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REVIEW of Mrs Marketa CERVINKOVA PhD Thesis

I had the pleasure of examining Mrs. CERVINKOVA's PhD research work through the compilation of her work in the PhD thesis provided. Her work tackles an important issue in the Stabilization and Solidification (S/S) of hazardous waste areas. Her work aims at using Asphalt Emulsions (AE) for S/S of wastes. Accordingly, she utilizes various AE for the S/S of different wastes and incorporates both experimental and mathematical modelling analysis to achieve her objective.

Her PhD work is divided into five major parts :

The first part includes a description of the state of the art technique of Stabilisation/Solidification (S/S) of waste which has been used in the last few decades. After a brief definition of stabilisation, solidification and the Asphalt, Mrs. CERVINKOVA referred to numerous useful results from studies on the Asphalt with regards its origin and composition. Thus whilst outlining the limitations of the use of Asphalt, she does also specify that a major advantage of the use of AE lies in its application without heating. Mrs. CERVINKOVA explained very well the different group which can be found in the AE (anionic, cationic and monionic) and emphasises the characteristics of each one and the difference which can be observed. The reader appreciate the paragraphs where she details the principle of asphalt emulsion breaking (the theoretical and background for control of emulsion breaking), the behaviour of the waste when it is in contact with the AE and the description of the different applications of the AE for S/S of wastes. Finally, the leaching procedures used for the assessment of stabilization efficiency were described and a table was drawn where she compared these procedures. Then, Mrs CERVINKOVA justified her choice in the use of two leaching procedures the TCLP and Aqueous Leaching Test according to the Czech regulations.

In the second part, Mrs. CERVINKOVA presents the materials used in her studies and describes the methodology adopted. For materials, eleven AE were tested and used for S/S on three types of wastes. After the description of all AE and the analysis of each one (pH and Asphalt content), Mrs. CERVINKOVA studies all the wastes used in her study. An environmental characterization was carried out for each waste and the concentrations of the main heavy pollutants were given. The main results obtained by Mrs. CERVINKOVA shows that the way in which the procedure of leaching is carried out strongly affects the results generated by leaching and the conclusions which can be drawn. The acid TCLP procedure leaches massively the heavy metals. But, when neutral Aqueous Leaching is used no metals are leached and the waste can be considered as inert.

Even if the results commented are in good quality, it will be more clear and interesting to the reader to have more details about the wastes used (grain size distribution, porosity, permeability, density).

The third part deals with Stabilization/Solidification techniques. In this chapter, Mrs. CERVINKOVA, introduces a new technique of S/S of hazardous waste based on multiple addition of AE. After the description of the technique which consists of adding AE to the waste and mixing, she presents the leaching tests which were carried out. The first one is the Toxicity Characterisation Leaching Procedure; the second one is the Aqueous Leaching test. Then, Mrs. CERVINKOVA, describes the instruments of analysis. In fact, the procedures used are very rich in information and can give a useful conclusion. Although, these techniques seem to be very well known, the methodology should be presented with more details.

In this part (chapter 4), a description of a mathematical model of leaching is included. The purpose of this, is the investigation of the diffusion of pollutant in an Asphalt matrix. After the presentation of the main hypothesis, the mathematical equations were given. When an analytical solution is possible the latter is formulated and demonstrated. A comparison with equations found in literature is given and compared. The program developed by Mrs. CERVINKOVA is an efficient tool which can be generalized and used in the future to resolve the problem of the diffusion of pollutant not only in Asphalt matrix but also for soils or sediments. The validation of the program on experimental data (on site) is a step needed to be carried out.

Finally the last chapter includes a presentation of the experimental and numerical results obtained. A comparison of stabilization efficiency of different AE (described above) of individual wastes (three wastes characterized in chap 2) was done. Moreover an estimation of long term behaviour of waste stabilized by AE according to the developed mathematical model is made.

Significant conclusions from her PhD work are: i) experiments results confirmed the importance of pH of the waste disposal site. The mathematical model shows that the pollutant release is not significant and hence there is minimum damage to the environment even a long time after the stabilized waste disposal, ii) The asphalt can be considered as good binder in S/S technique. Its main characteristics are: it's chemically and biologically stable and the asphalt matrix is hydrophobic

In conclusion, Mrs. CERVINKOVA presents a very sound PhD thesis work that holds great future potential/impact for other researchers in this area (Hazardous waste). Minor editing is needed to properly articulate the value of her work. She has successfully demonstrated her understanding of the methodology, and its proper use and role in modelling such systems. I personally appreciate and applaud her PhD work and consider it a valuable research and worthy effort. Clearly, her work is another excellent demonstration of the emerging field of S/S environmental science.

Therefore, I believe that she has presented an excellent PhD research work and he is definitely qualified and ready to defend her work. I strongly support her PhD work.

For further information on the matter, please do not hesitate to contact me.

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