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## Incidents in the Spanish Industry. Learned Lessons

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# SIDERÚRGICA SEVILLANA

**7th DECEMBER 2001**

# SIDERÚRGICA SEVILLANA
## The event

- On 7 December 2001 the alarm activated a detector located in the extraction of smoke dust.
- In accordance with the procedures, Siderúrgica Sevillana, began a gradual shutdown of the steelmaking process and adopted a set of measures to identify the causes that led to the contamination.
- The measures taken by facility personnel indicate that:

    1. The cast was not contaminated (the tests showed negative radiation values)
    2. There were abnormal radiation levels (greater than the background) in parts of the line of smoke and dust in the silo. Specially in the collector of smoke dust.

- Therefore, they decided to isolate the stored material in the silo inside a trench and covered with lime.
- Due to the radiation levels had dropped below the alarm threshold, the steel makers decided to launch again the furnace.
- On December 10, the staff analyzed a sample of dust in the spectrometer. They had doubts with the interpretation of the spectrometer, so they decided to contact with ENRESA's technicians. ENRESA advised them to inform to the CSN

# SIDERÚRGICA SEVILLANA
# Event (2)

- On December 12, taking account the spectrometer results, the CSN concluded that a Cs-137 radioactive source  has been melted into the furnace and there is significant pollution inside the steel mill (2738 Bq/q was measured in a sample of the smoke dust)
- On December 13 , the CSN recommended to the company to stop the furnace. MITYC required, under CSN`s advise, to Sevillana Siderúrgica a plan for cleaning and decontamination
- 10, 11 and 12 December, the CSN's inspection found that smoke dust had went out the installation to another site destined for recycling and composting plant "La Vega" in Alcalá del Río (Sevilla).
- A total of 135 tm of smoke dust were deposited in this plant.
- The dust was clearly identified in two fronts.
- All contaminated dust was returned to Siderúrgica Sevillana
- All the operations to decontaminate and recovery the plant ended until January 2002.

# SIDERÚRGICA SEVILLANA
## Consequences

- There was not any disturbance for worker. Any worker has a value of internal radioactivity greather than LLD
- The collective dose for all decontamination and recovery works was 6,27 man-mSv
- The tests made to the steel and slag showed that its were not contaminated
- A total of 135 tm were sent to Alcalá del Rio, and 283 tm were returned to Siderúrgica Sevillana.
- The total mass of radioactive generated in all the operations was 553 tm. All the radioactive wastes were to carry up to Radioactive Waste Management Centre ("El Cabril"). The total volume of waste was 372 $m^3$ , and the radioactive activity of the Cs-137 source was 99 GBq (2,7 Ci)

# SIDERÚRGICA SEVILLANA
## Radioactive wastes

The distribution of radioactive wasted generated in all decontamination and recovery works is showed in this table

| | Weight | Activity | Volume |
|---|---|---|---|
| Dust in the hole | 3,52 % | 39,89 % | 2,99 % |
| Inert dust | 61,55 % | 27,70 % | 47,64 % |
| Uninert dust | 33,16 % | 32,21 % | 47,48 % |
| Other waste (debris) | 1,77 % | 0,20 % | 1,89 % |

# SIDERÚRGICA SEVILLANA
## Learned Lessons

- A self powered portable gamma beacon detector located in the dust extraction system is very useful to prompt alert in case of an melted radioactive source with relative high activity.
- The automatic actions explained in the paragraph 6.1 of the Protocol must be adopted automatically in case of melting of radioactive source.

    1. Shutdown the process
    2. Avoid the exit of products outside the installation
    3. Require the services of an specialized company in radiation protection
    4. Call urgently to the CSN

- The delay to adopt all corrective actions produced more radioactive wastes and the contamination of an installation foreign to the steel mill
- The learned lessons have been sent to all the signatories of the Protocol, across the follow-up Commission. The CSN has included these lessons in a Safety Guide 10.12 "Radiological control of activities of recovery and recycling scrap. (This guide is available through the CSN's Web site)

# DANIEL GONZÁLEZ RIESTRA

**11th AUGUST 2003**

- On 11th august, a loaded truck with light wastes, generated in the process of fragmentation, activated the alarm of the gamma portal monitor located in the exit of the installation.

- The personnel of the installation checks that the alarm is not due to the set of all, not to an isolated piece.

- The persons in charge of the installation decided to stop the shredder machine and to warn the CSN. The zone is corded and an UTPR is warned.
- The initial characterization showed about 200 tm of crushed scrap was contaminated with Cs-137

- MITYC required, under CSN`s advise, to the installation a plan for cleaning and decontamination. The criteria are very similar to the former cases.
- 15 days after, the cleaning and decontamination works were finished, and the fragmentation machine started again to work.

# Consequences

- The event did not affect to workers. They internal radiation levels were less than LLD to all workers.

- The collective dose in the cleaning and decontamination works was 0,11 man-mSv

- There was not contamination outside the installations

- The total mass of the radioactive waste was 52 tm, the volume was 73.5 $m^3$, and the activity of teh source was 7,64 GBq (210 mCi). These wastes were send to El Cabril in 5 travels.

- A video was made and it was showed to an expert group of United Nations for Economic Commission for Europe, about the surveillance of radioactive scraps, in Geneva (2004)

The distribution of radioactive wasted generated in all decontamination and recovery works is showed in this table

| | Weight | Activity |
|---|---|---|
| Water | 0,53 % | 0,02 % |
| Dust | 34,41 % | 34,17 % |
| Mud | 2,36 % | 1,51 % |
| Not compactable Material | 6,28 % | 1,00 % |
| Pressed material | 53,46 % | 12,99 % |
| Dust of vacuum cleaner | 8,34 % | 44,31 % |

# DANIEL GONZALEZ RIESTRA
## Learned Lessons

•Analysis of the incident underlined the importance of reinforcing the awareness of this type of problem in the metals recycling industry, which includes a high degree of fragmentation technology capacity.

•These type of installations need to have a well-training in case of radioactive detection in their own process

•All the installations that they have a fragmentation machine must have a gamma portal detector to monitoring the recycling material at the entrance of the installation. The personnel must be trained with the detector.

# ACERÍA COMPACTA DE BIZCAIA

**15th SEPTEMBER 2003**

# A.C.B. Event

- On September 15, 2003, a truck loaded with smoke dust activates the alarm of the portal detector located to the exit of the installation.
- According to the Protocol, the installation isolated the truck, analyzed with an spectrometer a sample od smoke dust. The results showed a contamination produced by a melted Cs-137 radioactive source. The mass activity of the sample was 12 Bq/q
- Immediately, the staff, according with the Protocol, ordered the following:

1. Stop the furnace, and isolate the potential contaminated zone
2. Make a radiological charazterization in all systems in contact with the smoke dust.
3. Call to an expert company in radiation protection
4. Notify the event to the CSN

- The MITYC, advised by the CSN, required to the installation elaborate a Cleaning and Decontamination Plant.
- All recovery works finished 13 days later, and the installation began to work normally again

# A.C.B. Consequences

- This event had not any radiological impact for the people (all measures to the workers was less than LLD) or the environment (outside the facility)
- The collective dose for all recovery works was 0 man-Sv
- The measures and analysis made to samples showed that the steel and slag were not contaminated.
- The total mass of radioactive wastes was 80 tm. They were send to El Cabril in 5 expeditions. The volume of these wastes was 74,8 $m^3$, and the source activity was 1,75 GBq (47 mCi)

The distribution of radioactive wasted generated in all decontamination and recovery works is showed in this table:

| | Weight | Activity |
|---|---|---|
| Tanker Dust | 35,85 % | 35,88 % |
| Silo Dust | 60,27 % | 61,51 % |
| smoke dust (other) | 3,88 % | 2,61 % |

# A.C.B.
# Learned Lessons

- Although the facility was fitted with surveillance and control systems, it was showed that the materials entry failed as a result of human error
- The detection system installed in the smoke dust line (gamma beacon detector) was inefficient in the case of smelting of moderate activity sources.
- It was simpler and more efficient to ensure that the exit of by-products was controlled by the entry implemented controls.
- Training must be reinforced.
- The administrative procedures between the facility, CSN and MITYC, must be done more simples.

# SIDENOR INDUSTRIAL (Fábrica de Reinosa)

**24th MARCH 2004**

# SIDENOR (REINOSA)-1 Event

- On March 24, 2004, a truck loaded with smoke dust of steel mill activates the alarm of a portal gamma detector at the exit of the facility.
- According with the Protocol, the facility isolated the track, and a spectrometer was used for analyzing several smoke dust samples.
- The results showed that a Cs-137 radioactive sources was smelted in the furnace. The measured activity in samples gave a mass activity of 80 Bq/g
- Then, the facility started the issues showed in the Protocol for these events:

1. Stop the furnace, and isolate the potential contaminated zone
2. Make a radiological characterization in all systems in contact with the smoke dust.
3. Call to an expert company in radiation protection
4. Notify the event to the CSN

- The CSN, analyzed all available data, required to the facility to implement a set of complementary actions, inform to authorities.
- The MITYC, advised by the CSN, required to the installation elaborate a Cleaning and Decontamination Plant.
- The end of all activities for recovering the facility led to come back again the normal production of the facility in 13 days.

# SIDENOR (REINOSA)-1
# Consequences

- This event had not any radiological impact for the people (all measures to the workers was less than LLD) or the environment (outside the facility)

- The measures and analysis made to samples showed that the steel and slag were not contaminated.

- The total mass of radioactive wastes was 76 tm. They were send to El Cabril in 5 expeditions. The volume of these wastes was 74,8 m3, and the source activity was 3,0 GBq (81 mCi)

# SIDENOR (REINOSA)-1
# Radioactive Wastes

The distribution of radioactive wasted generated in all decontamination and recovery works is showed in this table:

| | Weight | Activity |
|---|---|---|
| Cleaning of the facility | 27,68 % | 13,14 % |
| Silo | 23,55 % | 23,12 % |
| Tanker | 24,01 % | 57,88 % |
| First Start | 2,42 % | 1,68 % |
| Second Start | 17,35 % | 1,91 % |
| Others | 5,00 % | 2,26 % |

# SIDENOR (REINOSA)-1
# Learned Lessons

- It is necessary to check the by-products with these leave the facility

- As result of this incident, the measures agreed on following the previous incident was seen to work correctly, the mechanisms for communication and coordination between the affected companies and the involved authorities were improved, and also training was reinforced

# ARCELOR ALAMBRÓN ZUMÁRRAGA

**31th MAY 2004**

# ARCELOR ZUMÁRRAGA
## Event

- On May 31 a truck loaded with smoke dust of steel mill activated the alarms of radiation of the portal monitor at the entry of another installation contracted for the management of the smoke dust of the steel mill.
- After the detection, the above mentioned company returns the truck to steel mill of origin, where the above mentioned alarm is confirmed.
- In fulfillment of the commitments of the Protocol, the installation proceeded to:

1. Stop the furnace, and isolate the potential contaminated zone
2. Make a radiological characterization in all systems in contact with the smoke dust.
3. Call to an expert company in radiation protection
4. Notify the event to the CSN

- The CSN, analyzed all available data, required to the facility to implement a set of complementary actions in order to avoid the spread of the contamination and assure an adequate radioprotection. CSN also inform to authorities.

- The MITYC, advised by the CSN, required to the installation elaborate a Cleaning and Decontamination Plant.
- The operational activity of the affected part of the facility was interrupted for 3 days.

# ARCELOR ZUMÁRRAGA
## Consequences

- This event had not any radiological impact for the people (all measures to the workers was less than LLD) or the environment (outside the facility)

- The measures and analysis made to samples showed that the steel and slag were not contaminated.

- No radioactive waste to be managed by ENRESA was generated. It was due to all the activity measured samples of the dust was less than 10 Bq/g.

# ARCELOR ZUMÁRRAGA
# Radioactive Wastes

Despite de fact it was not generated radioactive wastes, It is showed in the following table the contribution of all cleaned systems.

| | Nº big-bags | Activity |
|---|---|---|
| Silo | 38,78 % | 42,34 % |
| Start | 5,87 % | 27,03 % |
| Tanker 1 | 51,43 % | 27,93 % |
| Tanker 2 | 3.93 % | 2,70 % |

# ARCELOR ZUMÁRRAGA
## Learned Lessons

- Although the facility was fitted with surveillance and control systems, there was a failure due to human error in the materials entry system. Furthermore, the exit by-product control system had not implemented, although the redundancy of the overall system worked correctly, since the detection ocurred at the company receiving the steelyard dust for recycling.

- As result of this incident, the need to comply strictly with the agreements reached on the basis of the Protocol was underlined (mainly in the inerest of the companies themselves.

- Agreements were reached regarding reinforced training and information. These have been implemented during 2004.

- Instruct to smoke dust management companies to sign the Protocol

# SIDENOR INDUSTRIAL (Fábrica de Reinosa)

**22th MARCH 2007**

# SIDENOR (REINOSA)-2 Event

- On March 22, 2007, a truck loaded with smoke dust of steel mill activates the alarm of a portal gamma detector at the exit of the facility.
- According with the Protocol, the facility isolated the track, and a spectrometer was used for analyzing several smoke dust samples.
- The results showed that a Cs-137 radioactive sources was smelted in the furnace. The measured activity in samples gave a mass activity of 6,5 Bq/g. According with these values, the facility communicated to the CSN that it is went to continue with it normal production.
- The CSN informed to the installation that it was convenient to stop the furnace and analize the situation
- The CSN, analyzed all available data, required to the facility to implement a set of complementary actions, inform to authorities.
- The MITYC, advised by the CSN, required to the installation elaborate a Cleaning and Decontamination Plant.
- The end of all activities for recovering the facility led to come back again the normal production of the facility in 2 days.

# SIDENOR (REINOSA)-2
# Consequences

- This event had not any radiological impact for the people (all measures to the workers was less than LLD) or the environment (outside the facility)

- The measures and analysis made to samples showed that the steel and slag were not contaminated.

- The total mass of radioactive wastes was 27 tm. They were send to El Cabril in 2 expeditions. The volume of these wastes was 24,8 m3, and the source activity was 0,46 GBq (12 mCi)

# SIDENOR (REINOSA)-2
# Radioactive Wastes

The distribution of radioactive wasted generated in all decontamination and recovery works is showed in this table:

| | Weight | Activity |
|---|---|---|
| Tanker Dust | 98,5 % | 98,9 % |
| Silo Dust | 1,5 % | 1,1 % |

# SIDENOR (REINOSA)-2
# Learned Lessons

- It is necessary to check the by-products with these leave the facility.

- It is very important to communicate as soon as possible the event in order to minimize the generated radioactive wastes.

CSN

# THANKS YOU