4. Conclusions

This paper simplified the drilling system to a two-degree-of-freedom discrete model and studied the stability for two kinds of delay models (CD model and SDD model) in stick-slip vibration that are caused by regenerative cutting. The results show that the stability interval of the drilling system increases with rotational speed. In the stability analysis, the stability difference between CD model and SDD model is very small when the control parameter ρ is small. However, when the control parameter ρ become large, the stable intervals of the SDD model are bigger than those of the CD model, which means the SDD model can be applied to a wider operational range.

In conclusion, the SDD model can be applied to a wider operational range than the CD model, and can better reflect the non-linear nature of the drilling system. Moreover, the stability bounds of the SDD model are higher than for the CD model. The method and results can be adopted for deep hole drilling stability prediction and provide a reference for the dynamic optimization design.

STUDY ON THE INSULATION PERFORMANCE USING THE OPTIMIZED CHARGE SIMULATION METHOD

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Summary. *A new approach for the computation of electric fields is described, based on the response surface methodology (RSM) and geometric feature charge simulation method (GFCSM). And the novel combination of RSM and GFCSM is applied to calculate the electric field of the high voltage SF6 arc quenching chamber in this paper. The electric field distribution with higher calculation precision has been achieved. The results of the comparison between the conventional and proposed techniques are presented. Moreover, the new approach proves to be more efficient, minimizing computation of the electric field with multi dielectric medium.*
Keywords. *Electric field, CSM, RSM, SF6 arc quenching chamber*

Introduction

The numerical computation of electrics field plays very important role in analyzing the insulation performance and R&D of the high voltage electrical apparatus[1-2]. Numerical computation method of electric field covers boundary division and domain division method. In which, as one of the boundary division method, charge simulation method (CSM) has higher calculation precision[3-4]. For the application of the conventional CSM, in order to obtain the reasonable matching relationship between the fictitious simulation charges and the contour points, the number and the allocation of the fictitious simulation charges need to do many manual adjustments and amendment. However, the adjustment work is tedious. For solving the above limitations, a novel geometric feature charge simulation method (GFCSM) is proposed.

With the increase of the voltage, for the electrical appliance, the electric field calculation models become more complicated, and calculation time is relatively long. Besides, the goal variable is generally nonlinear and the field boundary is relatively complex. For solving the concrete problems, the response surface methodology (RSM) is applied. RSM can be used in many spheres[5] such as microbiol, mechanical science and food science, etc. It can be used for modeling and analyzing the response problem influenced by many variables, and the response variables are optimized. The application of RSM is to improve the calculation efficiency and guarantee the algorithm precision.

The RSM-GFCSM

The principle of RSM-GFCSM is described as follows:

Using the GFCSM, the coordinates and the electrical quantities of the simulation charges are the designed variables, Emax is the response variable and the potentials of the testing points are the constraint. And based on the principle of RSM, the RSM modeling is obtained. The response surface optimization is described by

$$\begin{cases} \min \quad y = f(x) \\ s.t. \quad v_i(x) = u_i \qquad (i = 1, 2, \cdots, NT) \\ d.v. \quad x_{jl} \le x_j \le x_{ju} \qquad (j = 1, 2, \cdots, N) \end{cases} \tag{1}$$

where, $f(x)$ is the response variable, u_i is the constraint, x is the designed variable, NT and N is the number of testing points and simulation charges. The best response variables and the correspondingly designed variables are solved using the linear least square method, and calculate the electric fields in the whole domain.

Electric Field Calculation and Analyses

The solution of the potential distrubution of the fictitious simulation charges configuration with RSM-GFCSM indicates that the time required can be effectively reduced. Compared with the conventional CSM, it can be seen that, the unnecessary pre-adjustment for the conventional CSM can be eliminated. By analyzing the electric field calculation error for CSM and RSM-GFCSM, the feasibility and validity of the RSM-GFCSM is verified.

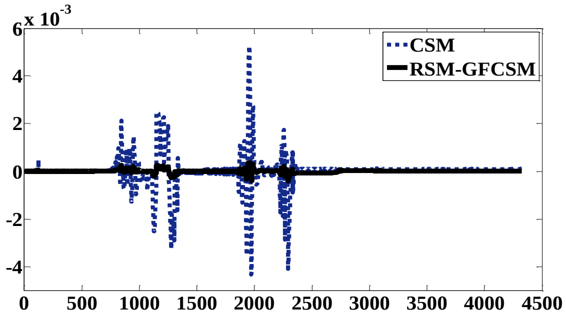

Fig.1 Electric potential error of the testing points for CSM or RSM-GFCSM

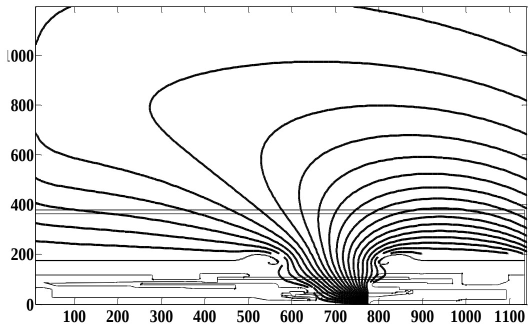

Fig.2 Equal potential distribution using RSM-GFCSM

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SELECTION OF HEAT STORAGE MOLTEN SALT USED IN SOLAR TOWER THERMAL PLANTS

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Summary. *The advantage of molten salt being as the heat storage material of solar thermal plant is clear. With the advantages of solar thermal plant system especially the tower system being more and more apparent, the improvement of molten salts' working temperature has drawn more and more importance too. Molten salts already existing and being used are mainly nitrates, however their admitted working temperature limitations can't gradually satisfy the promotion of collector's working temperature. The conception and theory together with three forms in existence are introduced, with analyzing of current salts, the selecting method of salts in solar tower thermal plant system and cautions in experiment are discussed too.*

By analyzing of research already published, it's available to recognize that the tower solar thermal plant's potential is still huge, as well as the space of optimization of the molten salt.

Nowadays the development of Solar heat plants is more and more accelerated, due to the problem of the shortage of energy as well as the emission of utilizing traditional energies. It is a cutting-edge technology transforming sun light to electricity by collecting the heat and propelling the turbine to generate electricity. However, the problem of the inadequate quality of molten salt is thorny which puts barrier to this technology's development. This program is aimed at contributing to improve the molten salt's quality.

After referring to existing research fruits, we drew some conclusions, which are as follows:

The main methodology of improving the capability of molten salt being the medium of heat flow is to reduce its melting point while increasing its boiling point. It is because salts block the tube at night or in other conditions without sun light, and in some extreme conditions with high temperature molten salts may decompose, causing serious damage to the whole system. As a result, the turbine and the circulation system will be hard to re-start. Hence, reducing the melting point while improving the stability in high temperature conditions is one of the most powerful solution towards this problem.

Moat accepted salts are nitrates, other than that, some are chlorides, but there is so few cases of molten salt applied being carbonates.

Compared with people's preference utilizing nitrates and chlorides, carbonates have huge potentials. Today's plants suffer from the low working temperature limit of nitrates and the corrosive effect using chlorides, while carbonates are much more suitable for high temperature conditions. Moreover, it has no or very little caustic properties, even though some of them may be prone to degrade in too high temperature (usually above 800 °C, which is relatively hard for the solar plant heat collector to obtain.