TERX 3D

The obvious solution to plasma profile analysis platform

Developed in partnership with academic and military facilities, TERX 3D is a tailored solution to analyze plasma droplets and streams in up to three dimensions based on X-Ray images. The challenging experimental setup requires a robust and flexible tool to calibrate the sources and provide accurate measurements on the plasma droplets in order to retrieve their velocity, volume, rotations as well as the estimated 3D position of the impact. TrackEye TERX 3D has been designed for this specific purpose. Applications areas include the development and testing of shaped charge explosives for military, construction and demolition.

Key benefits

- Easy to use, modular
- Unique solution for plasma analysis
- Full 3D analysis of droplets and impact
- Wide range of tracking algorithms
- Possibility of creating templates
- Various table & image export formats
- Compatible with all major HS cameras

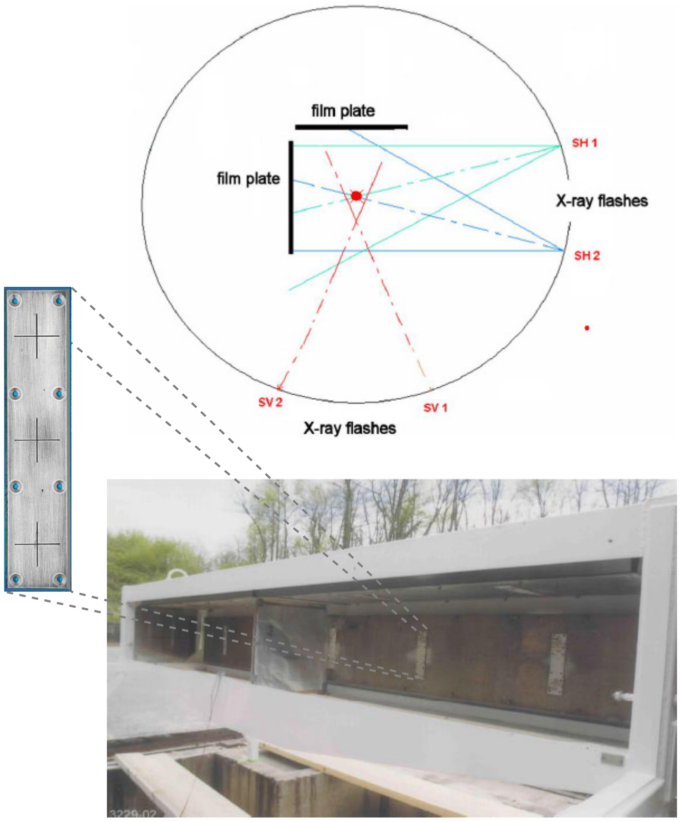
From images to results

TrackEye is the market leading motion analysis software and is used as a standard reference in many countries throughout the world. From loading an image sequence, executing the tracking algorithms, applying the chosen analytics and logic to presenting the derived data - TrackEye offers a straightforward workflow. The user interface is fully synchronized and any change of parameters or set-up will directly effect all parts of the tracking session, updating results, graphs and tables.

TERX 3D Experimental setup and acquisition

During a TERX 3D test, a series of X-Ray flashes are used to generate shadows of individual plasma elements, which are then captured on film and analyzed. The film plates are mounted behind protective aluminum plates which are transparent to X-Rays and act as a shield for possible physical damages. Reference cross hairs are engraved in the aluminum plate with an even distribution along the horizontal axis.

Prior to the actual test, the 3D position of the reference cross hairs are surveyed together with the exact position of the X-Ray sources.

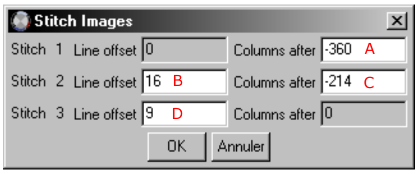


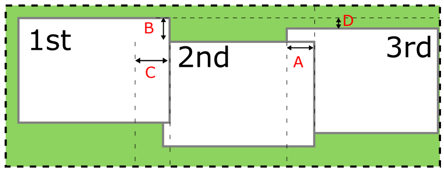
<u>Measurement:</u>
During the test, the plasma droplets are exposed along their flight path as the X-Ray flashes are triggered at different points in time and in two dimensions. This creates several shadowed lines of droplets from the same round but at different angles on the film plates due to the position of the X-Ray sources and at different times. The plates are then digitized/scanned creating image files which are then loaded into TrackEye for analysis using the TERX 3D module.

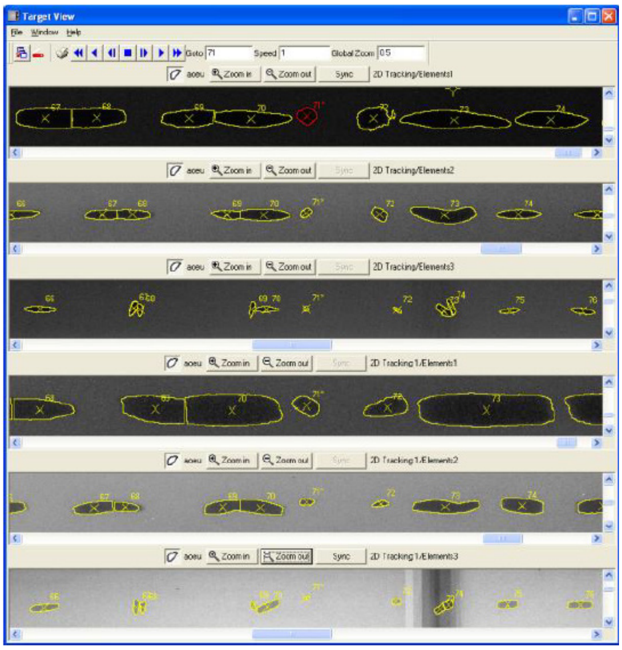
APPLICATION EXAMPLES

Synchronization of the images

The same round being imaged onto different consecutive film plates it is first necessary to realign the sequences and stitch them together. This is done through two offsets, one horizontal and one vertical.





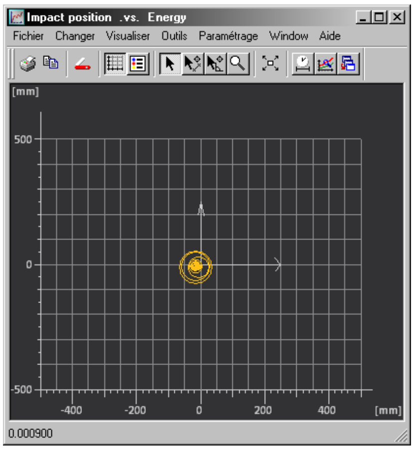


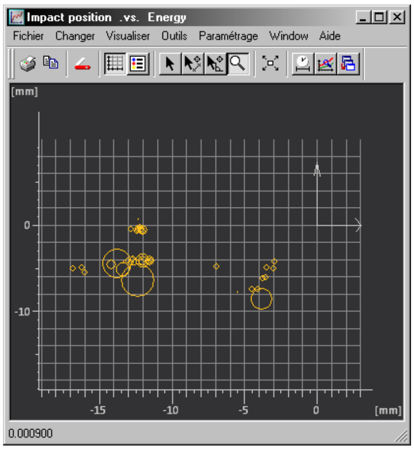
Identification of the plasma droplets

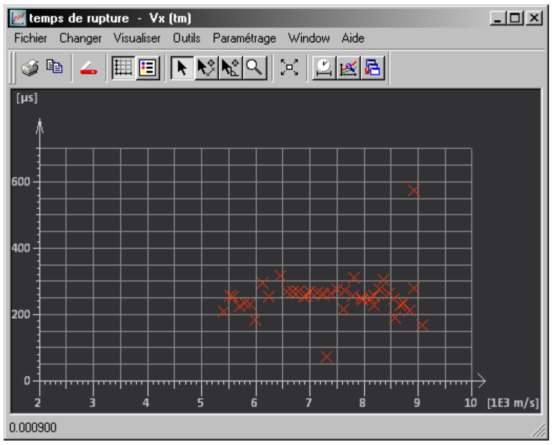
On a given film plate, several shadowed lines are visible due to the sequential triggering of the X-Ray sources and their different 3D position. To be able to compute statistics over the velocity, the volume and the rotation of each plasma droplet, it is necessary to identify each corresponding droplet on the different shadowed lines. Once the operator has identified one reference droplet, all the others are automatically detected and tagged with an incremental number if they are located before the reference one on the film (behind temporally) or a decremental number if they are placed after the reference (in front temporally).

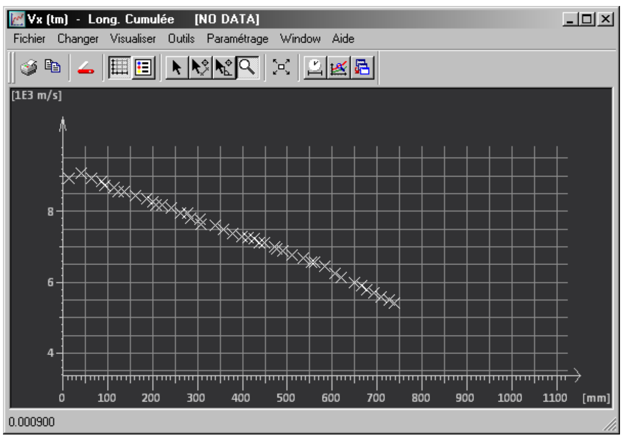
Results

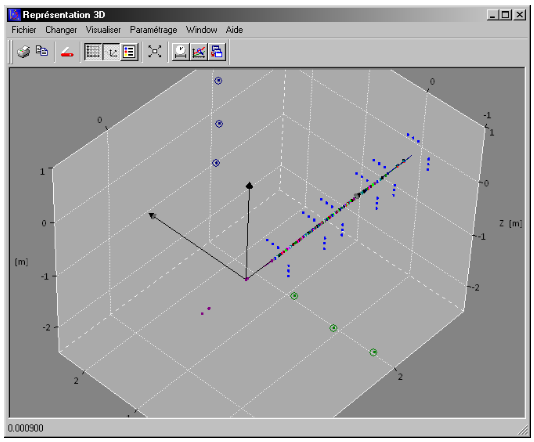
Below are presented a few ouputs provided by TERX 3D. [From left to right] The 3D position of the impact of each droplet projected on 2D planes as well as the energy. The breaking time of the hollowed charge using the different velocities of each droplets. This is a key parameter for reverse engineering in simulation models. The cumulative length of the blast can be displayed in 2D diagrams. The experimental setup with the position of the 3D surveyed X-Ray sources and 3D position of the film plate can be represented.











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