EUROPEAN COMMISSION
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Directorate Energy, Transport and Climate
Unit Hydrogen and Batteries

Clean Hydrogen Partnership

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NOTE TO THE ATTENTION OF THE USERS OF THE HYDROGEN INCIDENTS AND ACCIDENTS DATABASE HIAD 2.1

The Joint Research Centre (JRC) of the European Commission developed the Hydrogen Accidents and Incidents Database HIAD in the frame of the European Network of Excellence HySafe (2003-2006).
HIAD is intended for public use. It is in first instance a repository of hydrogen-related unwanted events occurred in the past. Almost all data in HIAD come from a publicly available primary or secondary source (news, inspection reports from public institutions, other public databases, scientific articles, etc.). As far as possible, HIAD maintains a traceable link to the original sources.

Important legal information

By downloading and/or opening the EXCEL files containing HIAD dataset, you automatically accept the following conditions:

- **Neither the European Commission nor the any person acting on its behalf is responsible for the use which might be made of the information contained in the database HIAD 2.0. The same is valid for the Clean Hydrogen JU.**

- **Neither the European Commission nor the Clean Hydrogen JU are responsible for the validity of the data contained in the original sources.**

- The use of the database and of the data contained within is free of charge, but its use **should be properly acknowledged** by mentioning the following:
  European Hydrogen Incidents and Accidents database HIAD 2.1, European Commission, Joint Research Centre, Petten, The Netherlands

A short history of HIAD evolution

After the end of the European project HySafe, JRC has maintained and populated HIAD with the support of the International Association HySafe. HIAD was accessible via a web-interface, full online consult was available, but the application had limited data download functions.

In 2017, the JRC executed a major upgrade producing HIAD 2.0 with the financial support of the FCH 2 JU. Shortly later, HIAD was integrated in the activities of the European Hydrogen Safety Panel (EHSP) of the FCH 2 JU.

Since December 2020, HIAD 2.0 is offline due to new security measures and therefore users cannot access directly the data and perform their own search. In alternative to the online access, JRC developed a system which exported the online data into an offline EXCEL file, which will allow users to access and analyse the complete set of data according to their needs. The file ***JRC HIAD 2.0 export 2022 01 01 for users*** has been requested by and distributed to hundredths of experts. It contained the data collected in HIAD in date 31 December 2021.

During 2022 and the first months of 2023, JRC has have update the database with new entries and upgraded its structure to improve some event descriptors and reduce data noise. The most recent version is ***JRC HIAD 2.1 export 2023 09 01 for users*** (the value 2.1 indicate the progressive structural upgrade, the date indicates the end date of the events update).

You are reading this file because you have required accessing the database and you have been provided the link to the JRC Major Accident Hazards Bureau platform hosting HIAD: https://minerva.jrc.ec.europa.eu/en/shorturl/capri/hiadpt

Quality of data

The overall quality of the descriptions depends on the quality and the level of details offered by the sources. To guide the users and allow a down selection based on event descriptors quality, JRC developed a quality label of each event.

All incident descriptions provided to HIAD by experts are first reviewed and validated by JRC, before becoming publicly available. The JRC validation provides a quality indicators based on 5 quality values. Events not validated receive value 1 and are not shared with users. They wait for possible improvement or eventual cancelling.

Whenever possible, HIAD contains a lesson learned and a cause analysis. In the majority of the cases (quality 2 and 3), however, the low quality of the event descriptors does not allow for a meaningful lesson learned.

What is new in *HIAD 2.1 2023 09 01*

The new version 2.1 is not only updated with more cases, it presents as well an improved structure in comparison with the previous version. The old-new correlation is explained in a dedicated worksheet of the EXCEL file.

- New/better event descriptors: in previous versions, some event descriptors were not capturing well the complexity of the hydrogen ecosystem. The version 2.1 addresses some of these shortcomings by characterising each event by two independent sets: the hydrogen supply chains and the end use applications. In addition, the cause descriptor has been improved. This indicator adopts now the classification proposed by the European Hydrogen

Safety Panel and allows for multiples causes for each event. In version up to the 2.0, it was possible to allocate only one cause to one event. Version 2.1 considers that each event (the incident) consists always in a chain of sub-events and has almost always more than one cause.

- Less data noise: due to the many event providers which have been active along almost 20 years of existence of HIAD, the event descriptors were input rather incoherently, muddling the statistical evaluation of events. In HAID 2.1, JRC has reviewed all major descriptors by adopting a stricter taxonomy.
- More events: In respect to the dataset 2021, this new dataset contains more than 100 new events, some occurred in the recent months, some other obtained thanks to several experts who have provided new sources.
- The improvement will continue: the upgrading work is not terminated. Several descriptors, especially in the part dedicated to consequences, were designed originally aiming at catching the details required for quantitative risk analyses. These descriptors are almost empty, because the public sources used by HIAD are rarely providing required details such as releases flows, ignition causes, geometric characteristics of the leakage, unambiguous identification of the failed components etc. Future upgrades will consider what to do with these descriptors.

How to use HIAD and caveats

HIAD data collection is a service provided by JRC to hydrogen all safety experts, educators, students and technologists active in the field of hydrogen. Please consider that **the events described in HIAD are not intended to serve as instruments for passing judgement on individual companies or countries associated with an accident.** A blame culture surrounding the database would greatly reduce the sharing of information. Hence, the HIAD EXCEL file provides only literature references but does provide the documents containing the first or secondary data sources, which remains managed solely by JRC. JRC will provide these on an ad hoc basis, following a request for specific research purposes and only on a sub-set of the total dataset.

A proper use of the data in HIAD should also consider the following **caveats**:

- Do not conclude from the data in HIAD that 'hydrogen is not safe'. Every technology, once deployed, will always be affected by unplanned, unwanted events. HIAD is a tool developed to assist safe improvements of hydrogen technologies.
- HIAD events descriptors have been designed to draw a lesson learned and improve the safety of hydrogen technologies, not to compare the safety of hydrogen technologies with the safety of other technologies. Do not use HIAD data to answer the ill-posed question: 'which technology is safer?'
- The present structure of HIAD data is not done for deriving quantitative failure probabilities of specific components, because the majority of the event descriptions do not provide the details required and the statistical reliability enabling this type of analysis.
- Be very cautious before drawing general conclusions, because they could be biased by the types of primary sources used. For example, the historical and geographic distribution of the accidents is predominantly reporting European and North America events. Moreover,

certain industrial sectors are more represented than others, because they are committed to investigate and publicly report their accidents, while others are not.

The EHSP regularly performs thorough assessment of the data contained in the database, according to a specific methodology and classification to gather lessons learnt and formulate recommendations. They also perform statistical analysis considering the limitation mentioned above.

For questions, updates, feedbacks and collaboration proposal, please write to pietro.moretto@ec.europa.eu

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