

Rupture of a grain storage cell

October 20, 2002

Jussy [Aisne]

France

Dangerous release
Food industry
Silo
Grains
Structural ageing
Preventive inspection
Studies / Expert evaluation
Evacuation

THE INSTALLATIONS IN QUESTION

The site :

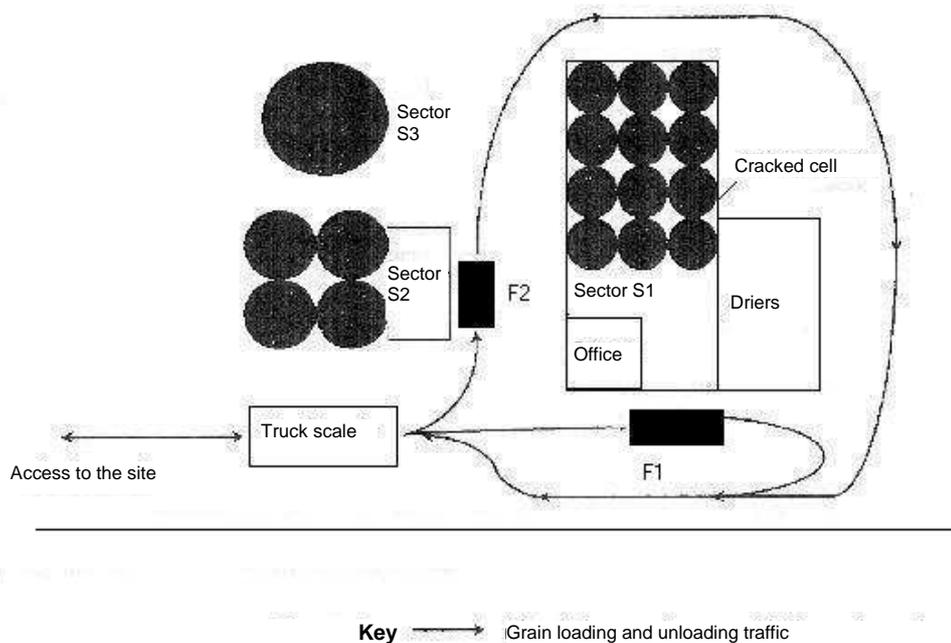
Located on the *commune* of Jussy since 1963, the silo, which has been enlarged over time, is divided into 3 zones of vertical storage cells interconnected by transport equipment :

- ✓ Sector S1 (1963): 12 cells with a total capacity of 5,520 m³
- ✓ Sector S2 (1971): 4 cells with a total capacity of 2,920 m³
- ✓ Sector S3 (1982): one 5,330 m³ cell

The installations also include driers, grading installations, and bagging equipment... with power of 80 kW and a 150 m³ liquid fertilizer depot.

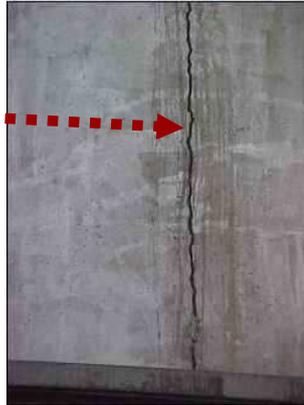
The establishment is governed by a Prefectoral authorisation of March 22, 1989 for the storage of fertilizer.

Cell identification



THE ACCIDENT, ITS BEHAVIOUR, EFFECTS AND CONSEQUENCES

The accident :



During a round on October 20th at about 10:00 am, the silo manager is alerted by the noise of a materials fall on the drier roof. He noticed a crack all along the 25-m-high cell in the sector S1. Roughly a hundred tons of corn had spilled out, damaging a wall allowing access to the control installations located at ground level, under the outflow cones forming the base of the cells.

Photo DRIRE Picardie

The consequences :

The accident did not claim any victims although property damage was extensive (amounts not available).

European scale of industrial accidents

The Jussy accident did not result in the release of dangerous materials and had no human, social or environmental consequences. On the other hand, due to the lack of a damage estimate, the financial impact could not be characterised by the scale officialised in February 1994 by the Committee of Competent Authorities of the member States which oversees the application of the 'SEVESO' directive.

Dangerous materials released		<input type="checkbox"/>					
Human and social consequences		<input type="checkbox"/>					
Environmental consequences		<input type="checkbox"/>					
Economic consequences		<input type="checkbox"/>					

The parameters that comprise these indices and the corresponding rating method are available at the following address : <http://www.aria.ecologie.gouv.fr>.

ORIGIN, CAUSES AND CIRCUMSTANCES OF THE ACCIDENT

The ageing of the reinforced concrete compounded by corrosion of the reinforcement is at the origin of the cracking phenomenon in the Jussy cell, built in 1963. Furthermore, prior to 1975 the cell construction rules stipulated the installation of a single level of steel hoops in the cell structure as opposed to 2 since that time.

ACTIONS TAKEN

The site was secured with a safety perimeter; deliveries from farmers were suspended, the progressive unloading of the 12 cells of zone S1 and the disconnection of the drier's gas and electrical power supplies. The Classified Installations

Inspectorate proposed that the *Prefect* issue an emergency shutdown order, which was signed October 31, 2002, requiring that the installations be subject to expert evaluation. The operator decided to stop operating cells S1 and S3 and to suspend the activity of the S2 cells pending the conclusions of the evaluation.

LESSONS LEARNED

If a silo can collapse from an internal explosion, it is not immediately obvious that cells can be damaged under the weight of the material stored. There are numerous causes for these structural ruptures and can, in certain cases, be cumulative : design fault, construction fault, modifications and work without sufficient prior engineering, corrosion and ageing of the materials. This accident confirms the risks of cell cracking resulting from the ageing of the reinforced concrete, particularly for cells built prior to 1975, when construction rules were modified to include a second level of steel hoops reinforcing the structure.

A certain amount of vigilance would seem necessary particularly concerning older installations. Operators should check, based on construction drawings of their installations, that the civil engineering, the conformity of the construction and possible modifications. If these elements are not available or, if there is a doubt relative to safety margins, an expert evaluation by a specialised organisation would seem highly desirable.

[Silo accidents caused by a similar problem:](#)

- Vailly sur Aisne – Detailed report, ARIA No. 23182
- Blaye – ARIA No. 346
- Méru – ARIA No. 24293
- Monthois – ARIA No. 26862
- Nogent sur Seine – ARIA No. 25044
- Seux – ARIA No. 25819
- Villette sur Aube – ARIA No. 28394