

The Security Management of Aluminum Electrolysis Based on CAS-MES

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Abstract. Well-established system of security management is not only the premise of the failure-free operation, but also the powerful guarantee of the efficient production. Comparing with the traditional system of security management, which is operation-complex, recording-disorder and lack of high security, the security management of aluminum electrolysis based on CAS-MES overcomes all the flaws above and provides a new way for achieving efficient and high security management system.

Introduction

Due to the complex technology, particular production environment and various production facilities [1], fatigue is incidental to the workers at the production lines. The defects of this mode are obvious:

- 1) Workers' initiative takes no advantage in the long terms due to the complexity in security management;
- 2) Accurate and effective analysis for the illegal operations is difficult to make due to all kinds of security management records from different work groups;
- 3) Corresponding training for security management is difficult to arrange, so the general training leads to resources wasting and no positive results gaining [6].

Comparing to the traditional security management, the one based on CAS-MES shows a lot of advantages, which includes:

- 1) All kinds of security information can be recorded in the same system, improving the management efficiency and accuracy of information analysis;
- 2) The work habits leading to potential safety problems of each worker will be easily predicted by the analysis so most security accidents will be prevented before it is too late;
- 3) According to the results of the analysis, the corresponding train will be more efficient and to the point, of course, good operation habits will be easier to develop;
- 4) The administrator in charge will grasp the comprehensive information of the operation process with the combination of the visualization management and on-site management. The advantage is obvious in the long run;
- 5) All sorts of security methods in the system keep the data safe.

The security management of aluminum electrolysis based on CAS-MES shows great advantages. More resources will be conserved and less security accidents will occur, which raise the efficiency and flourish the enterprise.

The Security Management Process

The security management of aluminum electrolysis based on CAS-MES is supplied to the security production management of ZunYi Aluminum Co. Ltd. After extensive and thorough investigation, the details in security production management can be reduced as follows:

- 1) In order to make elaborate plans for production, a special security meeting before production is necessary and important;
- 2) In order to regulate the production operation, regular inspection will be took during the

production and corresponding information or illegal operation will be recorded into the knowledge database;

3) Basic data like laws and regulations related to the production exists in the database as essential data;

At the present stage, there are a lot of disadvantages during the production throughout the work groups. On the basis of the present management frame, the method put forth in this paper optimizes part contents, the details show in the Figure1:

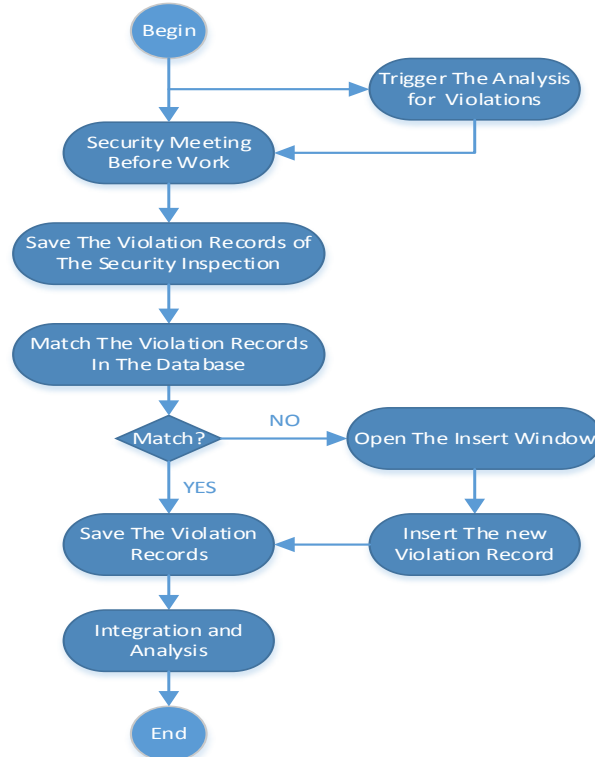


Fig.1 the Security Management Process of the CAS-MES

Login Mode of the System

Users need to login in the system with username and password in order to keep the system safe [5]. Besides, the login mode is Single Sign On and the password stored in the database is encrypted by MD5, all these lead up to the safety of the data.

PC mode (login in the Computers) or mobile mode (login in the smart phone, pad, etc.) can be chosen according to the practical need. The differences between the two modes in the security management module reflect in two main aspects:

1) Login in the system in the PC mode for meetings before work, as the meeting location is appointed and desk-top computer can be used to record the information.

2) Login in the system in the mobile mode (including smart phone, pad, etc.) for the regular inspections, as the working location is uncertain and the login mode increase the efficiency for users.

“The Meetings before Work” Mechanism

Meetings before work are necessary because experience from former work can be summarized and security precautions for the latter work can be assigned. The specification of the meetings before work sub-module is as follows:

1) The default shift information of the work group is shown in the interface according to the time of the data base.

2) It is allowed to change the shift information.

3) The data of the meeting host comes from the sheet of employee.

- 4) The logic between the number of workers supposed and the number of workers present is controlled.
- 5) The work plan of the work groups is recorded in the other information control which is support fuzzy query.

“Records of Security Inspection during work” Mechanism

The results of security inspection during work are recorded in three time sections which is morning section, noon section and afternoon section. The content of the security inspection varies from the time section. For instance, dress codes and cleaning will be mainly checked in the morning section and standard operations will be checked in the noon section.

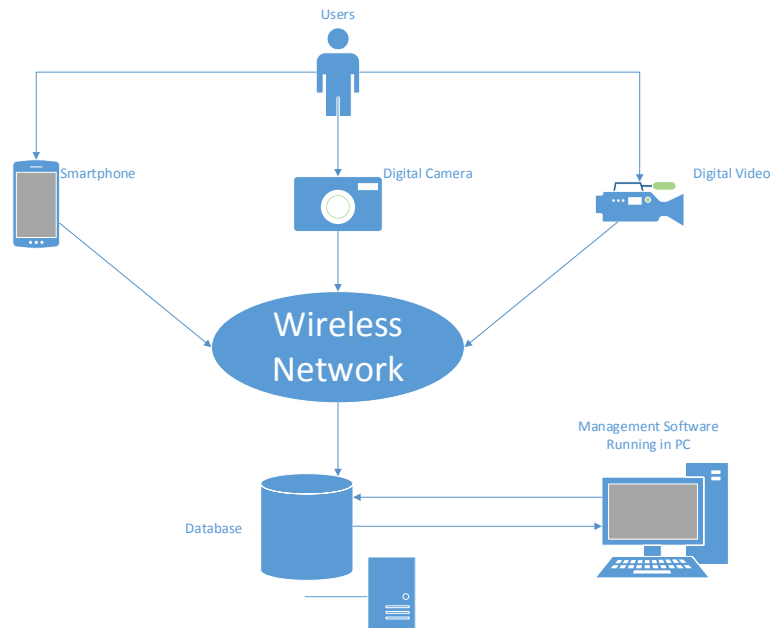


Fig.2 the Principle of the Data Transmission

By the influence of objective element such as locations, checking items, there are more advantages to use mobile equipment to record the raw information so that text information and image information can be uploaded to the data base immediately. The Principle of the data transmission by mobile equipment is shown as Figure2.

Management Interface of Security Information

After saving all the information including meetings before work, security inspection during work, it will be shown in the security management interface. The functions of the management interface can be summarized as follows:

- 1) All the records of the security management can be manipulated in the interface.
- 2) It is convenient to search the specific records by setting corresponding conditions.
- 3) For the reason of space in the interface, some information which is not in the interface can be checked in the details window by clicking “Details” button.
- 4) All the records include two kinds of status which are unfinished and finished. The differences are: records of the former one can be updated and deleted without authorization; On the contrary, records of the latter one are approved and can’t be updated or deleted.
- 5) Paging control is used to set up user-friendly operations and ensure the fluency for searching.

Data Analysis of Aluminum Electrolysis

The safety management log is not only supposed to be a record as violation operation but also more as result or a solution presenting to the administrator as an aid for determination[7]. Under the platform of the manufacture executive system, the aluminum electrolysis safety management could

not only easily and readily enable the record of safety management, exempting from the tedious operation under the traditional model, but more importantly capacitate the generalization, integration and analysis to the complex record data and present to the administrator with a more illustrative histogram or pie chart.

The objects of this kind of data integration and analysis are diversified, such as the occurrence possibility counted of all violations in a certain time ,or the classes and frequency counted during the violation operation by a specific staff in a certain time, or the a certain violation's occurrence possibility counted in different teams. To analyze different objects, we could for sure make a shift pretty conveniently and readily through a control component or an operation on the safety management platform.

Here is the detail integration and analysis progress of the safety management log.

Sub module with data analysis under the model of safety log management, then click and enter, the data analysis main interface will present, as Figure3 shows:

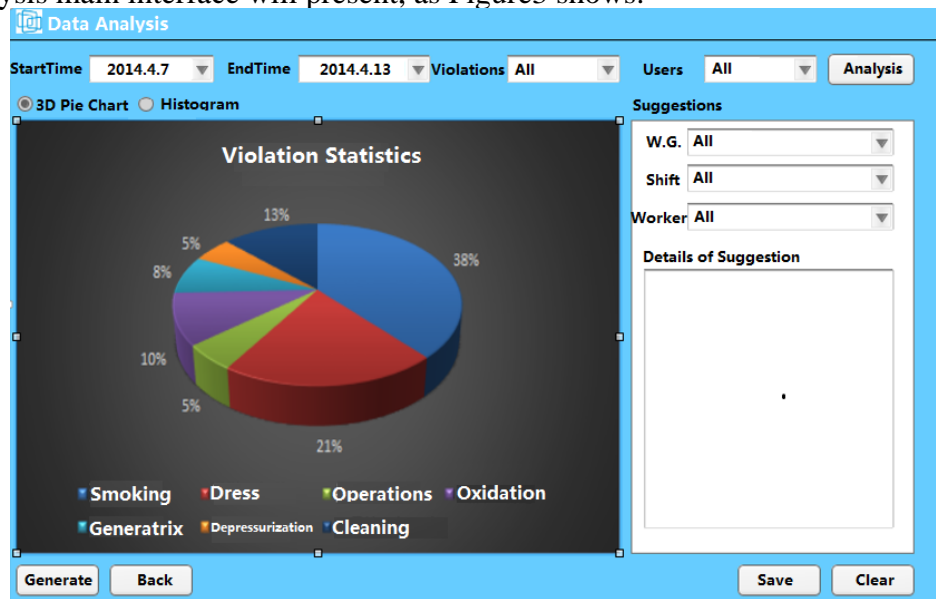


Fig.3 the Interface of Data Analysis

The specifications of the interface is as follows:

- 1) Filtrate by the condition of "start time", "finish time", "violation items" and "operation staff" and analyze the results from different objects;
- 2) Choose different views to check the analysis results via "3D pie chart" and "histogram".
- 3) According to analysis views, click "generating advice", the generated advice will be presented in the right advice control component. The text box control component supports "copy", "paste" and "delete", and adjustment done to reference proposal is available.
- 4) Choose different "team" "shift" and "staff" information, then click "save" to save the generating reference proposal to pre-shift meeting note of the relevant team, in order to facilitate the pre-shift meeting reference or to guide safety work of this team.
- 5) Analyze the relevant data .we could take control of certain violations of medium or high frequency in a certain time. According to the analysis result, training or education will be appropriately and specifically arranged which could alleviate working efficiency and conserve enterprise's resources.

Conclusion

"More input to production while less to administration", this situation has always been a malpractice in numerous enterprises of aluminum electrolysis industry. In order to pursue benefit maximization, it is surely of great potential safety hazard with inadequate supporting facilities, imperfect safety management system, unclear safety management responsibility as well as lacking safety management. Thus that is the one and only way to establish wholesome safety management

system for production is to initially and inwardly attach importance, perfect safety management institutions, strictly practice safety examination and build reward and punishment mechanism. The safety management based on CAS-MES manufacture executive system in this paper is not the constituter but the unswerving executive of the safety management system in aluminum electrolysis enterprises. The safety management model is one of the embodiments applied in aluminum electrolysis industry in the aspect of safety management of the CAS-MES manufacture executive system. With powerful supporting service, the safety management model will not only have the manager break away from the complexity of traditional safety management procedures and alleviate the safety management efficiency but also provide aid and support for the manager's determination via data integration and data analysis. The application of CAS-MES manufacture executive system has not only created a favorable environment for enterprises' high-efficient production but also made its due contribution for the development of our country.

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