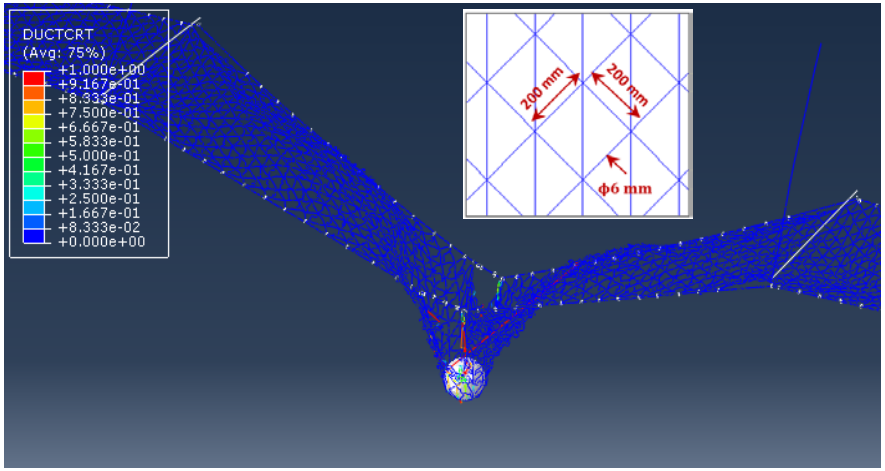


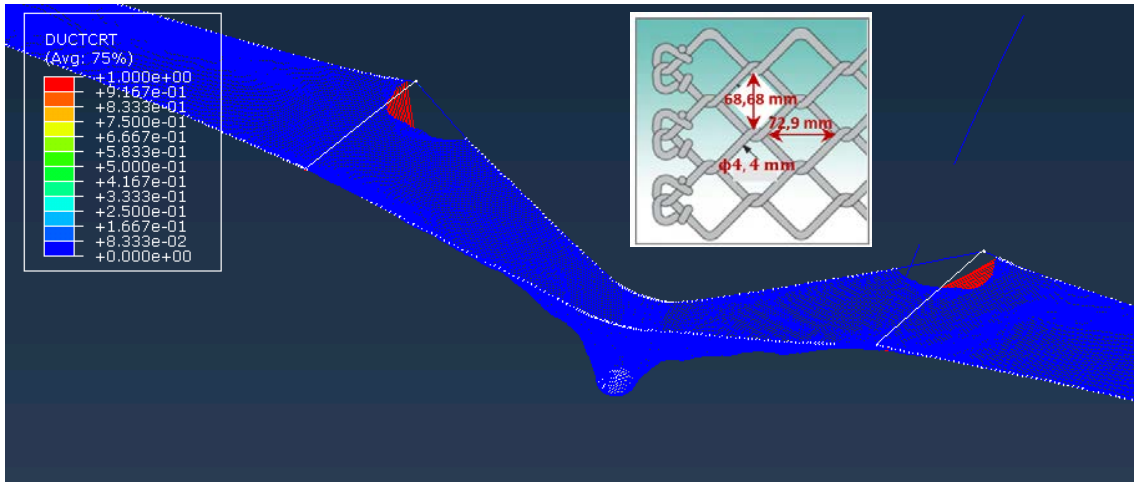


RESULTS

- Selection of the interception structure





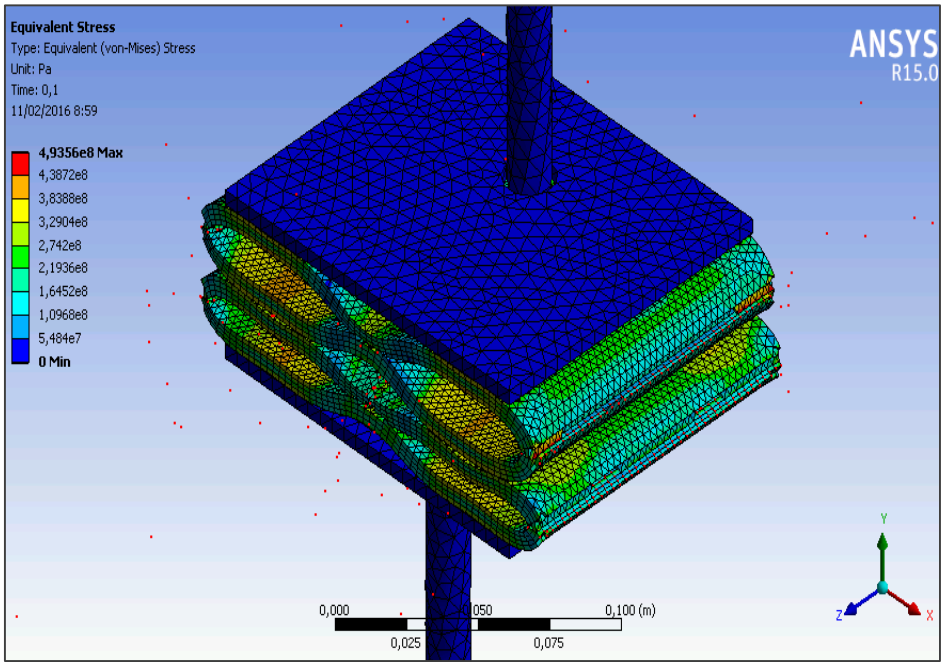


RESULTS

- Design of a new energy dissipating device

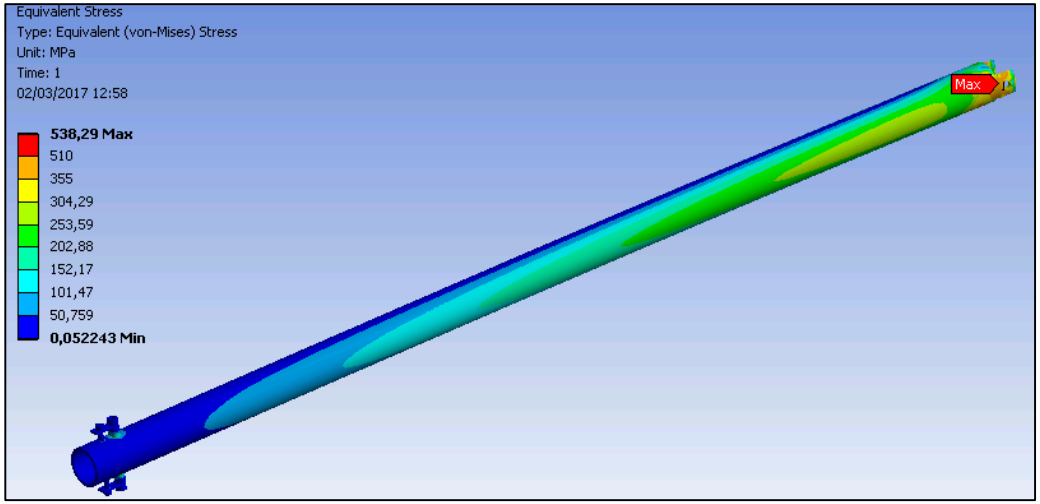
5 steps

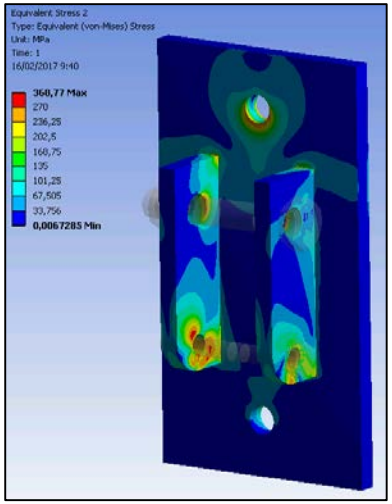
1. Design of the brake
2. Initial simulation
3. Static and dynamic tests
4. Calibration of the numerical model
5. Selection of the optimal tube

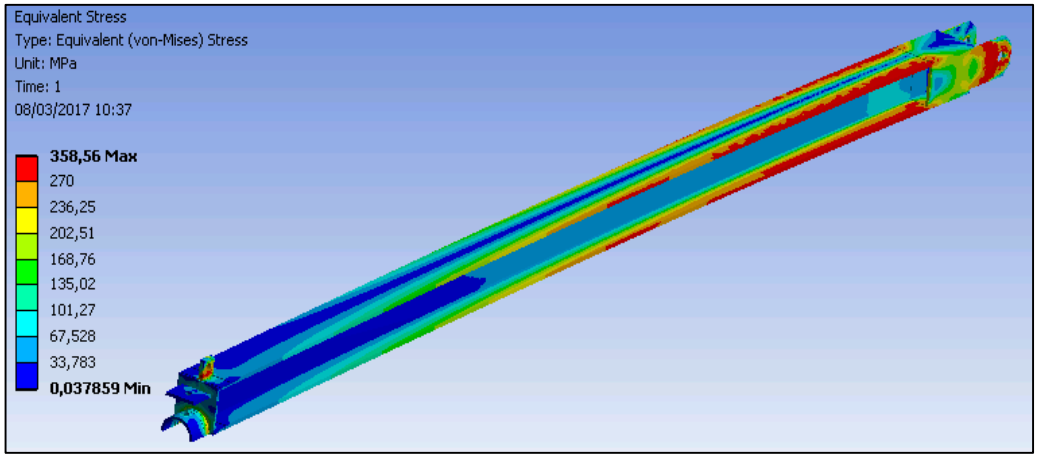


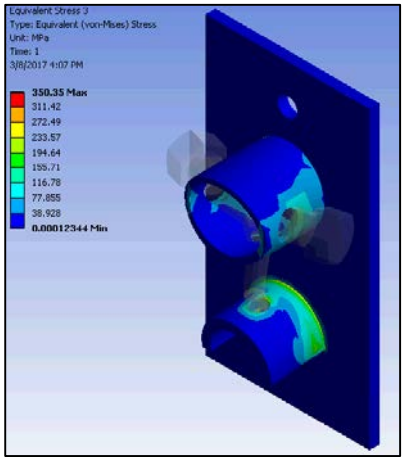
RESULTS

- Several alternatives for posts and anchorage plates









TRAINING COURSES

- Data processing with EXCEL 2013. 16-20 January 2017. PFPU.
- Patents: all that researchers should know. 9-11 March 2016. 9 h. PFPU.
- Statistics for research in construction engineering. 18-22 January 2016. 20 h. GITECO.
- EDUC Advanced course on the future career of the PhD student. 16-27 November 2015. 40 h. EDUC
- EDUC Basic course training. 24Nov-15Dec 2014. 40 hours. EDUC

PUBLICATIONS

- Castanon-Jano, L., Blanco-Fernandez, E., Castro-Fresno, D., Ballester-Muñoz, F. Energy Dissipating Devices in Falling Rock Protection Barriers (2017) Rock Mechanics and Rock Engineering, 50 (3), pp. 603-619. (Q1)

CONFERENCES

- Future attendance to “IX Simposio Nacional sobre Taludes y Laderas Inestables”. 27-30 June 2017. Santander (Spain)
- “Rock Slope Stability 2016”. 15th-17th November 2016. Lyon (France)

PATENTS

- Energy dissipating device for flexible rockfall barriers. In process.

EVALUATION GUIDE

Basic competences	Science and Technique	Technology	Training courses	Results	SWOT analysis	Workplan	Mobility	Funding	Ethics
CB11	✓	✓	✓						
CB12				✓		✓			
CB13				✓					
CB14					✓				
CB15				✓					
CB16				✓					✓

Capacities and personal skills	Science and Technique	Technology	Training courses	Results	SWOT analysis	Workplan	Mobility	Funding	Ethics
CA01	✓	✓	✓						
CA02				✓					
CA03						✓			
CA04			✓						
CA05	✓	✓	✓						
CA06					✓				

THANK YOU FOR YOUR ATTENTION