REDUCING DIGGING INCIDENTS USING RISK MANAGEMENT

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ABSTRACT

Background

In the Netherlands digging incidents cause almost 40% of the failure of the gas distribution system. Nuon owns approximately 35,000 km of mains and over 2 million connections to customer’s houses. The annual cost for repairing damage is 1.4 million euro, approximately 75% of those costs are reclaimed. Damaged pipes not only lead to the cost for repair but also to certain risks such as explosions and fire.

In order to prevent damage caused by digging, most of the Dutch network owners are joined in a foundation called KLIC (Cable and Pipes Information Centre). A contractor receives information on all the mains in a requested area simply by contacting KLIC, and through KLIC the network owners.

In addition to sending information Nuon has supervisors who support the contractor.

Nuon automatically answers all requests with an own system named WEB-KLIC. This application selects the requested area in a Geographic Information System (GIS) and either prints the selected area or sends an email with the precise information to the excavator.

Nuon receives annually 67,000 requests through KLIC, in 6% of these requests an incidents occurs. Not all excavators contact KLIC before digging. At this time there’s no act in the Netherlands that forces the excavators to contact KLIC.

Aims and method

Against this background, Nuon Assetmanagement has investigated an additional method how to reduce digging incidents in the future. By using risk management as a tool to guide the supervisors Nuon aims to reduce the number of incidents to a minimum. Nuon wants to improve safety, to increase reliability of the infrastructure, to reduce costs and to prevent environmental damage.

Conclusions

Preventing incidents caused by digging is an obligation for the network operator as well as for the excavator. In the Netherlands many initiatives are started to prevent digging incidents. Nuon provides accurate information and supports the excavators through supervisors, by supplying them with the right information based on Risk Analysis, to reduce digging incidents.
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2 INTRODUCTION

2.1 Inducement

The independent Dutch grid operator, Continuon Netbeheer (Continuon), is responsible for the management of the power and gas grid of the Dutch utility Nuon. Nuon owns approximately 35,000 km of gas mains and over 2 million connections to customer’s houses besides HV/MV/LV electrical distribution network.

A department of Nuon is Nuon Assetmanagement; this department determines the governance policy for the grid.

In order to support the excavators preventing digging accidents Nuon annually sends 67,000 maps of the mains on planned digging sites. In less than 1% of these requests an incident occurs. At excavation sites without a map of the mains present the probability of an incident is more than twice as high.

In addition Nuon employs 15 digging supervisors who support and if necessary control the excavators.

A considerable part of the annual cost (1.4 million) for maintaining and operating the gas mains is caused by digging accidents. Also digging accidents cause 40% of failure of the network.

Both items motivated to start a study how to prevent and thereby reduce the number of digging accidents. The whole process of digging and accidents from the past are analysed. In this paper the most important change is explained.

2.2 KLIC

In the Netherlands the grid owners started a corporation named KLIC. KLIC (Cable and Pipeline Information Centre) is a nationwide corporation to prevent damage to cables and pipelines. KLIC is taking care that the cable and pipeline operators inform the excavators about the exact location of cables and pipelines.

At the moment there are a little less than 1,000 cable and pipeline operators who collaborate within KLIC. On a yearly basis KLIC handles about 160,000 applications and sends more than 1,000,000 information messages to the participating companies.


![Diagram](image-url)

**Figure 1**

KLIC maintains a geographic database with all the network owners per location. The excavator receives information from all the grid owners active in the requested area simply by contacting one office.

Each excavator is asked to send a request at least three workdays before digging. The excavator is able to make a request on the Internet or a phone call.
The contractor is able to set the exact location of the planned activity based on geographic coordinates. An example of such a planned area is given in figure 2.

Figure 2 Example of a requested area

Figure 3 Fragment of the requested area presented by WEB KLIC
2.3 Nuon WEB KLIC

All request from the KLIC corporation to Nuon are received in an own application called WEB-KLIC. This application is able to select the maps with information of the different types of mains. The different types of mains are stored on separate layers. (Gas high pressure, Gas medium pressure, Gas low pressure, Power high voltage, Power medium voltage, Power low voltage)

The application either prints the selected maps including an informative letter or converts the maps to PDF files and sends an email to the excavator.

2.4 Nuon supervisors

Nuon employs 15 supervisors, who support the excavators. The supervisor at his own is able to select any activity for a period and area in the WEB KLIC application. It is also possible for the contractor to contact a supervisor by phone. The supervisors can explain to the contractor how to judge the received information or show where the mains can be found. The supervisors are for that reason equipped with a grid-locating tool. It is also possible for the supervisors to make an unannounced visit to an excavation site, because not all excavators contact KLIC before digging.

Each visit to an excavation site is stored in the WEB KLIC application, the findings of the supervisor on the quality of the excavator is stored in the so called database Excavator Experiences Database, each digging incident is stored in the same database.

2.5 Legal regulations

A study performed in commission from the ministry of Economic Affairs showed that the excavator often causes damage because he has poor knowledge of the location of the mains. The minister of Economic Affairs has presented an act that will regulate the responsibilities of the network operators and the excavators. This act will probably not come into effect until the end of 2006. The intention of the law prepared by the minister is that the information of the network at the planned excavation site presented by the network owners to the excavator is accurate and complete. Also the excavator is forced to work more careful and will be obligated to make a KLIC request in advance of an excavation.

(Source: Ministry of Economic Affairs digging with policy Pubnr. 04TP39)

3 AIMS

The main aim of this study was to reduce the number of digging accidents.

A number of points of improvement are elaborated that contribute to the aim in procedural or operational matters. The improvement points are for that reason divided in three groups

1 the correct tools for the Nuon supervisors
2 more knowledge of the quality of the excavators
3 better information and coaching of the excavators

Using Risk Management as a tool has an influence on all three groups. By knowing the quality of the excavator it's possible for the network owner to sent the Nuon supervisor to those excavation sites where the risk of accidents is at highest. Better knowledge of the excavator will makes it also possible to adjust the management of the supervisors to the excavator who work in the highest risk areas or causes the most incidents.
4 METHOD

4.1 Evaluation

In 2005 a study was performed by KLIC to investigate the reasons of digging accidents. Nuon collaborated in this study. From the Nuon database a hundred randomly chosen incidents were selected. The evaluation showed that providing accurate information on time does not assure the prevention of incidents. Reckless digging or digging under time pressure led to fifty-five of the hundred incidents. Forty incidents happened while the contractor didn’t request for information. Only five incidents were caused by a lack in the information of the network owner.

4.2 Approach

With the data stored in the WEB KLIC database it is possible to make an overall judgement on two items. First Nuon is able to judge each excavator based on own experience. Secondly the probability of an incident is related to the type of activity performed by the contractor, this type of activity is one of the questions in the KLIC request.

The location of the planned activity by the excavator determines two other items. The number and type of mains in the selected area both have an influence on the probability and the impact of a digging accident.

The type of network determines the expected impact after an incident. For example damaging an oil pressure high voltage cable scores high on Safety, environment and Costs. Damaging a low-pressure Gas pipe scores medium on Safety, low on Environment, costs and Power outage.

It is possible to determine the type of soil. This also has an influence on the probability of a digging accident. For example it is more difficult to dig in clay in compromise with sand.

4.3 Model

Each (KLIC) request is judged on the next items,

<table>
<thead>
<tr>
<th>Probability</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excavator company</td>
<td>Safety</td>
</tr>
<tr>
<td>Amount of network in the area</td>
<td>Environment</td>
</tr>
<tr>
<td>Area of digging (e.g. city or rural)</td>
<td>Costs</td>
</tr>
<tr>
<td>Type of activity (e.g. digging or drilling)</td>
<td>Power outage</td>
</tr>
</tbody>
</table>

Table 1

By providing scores on each given item from the table above and multiply this score by a factor it is possible to determine a risk score for each received (KLIC) request. To determine the multiplying factor as shown in table 2, interviews were held with the Nuon supervisors.
Using Risk Management enables Nuon to get a better grip on the digging activities. The result of scoring each (KLIC) request is a list sorted by score. A higher score means a higher risk of a digging accident. After implementing this model in WEB KLIC the Nuon supervisor will not only see a list of all the activities in his area but this list will be sorted on risk.

The Nuon supervisors are obligated to visit all the requests with the highest score. Requests with a medium or low risk are visited less frequently.
5 EXPERIENCE

The introduction of WEB KLIC makes it possible for Nuon to answer all request in a very short period of time. In the past each request lead to A0 size paper drawing had to be copied, put in an envelope and then were posted to the excavator. WEB KLIC reduced the number of employees active on the KLIC requests and also the amount of paper used for this process. The reduction of paper is mostly achieved by sending emails instead of paper and being able to select an area in the database instead of coping papers.

The growing attention for digging accidents by the network owners, the government as well as the excavation companies provide a environment where improvement can be reached by cooperation. For example Nuon recently presented a very well received information session at an excavation employers instruction day.

The database with the experience from the supervisors enables Nuon to take action based on our own experience. A result is a monthly top ten of excavators with the most incidents.

6 CONCLUSION

Preventing incidents caused by digging is an obligation for the network operator as well as for the excavator.
In the Netherlands many initiatives are started to prevent digging incidents.
Nuon provides very quickly accurate information and supports the excavators through supervisors, by supplying them with the right information based on Risk Analysis, to reduce digging incidents.
REFERENCES

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www.nuon.com

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www.klic.nl

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www.ez.nl

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