Research on the communication system of Mine Managing Mobile

WANG Jian-guo a*

School of energy and environment, Inner Mongolia University of Science and Technology, 014010 Baotou, China

Abstract

This paper studied the network structure about the mine managing mobile communication system. The call model of the system and the channel control technique is decided. To fulfill the system’s requirements, the structure form of the base and mobile station is proposed in this paper.

Keywords: Mine; Managing mobile communication; Base station; Mobile station

*WANG jian-guo. Tel.: +1-384-722-0445; fax: 0472-5951568.
E-mail address: jgwang@imust.cn.
1. Introduction

At present, the form of mine wireless communication system is mainly has the following kinds of kind: Through-the-Earth Communication system; MF Inductive Communication System; VHF strewing communication system, distribution antenna communication (DAS) system and so on. The different systems have different working frequencies, but the practical effects of the existing systems have a lot of clearly insufficient departments, for example, from the 1980’s to the present, strewing communication technology is the most successful technology in mine, but the way of strewing system’s working makes the communication distance increased which have to depend on a lot of relays to achieve, a result of this is the low reliability and also this is the inherent weaknesses of strewing communication. Therefore, it has a lot of work to do to explore low prices, reasonable structure, complete functions, good practical effect and convenient mobile communication form of mine.

2. The structure of mine managing mobile communication system consisted of minute areas

On the basis of paper [1], this article proposes a specific structure as shown in figure 1, which is a kind of all mine managing mobile communication network of minute areas. This system has three-layer network structures: mobile Private Automatic Branch Exchange (PABX) above ground, base stations (BS) under ground and mobile station (MS). Connecting traffic system and the implementation of various scheduling functions are completed by the cooperation of the base station and PABX which is on the ground. The base station is directly connected with the PABX by wire, the mobile station is managed and controlled by the base station in the area of its.

Fig. 1. Structure of a kind of mine managing mobile communication system
3. The call model of system

According to the system's overall structure and characteristics of underground managing mobile communication, the site call and cross-site call systems have been designed.

3.1. Site call

As the focus of underground manage communication is on the first line of production, particularly the communication of workers within the local account for a large proportion. Therefore, to facilitate communications and liaison within the cell site, the call and talking between the mobile stations within base station may be connected to complete by cell sites, without the ground PBX.

3.2. Cross-site call

When the lord call mobile station is not sure the location of the called mobile station, the cross-site calls is been designed. Cross-site calls uses "one chanted" approach. The so-called "one chanted" approach is that the lord call firstly build chain and exchange signal, and programmed by their base station and exchange signal with mobile station where the base station within its, and through the switch instruction of all base stations issued a selective call signal in their area, to ensure that the outgoing mobile station being called. This shows that “one chanted” approach can solve the mobile station in the network of "roaming”.

4. Multi-channel sharing technology of system

To improve the efficiency of channel, multi-channel sharing technology was used in the base station. Multi-channel sharing technology of the system which developed by system characteristic is following:

4.1. The channel ruling principle

As the most important issue of the underground communication is not the frequency resource but the quality of communication. Therefore, minimum interference is the principle of system channel assignment;

4.2. The channel assignment model

Because system has little channels number of the user and the service cells, so it uses a relatively simple mode of fixed channel assignment.

4.3. Channel selecting principle

Channel selecting principle of system is simple equipment and firstly using principle based on economic because that system is a small mobile communication system. So that in the channel searching, the using channels are the ones that used the initial encounter eligible idle channel.

4.4. Controlling technology of channel
In multi-channel sharing technology, the key technology is channel controlling. Channel controlling ways of searching for the carrier and cycle location which suitable for the system are developed according to system characteristics. The work process is low number idle channel of the base station issues selection call signal when the base station calls. Because the system requires each mobile station to scan all channels assigned by the system, therefore, the called mobile station can respond to the call of the base station when scanning reach the signal. The base station can call the chain directly if the base station is waiting on a high number channel when the mobile station calling. Also it can directly call the chain if the mobile station is waiting on a minimum number channel of a base station. If the mobile station fails to call the chain, then, please detect the minimum number channel of another channel mode, if the channel is busy, it can determine the channel mode is the channel model cell where the cell is, and detect the high number of the mode channel. If the channel is idle, it can build a call chain. If the channel is busy, the loop can detect the channel mode until the channel is idle or the required time is over. If the minimum number channel of the channel mode is idle, and the call chain built on the channel still fails, it can determine the channel model of the cell. Then as long as repeat the above process on the last channel mode.

5. Base station and mobile station

5.1. Base station

The basic function of base station is general controlling of the mobile station and forwarding call. According to system actual situation, base station is made up of 1 or 2 sets transceiver. The structure of base station shown in Figure 2. The hardware circuit structure of base station channel is made up of two parts that are the RF and base band. And in the base station each transceiver board has set station switching network and the voice circuit which interface to the ground switch.

5.2. Mobile station

The main function of mobile station is making a call with the system scheduling phone, cable telephony and other mobile station or outside, if necessary, an emergency call can be made. The authorized mobile station may initiate a call with the whole or group call.

The hardware structure circuit of the mobile station is basically the same as the base station channel, also made up of two parts that the RF and base band. But the mobile station does not need to set the switching network or the voice circuit which interfaces to the ground switch.

Comparing with the existing mine mobile communication system, the network structure of cell system for mine managing mobile communication system has some advantages. They are more ideal structure, better scheduling function and the flexible and convenient use of the mobile station.

Fig.2 Base station structure diagram
References