

# ivt

## INTERNATIONAL OFF-HIGHWAY ANNUAL 2021

— THE —  
ANNUAL REVIEW OF  
**INDUSTRIAL  
VEHICLE**  
DESIGN, ENGINEERING &  
COMPONENTS  
— 2021 —

**“Selling traditional diesel  
machines will not be the  
future of our industry”**



**EXCLUSIVE INTERVIEW**

**Michel Denis, president  
and CEO, Manitou**

# DESIGN CHALLENGE

Four of the world's leading industrial designers give their visions of how electrification will open up new possibilities in the styling and functionality of off-highway vehicles



# AN ELECTRIFY

AS MORE ELECTRIC VEHICLES ARE BEING LAUNCHED ACROSS ALL PARTS OF THE OFF-HIGHWAY VEHICLE INDUSTRY, WE ASKED INDUSTRIAL DESIGNERS TO CREATE NEW CONCEPTS THAT TAKE FULL ADVANTAGE OF THE NEW POSSIBILITIES OF THIS TECHNOLOGY. HERE WE PRESENT THE FOUR FINALISTS





# STYLING CONTEST



▶ The iVT Design Challenge first became a feature of this publication back in the early 2000s and has become a regular favourite with readers ever since. Its purpose is to inspire new thinking in off-highway vehicle design in order to meet the constantly evolving demands of the industry, utilising innovative materials, concepts and components in fresh and creative ways.

The challenge helps to promote the work of the world's best industrial designers, pushing the industry forward and bringing it face-to-face with new challenges, enabling us to address them as a global industry.

The response this year was stronger than ever, perhaps because electric vehicles already abound, and are almost certainly the future. All four of our featured vehicles could be in use before the decade is out, some of them well before that. Over the next 10 pages we will examine each machine in detail, and include interpretations from their creators.

**DC** DESIGN CHALLENGE

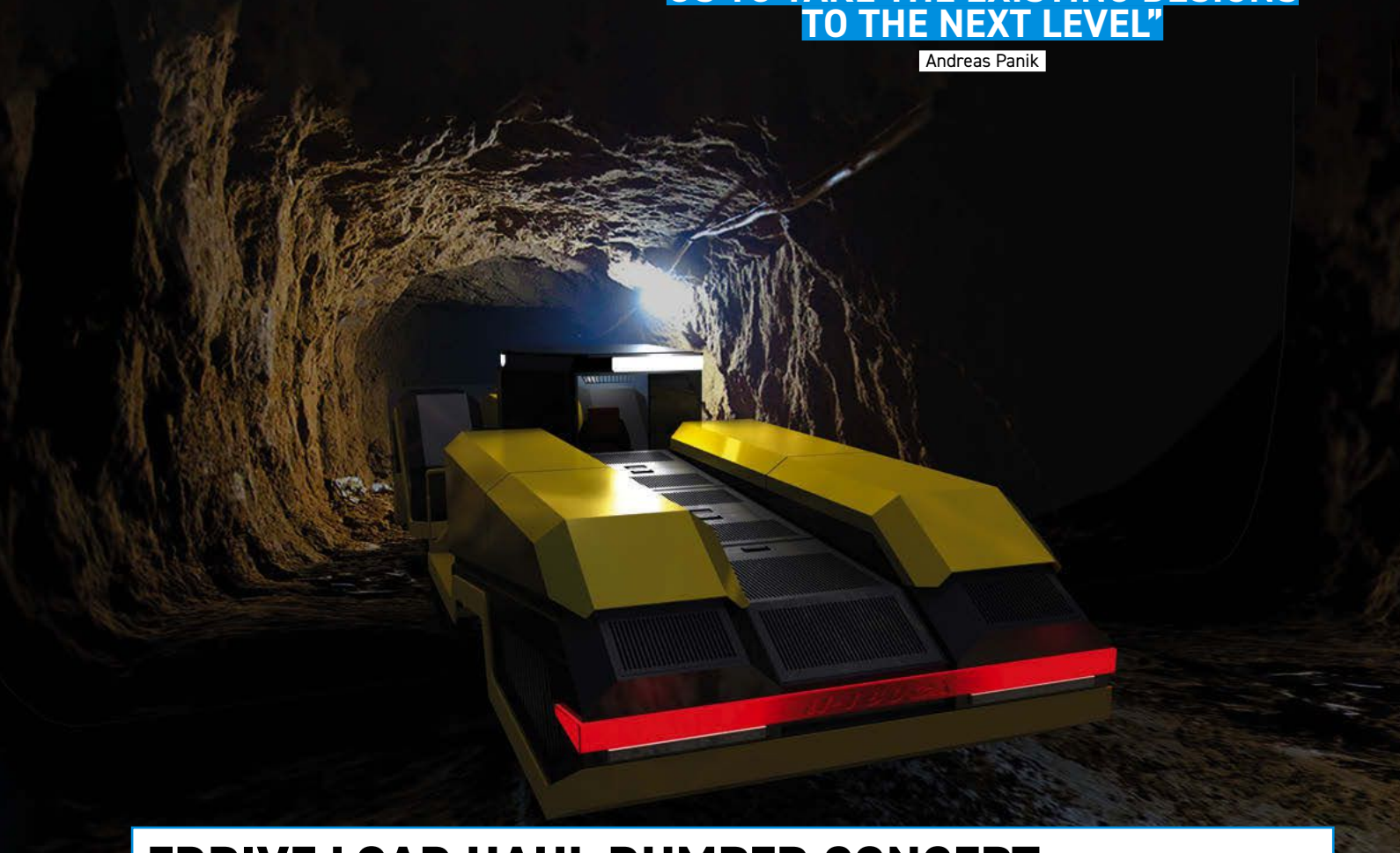
## THE BRIEF

"Design an industrial vehicle that includes new styling and functionality that takes full advantage of existing and possible future trends in electrification"



## “NEW TECHNOLOGIES INSPIRED US TO TAKE THE EXISTING DESIGNS TO THE NEXT LEVEL”

Andreas Panik



### EDRIVE LOAD HAUL DUMPER CONCEPT

Andreas Panik and Christian Ebner are two Stuttgart-based designers behind Panik Ebner Design. Their designs vary from trains and off-highway vehicles to exhibitions and graphics

▶ The load haul dumper is a type of vehicle that must be able to withstand extreme operating conditions, as it is used in mining operations worldwide. This requires a rugged design that is either as flat or as narrow as possible, depending on the cross-section of the tunnel. More than 75% of world's underground metal mines load haul dumpers for handling their excavations.

“With the developments taking place today for truck electric drives based on hydrogen production using fuel cells and drives using electric wheel hub motors, a transfer to other vehicle types seems sensible and attractive to us,” says Andreas Panik. For them the load haul dumper design came fairly easily.

#### Modularity allows flexibility

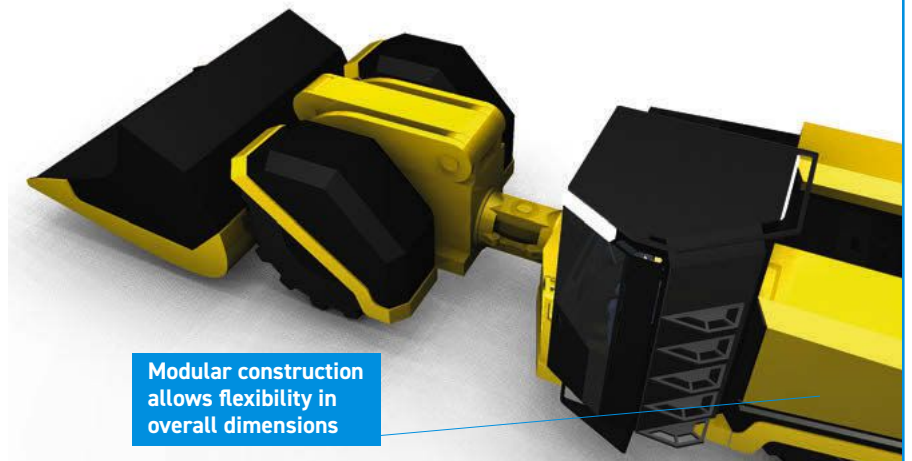
A modular design allows OEMs to react flexibly to enquiries without having to redesign. Due to the variable arrangement of the components – batteries, fuel cells, reformer and methanol tank – the electric drive creates advantages over the common diesel technology with central drive train.

“This drivetrain determines the overall design and the positioning of the cabin in the long term,” says Panik. “Electrification can increase the degree of freedom here with the exception of the trailing cable that supplies power, which prevents rapid manoeuvring.” The modular structure allows flexible configuration for various applications such as

narrow profile ore-mining and low profile salt-mining. The economic benefit is industrial-standard small-series production.

#### Tough conditions, electric solution

Extreme operating conditions in salt or ore mines make it difficult to comply with ergonomic standards of a workplace. In ▶



Modular construction allows flexibility in overall dimensions

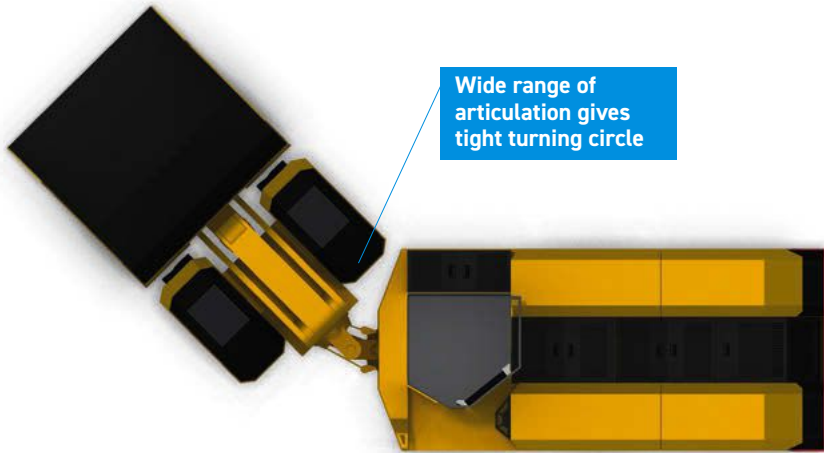


In addition, the design of the vehicles must meet increased safety standards for mine operation, for instance the option of remote-controlled working in the future.

In their study, Panik and Ebner developed a corresponding cabin concept that offers better standards for the driver in all configurations. A decisive advantage of the electric drive in improving workplace conditions is the elimination of diesel emissions, which can be removed only inadequately in the mine. The machine is designed with a general capacity of 75 to 150kW, is powered by 400-750 VDC Lithium NMC-cell-units and constantly charged via 40l (VPD 3.2 kW/l) methanol fuel cells. Flexible trailing cables are provided with reeling/unreeling facility to feed power.

**Ergonomic values**

In traditional vehicles of this type drivers can suffer from problems of the cervical spine while driving back and forth. There is considerable shock load on the cervical spine due to the jerky loader movements during loading and frequent manoeuvring. To help solve this problem this vehicle's articulated steering gives a very tight turning circle and the driver's cab is located close behind the articulation point, with excellent visibility for



Wide range of articulation gives tight turning circle

the operator to see the travel path both in forward and reverse motion. This helps to offer better comfort standards for the driver in all configurations and builds on research that shows that on loaders with swivelling driver's seats the load on the driver's cervical spine is significantly lower than with rigid seats.

"The eDrive LHD aims for more steps to reevaluate the working space within the cabin – such as an air curtain that helps to ensure clear vision and cameras at all times," says Panik. "For the future, remote controlled

operating of the LHD is a serious safety option in addition to manual steering. New technologies inspire us to take the existing to the next level and create impressive and convincing designs for fascinating vehicles." **iVT**

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'Air curtain' helps ensure clear vision

**DC** DESIGN CHALLENGE **2022**

Think you've got what it takes to design a vehicle that will make it into the pages of iVT magazine? Then it's time to start thinking about the Design Challenge for 2022. The challenge for next year is to...

**Design an industrial vehicle that includes new styling and functionality that takes full advantage of existing and possible future trends in connectivity and automation**

For submissions or to discuss more please contact iVT's Saul Wordsworth on [saul.wordsworth@markallengroup.com](mailto:saul.wordsworth@markallengroup.com)

Closing date for entries is Friday 2 July 2021