

H2 IntraDrive

FUEL CELL POWERED INDUSTRIAL TRUCK APPLICATION IN THE
PLANT LEIPZIG. A NEW BENCHMARK? ANALYSIS AND REPORT

WORLD OF ENERGY SOLUTION 2014

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**BMW
GROUP**



Nationales Innovationsprogramm
Wasserstoff- und
Brennstoffzellentechnologie

Gefördert durch:



Bundesministerium
für Verkehr und
digitale Infrastruktur

Koordiniert durch:

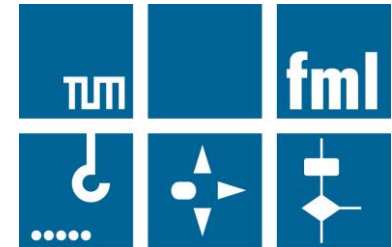


Nationale Organisation Wasserstoff-
und Brennstoffzellentechnologie

H2IntraDrive



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Potential advantages for customers

- “ No inconvenient battery change
- “ No investment on charger or spare batteries
- “ No extra space needed for charging stations
- “ No acids or chemicals needed
- “ Interesting especially for industries with high hygiene demands (e.g. food and pharmaceutical industry)
- “ Shows social sense of responsibility or environmentalism of customers towards the public

Requirements

- “ On-site H₂ infrastructure
- “ On-site H₂ production or regular H₂ delivery by a hydrogen supplier
- “ Sufficient ventilation of warehouses (if necessary)



- “ Technological leap in the fields of operating performance, customer benefit and environmental compatibility of electric trucks
- “ Development of the European market
- “ Implementation of the whole value-added chain from research and development right up to service
- “ Investigation of resource expenditure, load on hydrogen components (especially on the fuel cell system), as well as gathering of real operating conditions of industrial trucks equipped with a fuel cell in different operational scenarios
- “ Proof of energy efficiency, reliability, durability, sustainability and profitability

Topics overview

General Information

- ” Site selection
- ” Industrial truck fleet
- ” Indoor or outdoor
- ” Supplier overview

Hydrogen Infrastructure

- ” Functionality
- ” Specifications
- ” Construction
- ” Security



Industrial Trucks

- ” Specifications
- ” Commissioning
- ” Operation
- ” Security



Permits and reports

- ” BImSchG
- ” ErlaubnissachBetrSichV
- ” Risk assessment
- ” Fire protection report



Supporting instruments

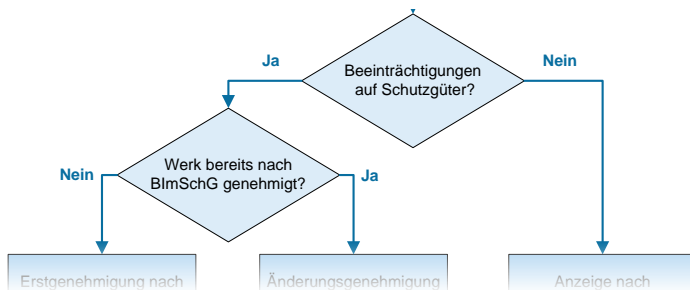
Checklists

- “ Select location for fuel industrial trucks
- “ Define eventual extensions plan
- “ Define number and types of trucks
- “ Calculate predicted hydrogen consumption
- “

Timetables

Aufgabe	Monat	1			2						
	Woche	1	2	3	4	5	6	7	8	9	10
Erstellung und Einreichung BlmSchG-Antrag											
Prüfung auf Vollständigkeit des BlmSchG-Antrages durch Behörde											
Prüfung BlmSchG-Antrag											
Erstellung Antrag für Erlaubnis nach BetrSichV											
Erstellung Brandschutzgutachten											
Erstellung Schallschutzgutachten											
Erstellung EX-Schutz-Dokument											

Flowcharts



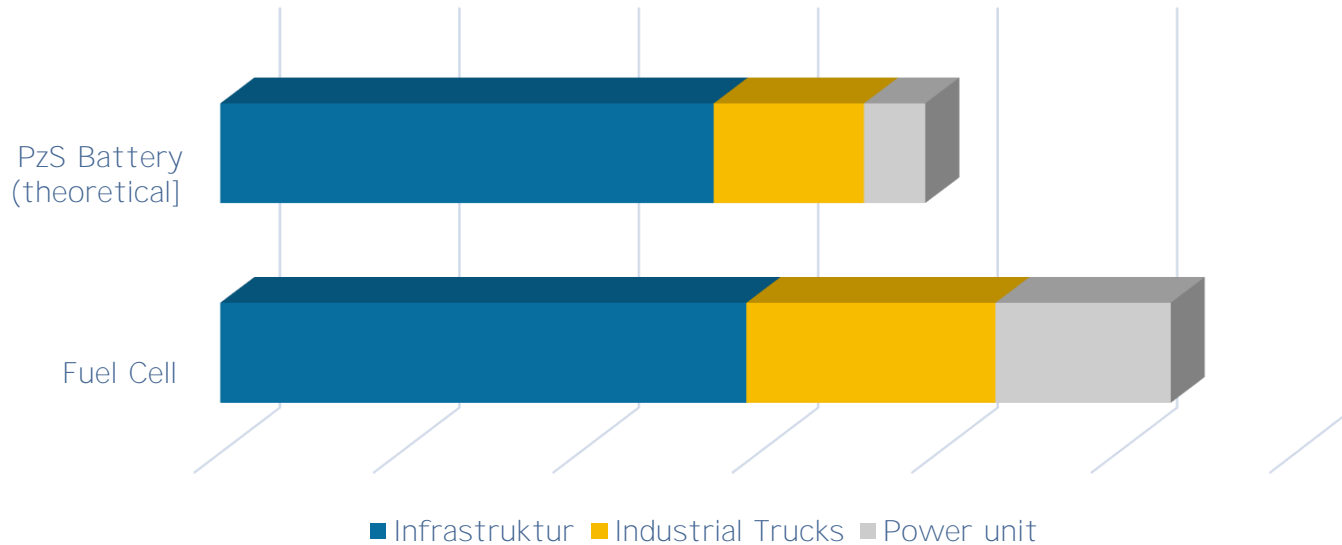
FAQ

- “ What happens when hydrogen leaks?
- “ What is green certified hydrogen?
- “ Benefits of fuel industrial trucks
- “ Disadvantages of fuel industrial trucks
- “

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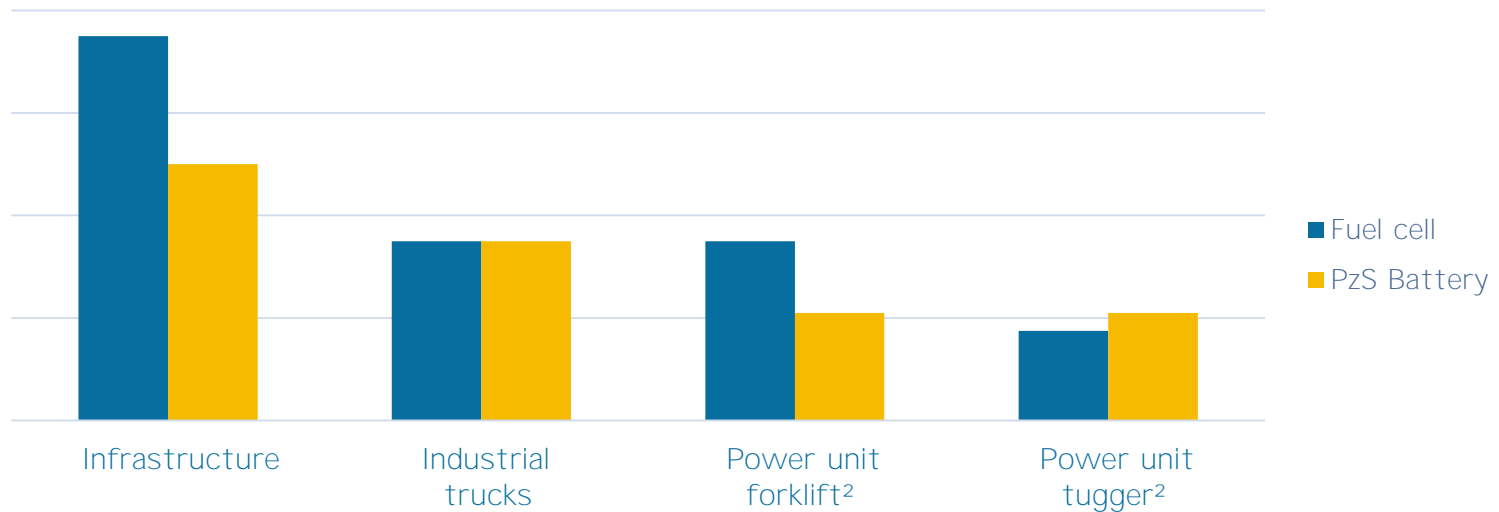
H2IntraDrive: Invest



Notes

- “ Similar invest for infrastructure are currently approx. 20% of the hydrogen infrastructure capacity needed
- “ Higher invest for industrial trucks because of adaptation costs will decrease with a higher production quantity
- “ Significant higher invest in power unit longer lifetime and new technology, costs will decrease with high production volume

H2IntraDrive: Proposed lifetime of components

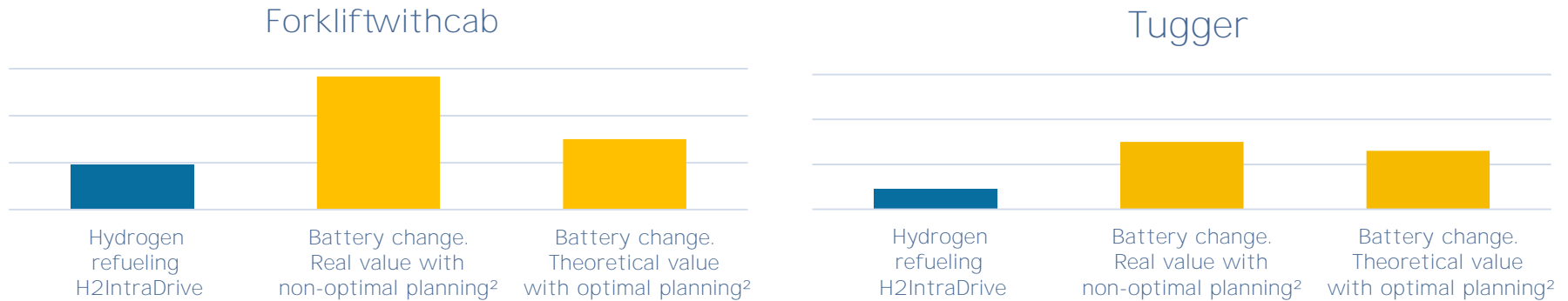


² Battery change operation hours / Battery per day = operation hours fuel cell / 2

Notes

- “ Lifetime of hydrogen infrastructure is significantly higher
- “ Lifetime of fuel cell power units is significantly higher

H2IntraDrive: Handling processes refueling vs. battery change

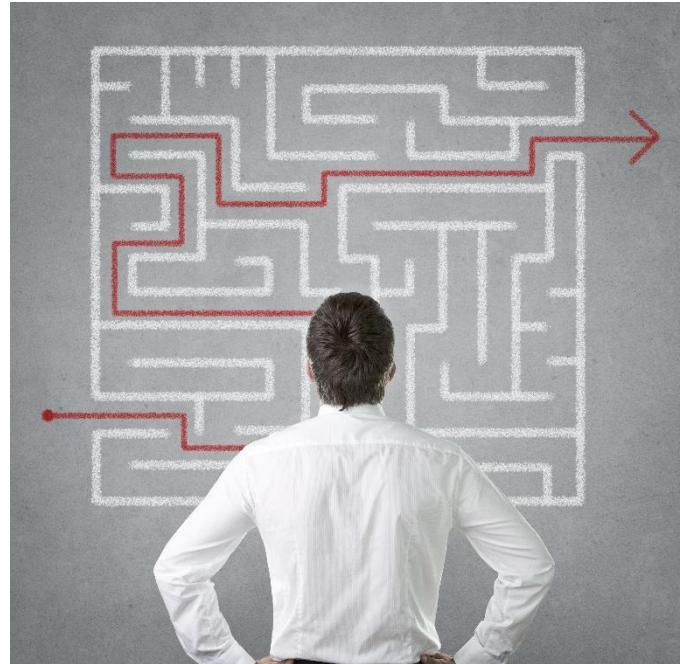


² Central charging station with crane & lifting beam

Notes

- “ Hydrogen refueling is much faster than battery change
- “ No additional training for truck operator needed to refuel hydrogen tank (crane license)
- “ Planning of battery changing stations is often suboptimal

Next steps



- “ Evaluation of operating data
 - “ Personal costs
 - “ Energy consumption of industrial trucks
 - “ Energy costs
 - “ Maintenance costs
 - “ “ “
- “ Evaluation of life cycle costs H2IntraDrive
 - “ LCC Model for evaluation of further applications
 - “ Determination of requirements for economic operation of cell
 - “ Industrial truck fleet size
 - “ Hydrogen cost
 - “ Invest
 - “ “ “

Projects in Germany

LindeMaterial Handling

Linde

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BMW	11 trucks
Daimler	2 trucks(delivery in Q3/ 2014)
Seifert Logistic	1 trucks(delivery in Q3/ 2014)
BASF	1 trucks
Airport Hamburg	2 trucks
AirportMunich	1 trucks(notoperatinganymore)
Linde GasMunich	2 trucks(notoperatinganymore)



Projects in Europe

Denmark

Kraft 4 trucks

Belgium

Colruyt 8 - 10 trucks

France:

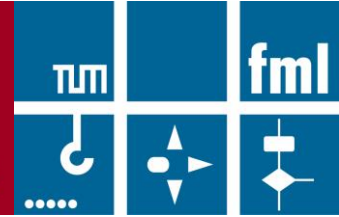
Ikea 12 trucks

Austria:

Fronius 5 trucks

DB Schenker 10 trucks (application for project extension in process)





www.h2intradrive.de

