HAZARD EVALUATION IN DIAMOND PROCESS INDUSTRY

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Abstract: Several decades ago, metal-bonded diamond tools were introduced into natural stone processing and civil engineering applications. Without any doubt, by allowing dramatically increased material removal rates, they have revolutionized the whole sector. However, although significant improvements have been made since the early days in tool performance, diamond tools are still the main cost-effectiveness factor. This project aims to use chemical reactivity tools and risk assessment to assess the diamond processing industry's hazards. It covers the importance of choosing an appropriate hazard identification technique, how the methods were reviewed, details of the literature review, phases of the process life cycle, summarizing the hazard identification techniques, comparing the applicability of each technique for different installation types, then discussing the information provided in the report and comparing the relevance of each method for various installation types.

Keywords: Hazard, Diamond, Acid, Deep, Regular Boiling

I. INTRODUCTION

Diamond instruments govern cutting processes in the natural stone industry and similar applications. One of the most widely used methods is the so-called 'sawing' applied in natural stone and civil engineering.

This computer program should be used to help identify possible risks of chemical reactivity in chemical operations. These risks are often well hidden, and their identification requires a thorough analysis of what might be wrong with chemical processes. Particular thought and care should be taken in understanding the Chemical Interaction Matrix where binary chemical reactivity is identified and the Scenario generation area where the user is asked to identify both intended and unintended operations. This analysis is best carried out by a team, including those familiar with manufacturing technology, chemistry, reactive chemical testing, and procedures.

The program's binary chemical interaction section is the same as the NOAA (National Oceanic and Atmospheric Administration) CAMEO (Computer-Aided Emergency Management) CRW2 (Chemical Reactivity Worksheet). The CRW2 is based on functional group reactivity. Because the program must predict many chemical reactions, many false positives can be generated. They must be identified and removed from the results to avoid wasting resources on unnecessary risk remediation. CRW2 rarely produces false negatives, but the user must always be aware that there is a possibility of missing a significant interaction based on the previously unknown chemical reaction or the molecule's unique characteristics, which may allow an unusual reactivity to occur between typically non-reactive functional groups. This is one of the reasons why the team approach is the best. At least one of the 167 CSB(Chemical Safety Board) incidents1 involved the inadvertent introduction, on a large scale, of a contaminant not previously known to be a reaction catalyst – a lesson in the dynamic and evolving nature of chemical and scientific knowledge that cannot be captured in a static reactivity prediction tool and the need for reactive chemical testing.

II. BACKGROUND STUDY

Amankwah, R. K., & Anim-Sackey, C. [1] In the literature, the sustainability concept for small-scale mining has various opinions. This paper discussed the current situation of the small-scale mining industry in Ghana. Careful analysis of the steps taken about environmental issues, products, and improved human conditions in terms of education, skills, and living standards resulting from small-scale mining was carried out in the context of the affected areas' prevailing socio-economic realities. The results show that the industry's profound economic and social impacts at the local and national level are positive for individuals, families, and communities directly or indirectly involved in these activities.

Banimostafa, A et al. [2] This mixture of hierarchical and iterative processes calls for coordination between manufacturing teams of different knowledge backgrounds, such as R&D, process engineering, and potentially product commercialization, to achieve the optimized nature of the production process.

Tillmann, W. [7] Synthetic diamond is a fast-growing demand for high-performance instruments. Both major development routes, such as high-pressure and low-pressure synthesis, generate diamonds that open up many tool applications in the construction sector. The theoretical and applied analysis also indicates that the total capacity of this old but completely new content has, by definition, been utilized.

Tönshoff, H. K. et al. [8] Diamond tools can be represented as a complex device with multiple influencing factors for cutting natural stones in this case. However, as stated in the previous pages, most cutting applications problems can be sought the method required (and it must be stressed that it is a grinding process) and all related features. Sometimes this structural method alone provides the chance to find fault points that are not apparent and cannot be addressed regarding particular aspects alone.

a) PROBLEM IDENTIFICATION

The chemical reactivity testing method will only help the consumer recognize threats. The software tool complements the user's awareness of established reactivity threats. It is not feasible to identify all threats of reactivity. Besides, the conclusions produced by utilizing the software method may only be precise and comprehensive.

The warehouse separations are based on the codes entered for the DOT's chemical (Department of Transport). The proposed segregations must be tested against the Chemical Reaction Binary Contact Matrix and special threat regulations to segregate such incompatible products correctly. Care must also be taken while considering concealed risks such as holding vast volumes of water-reactive products in a fire-protected storage facility through a water sprinkler or a water diluge device.

A functional group methodology is used to test chemical reactivity by the program. This can trigger mistakes. Either laboratory or professional chemist qualified in chemical synthesis and chemical reactions can verify all predictions.

III. SYSTEM MODEL

a) ACID BOILINGPROCESS

One way to disinfect diamonds is to simmer. To decide what flaws exist, diamonds must be tested at any point of manufacturing and sorting. Dirt sticks to the surface of gems, traces of glue, residue attributable to polishing, etc., during some points of the development phase. Until sorted polished, the diamonds are boiled, and any foreign substances stuck to the diamond are extracted at the end of the production process. The boiling, normal and extreme, also known as deep-frying, is two styles.

b) REGULAR BOILING

Regular boiling is meant to eliminate external contaminants, if the polisher considers to be appropriate to begin the operation, which can be performed at different stages of the polishing process. Single rooms are boiling. In special ovens, in which diamonds are set, special test tubes are mounted. They are individually positioned if the stones are big, and if the stones are small, they are put in packets. Along with sodium hydroxide acid combination, nitrium acid is pumped into the test tubes. Acid is not damaged by diamonds and therefore is not affected. Then diamonds are "boiled" for about 15 minutes and the fluid is yellowed.

The diamonds are then pulled from the furnace, refrained and cleaned with lots of water, spirited, and checked well. The diamonds are sparkling and clear at the end of the process and are free from all outside dirt.

c) DEEP BOILING

Deep boiling is intended to enter internal dirt through a tiny crack called "open inclusion," which can be reached by boiling the boiling content, the little black graphite embedded in the diamond. As it is shaped, these little dots are trapped in the diamond. As the diamond itself is not corroded by acid but only by the soil within the gem, it encourages dirt to be extracted such that the polished diamond appears firmer. Deep boiling is a long 10-12-hour operation. It is made with a blend of fatty high-heat acids. Diamonds are then put in substantial containers of tantalum and sealed in containers with pressure. The cooling phase consists of cooling the cases, clearing the residual acid vapor, and cleaning the diamonds. The in-depth boiling is slower and more challenging than normal boiling.

d) FACTORY LAYOUT

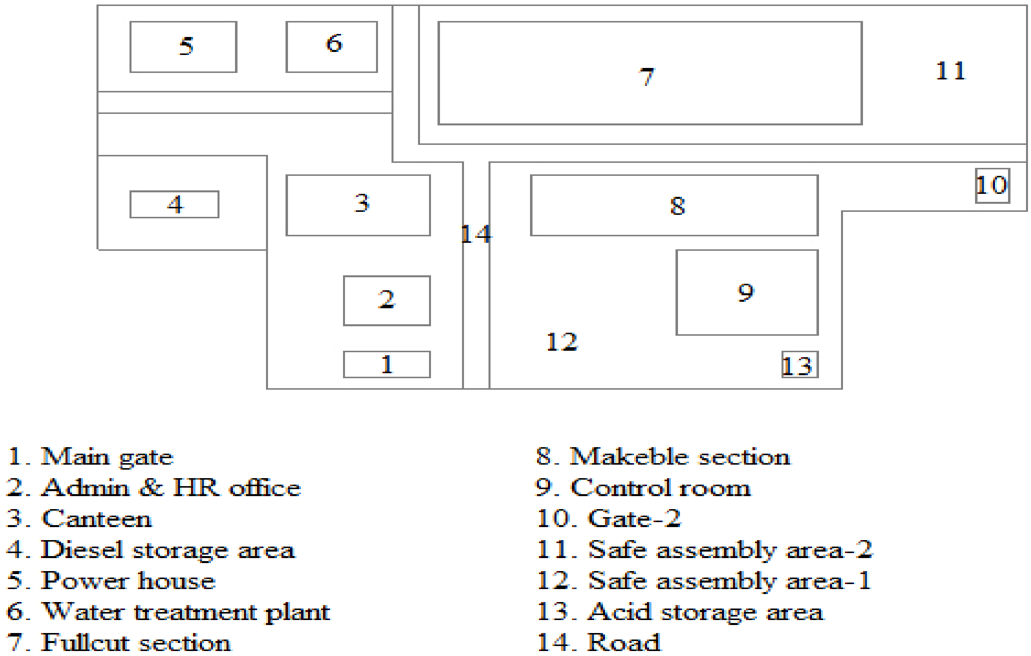

Figure 1 Factory layout

d) PROCESS FLOW CHART

The following flow chart of chemical reactivity tool process flow

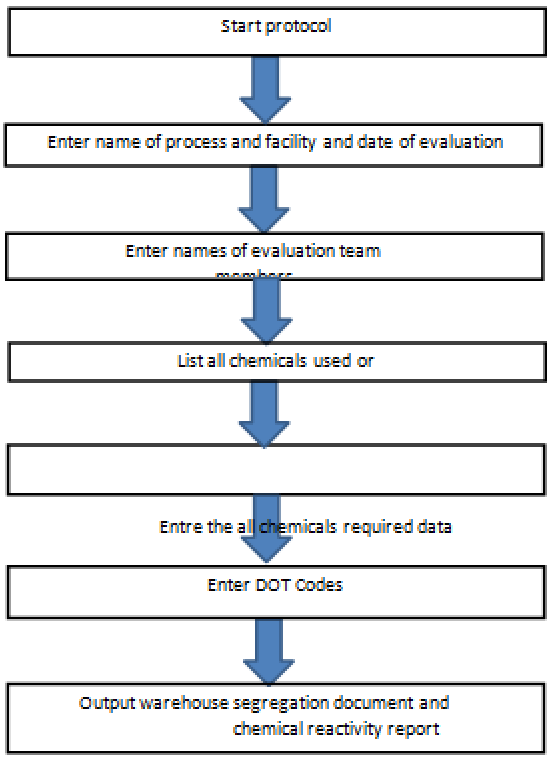

Figure 2 Process flow diagram

IV. DISCUSSION

The following figures give details about the chemical reactivity tool using a procedure

STEP-1: Open the software and first load or create a process

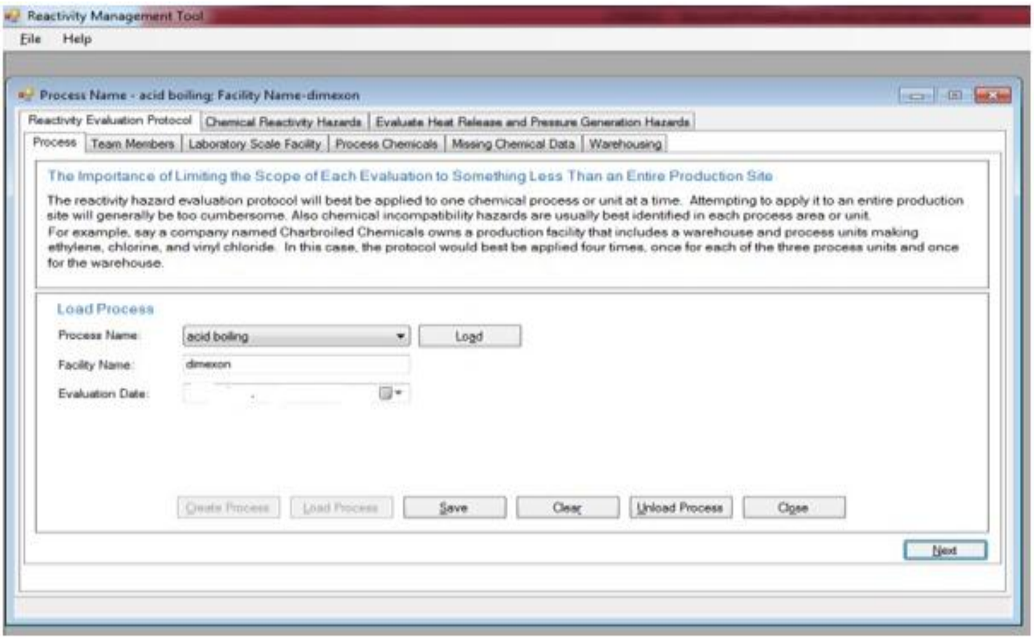

Figure no. 3 load process procedure

STEP-2: Give team members details

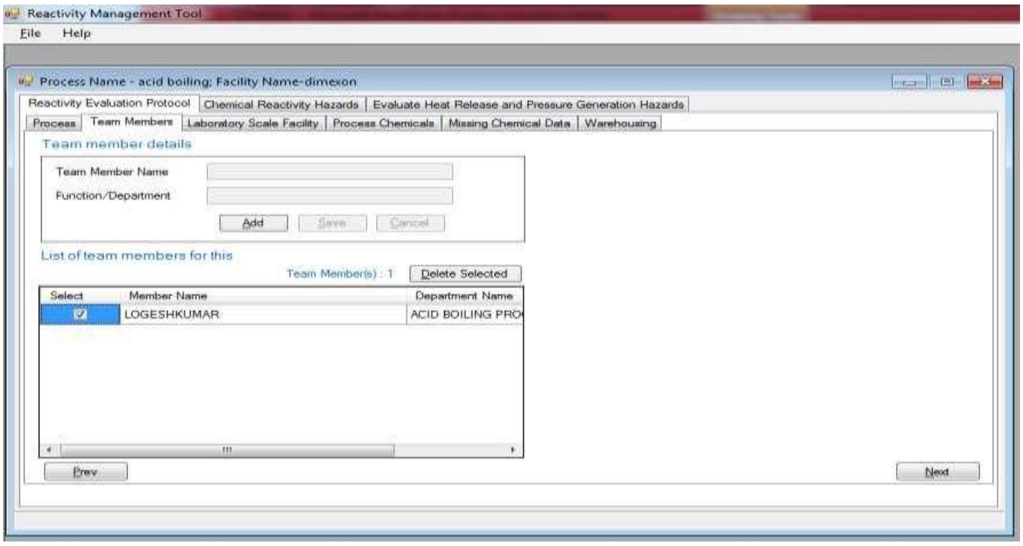

Figure no. 4 Team member details

STEP-3: Select the required chemicals from the software

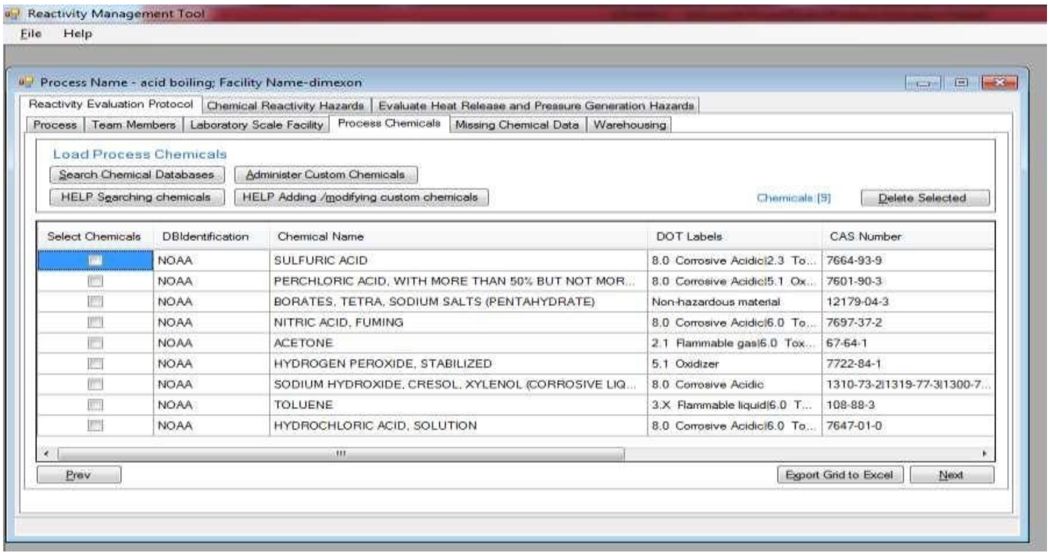

Figure no. 5 Load process chemicals

STEP-4: Give some missing inputs refer from the standard MSDS

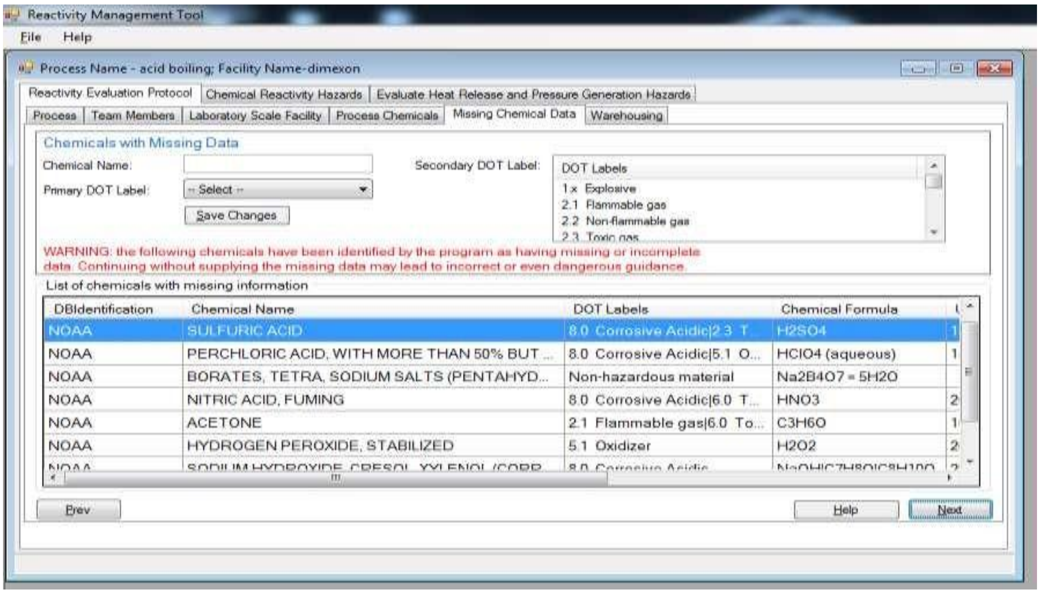

Figure no. 6 chemical with missing data

STEP-5: Get the warehousing report and save it in excel format

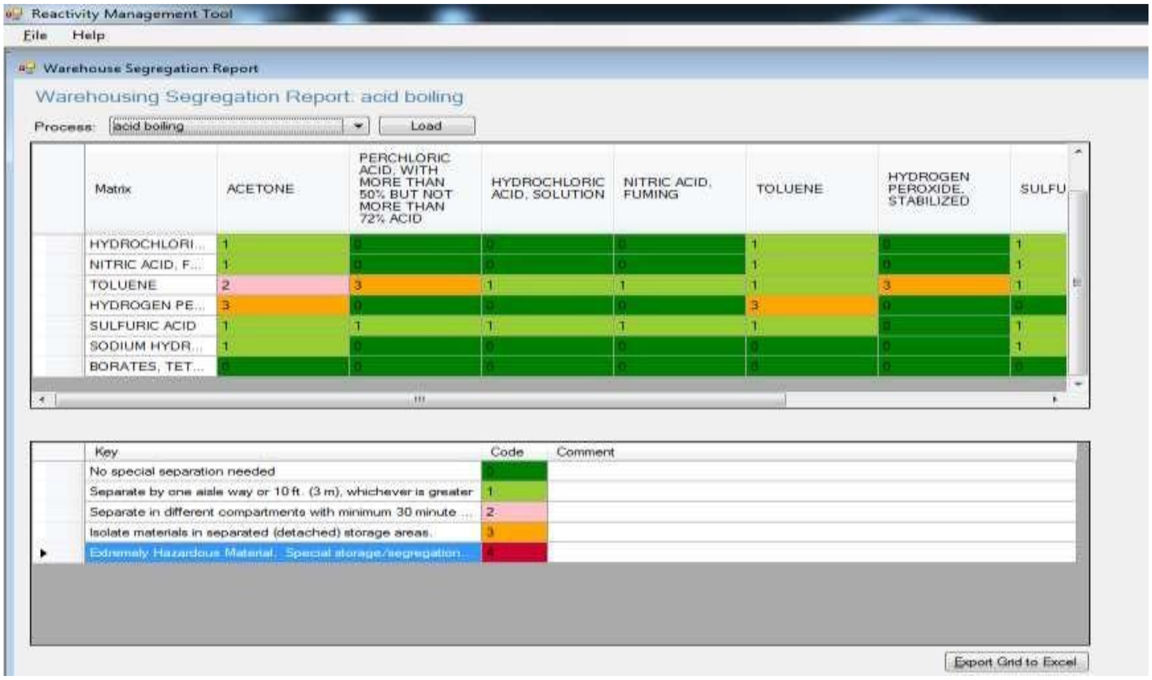

Figure no. 7 warehousing report

STEP-6: Get the chemical reactivity matrix and save the file

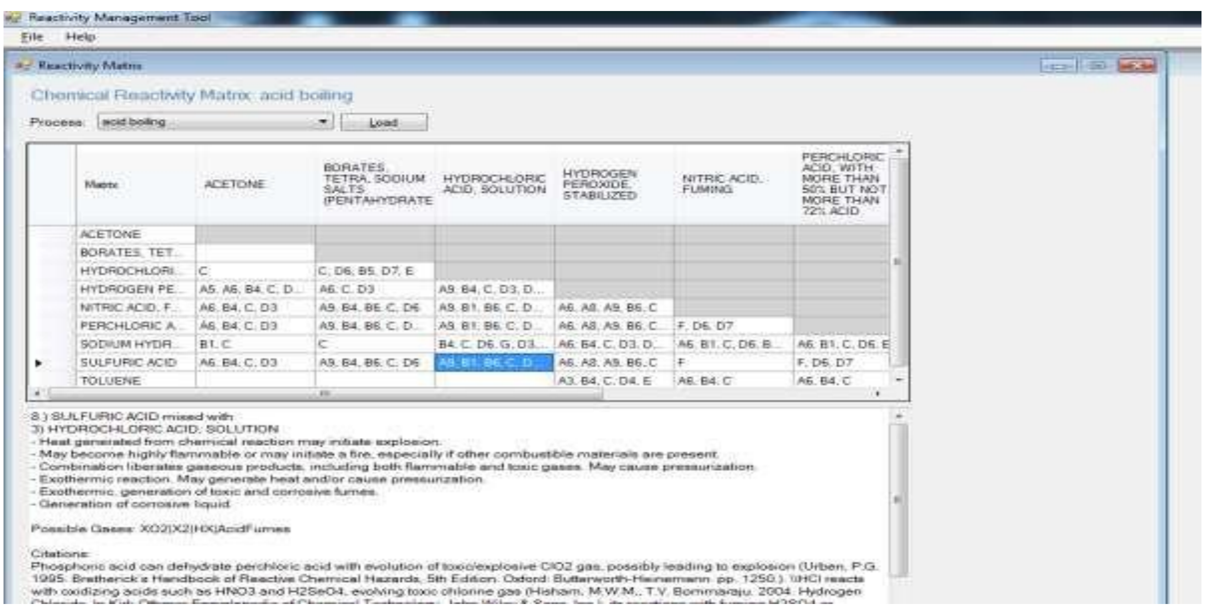

Figure no. 8 chemical reactivity matrix

The following figure represents the warehousing report

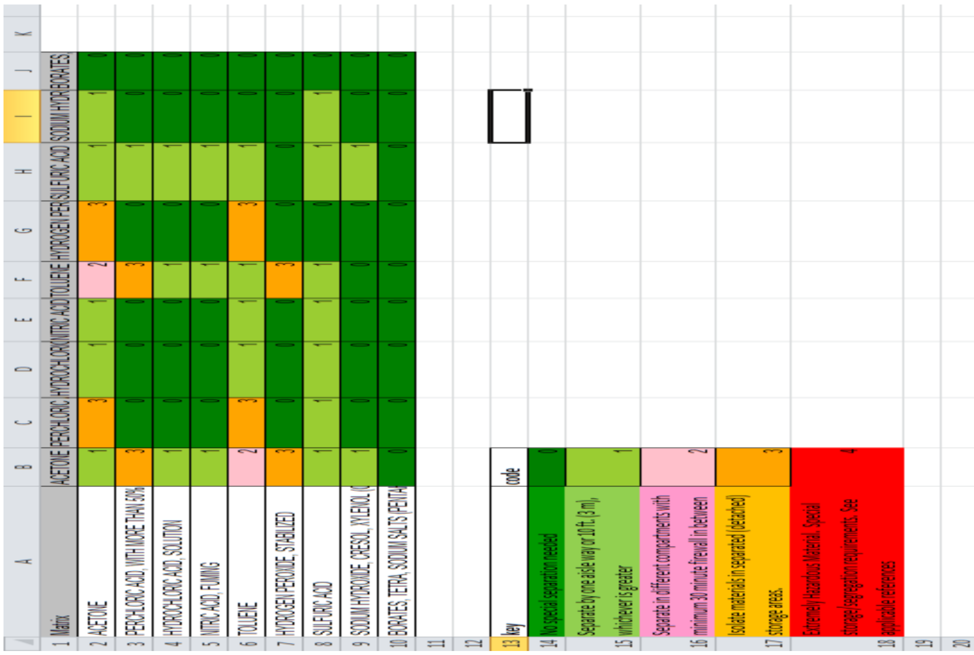

Figure no. 9 Warehousing report

V. CONCLUSION

In early design stages, characterized by increased degrees of freedom and limited available information about the process, decision-making tools have a dual goal: to screen out undesirable process options as fast as possible and to identify critical trade-offs between the remaining process options to propose directions where more detailed process knowledge has to be obtained. Therefore, the diamond process sector's threat assessment has been effectively achieved with a tool for chemical reactivity and danger evaluation. In this initiative, we gained several new hazard assessment insights. This has also forced us to face and technically fix several concerns.

VI. REFERENCES

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