The Design of Automatic Fire Alarm System of HESYRL

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ABSTRACT

Three types of automatic fire alarm systems were chosen to meet the special requirements of different objects.Full-shield infra-red beam smoke detectors were used for klystron gallery where high frequency electromagnetic field and strong radiation interferences exist, the linac tunnel the storage ring hall and the nuclear physics experiment hall.Cable line-type fixed temperature detector which are suitable for the bad environment of both electromagnetic interference and high-humidity were employed in underground cable tunnel. Ionization smoke detectors,combined rate-of-rise and fixed temperature heat detectors were used in computers and common places.The whole fire alarm system consists of four zone fire alarm control units,a central fire alarm control unit,a simulating indicating panel and fire telephone & emergence broadcaster networks.

INTRODUCTION

HESYRL covering 1209 mu with total building area of 20287 square meter,is a key project within the seventh national five-year plan. The sychrintron radiation in the lab is a wide-used new kind of light source. It can provide high strength and high stability radiation from intra-red,visible light, vacuum ultraviolet rays to X-ray,It can be applied to basic research ,applied research, and developing research and production. It is useful to physics, chemistry, biology, material,surface science, measure science, medicine,micro-technique and super integrated circuits. It will greatly accelerate the pace of the four monetizations of our country.

Because of its special use, the lab has some unique aspects in the main building and the environment. For example, there are a 50-meter high in diameter, 12-meter high storage ring hall, and 114-meter long, 3.5-metrewide, 4.5-meter high semi-underground lilac tunnel, a 950-meter long, 1.2-metrewide, 1.8-meter high underground cable tunnel. There are 204m/s,20kw high frequency emetic source, 12000 gauss strong magnetic field and15000 Dr strong radiation,etc. The environment of lab is complicated for many intense interferences. There are many valuable and precise instruments, especially high-powered equipment, such as the electic source cabinet in storage ring hall, electic source of ion pump in keystone gallery. These equipment had caused fire several times and some damage had been done. Main fire is elective fire. The combustion process gave off smoke and heat at the begin. This makes the design of alarm system and the choose of equipment more difficult.

DETECTORS CHOOSE

The previous design adopted a spot type photoelectric smoke detectorsystem. For some reasons, the system was out of work after operating for a period. On the base of research and experiment,Three types of fire alarm were choosed.according to << The Standard of automatic fire alarm system design >>, considering the characteristics of different building and environment of the monitoring object.

1. Full-shield intra-red beam smoke detector were used in klystrongallery existing high frequency electromagnetic field interference, linactunnel existing strong radiation interference, storage ring hall and nuclear physics experiment hall with two kinds of interference.

It is found in research that the false alarm rate of ionization smoke detector is high at the injector of electron beam in the lilac. The spot type smoke detector just work well for a short time. To increasing the anti interference ability of infra-red beam detector, the step of anti-interference against radiation at the base of anti-interference against electromagnetic field was taken to ensure detector's stability.

Because the storage ring hall is 12 meters high, and equipment has been installed and have been operating, to dissolve the installment difficulty and ensure the reliability of the detector, we checked the data of detector provided from the producer that the monitoring area of a pair of detectorsisheight of 6 meter and 9 meter respectively to the fire simulating experiment The experiment showed that the width of monitoring area is 2-3 meter, the results supported the arrangement.

2. The high humidity in the cable tunnel and bad environment made fire extinguishing very difficult.

The spot type heat detector alarmed late used in some civil cable tunnel. Although the smoke detector responses early than the heat detector ,many of alarms are false alarms, These made system operating and processing fire difficult. To work steadily and alarm early, line-type heat detector alarm system made up of cable line type fixed temperature detector and special control unit,which were developed in our country were choosed. This kind of detector is a special heat-sensitive cable. It response temperature is stable and response time is suitable. It can be fixed at danger position near the protected object. In addition to the function of other alarm system,it can identify and display the alarm zone and distance. It can be used in bad environment such as powder stream,smoke,caustic gas.It also can be used under the condition of interference of low frequency electromagnetic field,high speed,stuff air and humidity,vibration without false alarm. The investigation of this system fixed in the cable tunnel in cold-rolled plant of Shang Hai Bao Shang steel and iron factory revealed the system worked steadily reliable after operating for some time.

3. The ionization smoke detectors were chiefly installed in computer room and common places.A few combined rate-of-rise and fixed temperature heat detector also were used

4. Two kinds of detectors were used in the places where fire was easy to occur,such as electric source cabinet in storage ring hall and ion pump electric source cabinet in klystron gallery:
infra-red beam line-type smoke detector and cable line-type fixed temperature detectors

ALARM EQUIPMENT

The automatic fire alarm system consisted four zone fire alarm control units,a central fire alarm control unit,a simulating indicating panel, fire telephones and a emergency broadcasting(as shown in fig.1). The first zone is in the west of storage ring hall, including a JB-QB/1101 zone fire alarm control unit, 67 JJY-LZ/1051 ionization smoke detectors, 2 JTW-MCD/1056 combination rate-of-rise and fixed temperature heat detectors and 7 manual fire alarm sounder. The second zone is in the east of storage ring hall and electric power supply room and the attached houses of klystron gallery and nuclear physics experimental hall,including a JB-QB/1101 zone fire alarm control unit, 64 JTY-LZ/1501ionization smoke detectors and 15 manual fire alarm sounder.The third zone contains the storage ring hall nuclear physics experiment hall,klystron gallery and linac tunnel,including aJB-Q-20 fire alarm control unit, 18 pairs of JTY-SH-60 infrared beam smoke detectors, 2 spot-type smoke detectors and a manual fire alarm sounder. The fourth zone is in the tunnel of underground cable, including a JB-TB-32 cable line-type fire alarm control unit,36 terminal boxes and 1500 meters of JTW-LDheat cable.

The signals from the detectors in the first and the second zones or manual fire alarm sounder are sent to JB-QB/1101 zone fire alarm control unit to display the address. At the some time,the signals from JB-JB/1202 central alarm unit, JB-Q-20 alarm unit and JB-TB-32 alarm unit are sent to simulating indicating panel to display accurate place.When the temperature of a heat detector in monitoring area,or the concentration smoke reach to the threshold value for some reasons, the signal is sent to the fire alarm control unit in time.The control unit displays then umber of detector,at the same time,indicating panel displays the accurate place.So precaution can be effectively taken to put out the fire by use of the telephone and broadcasting.In some place the staff can't go in when the lab is in operator(like linac tunnel), the television monitor system is supplemented to make it more stable and safe.

CONCLUSIONS

Having gone through the test,simulating operation in aging room and subjecting to practice environment,the fire alarm system proved to be reliable and reaches the request of design.

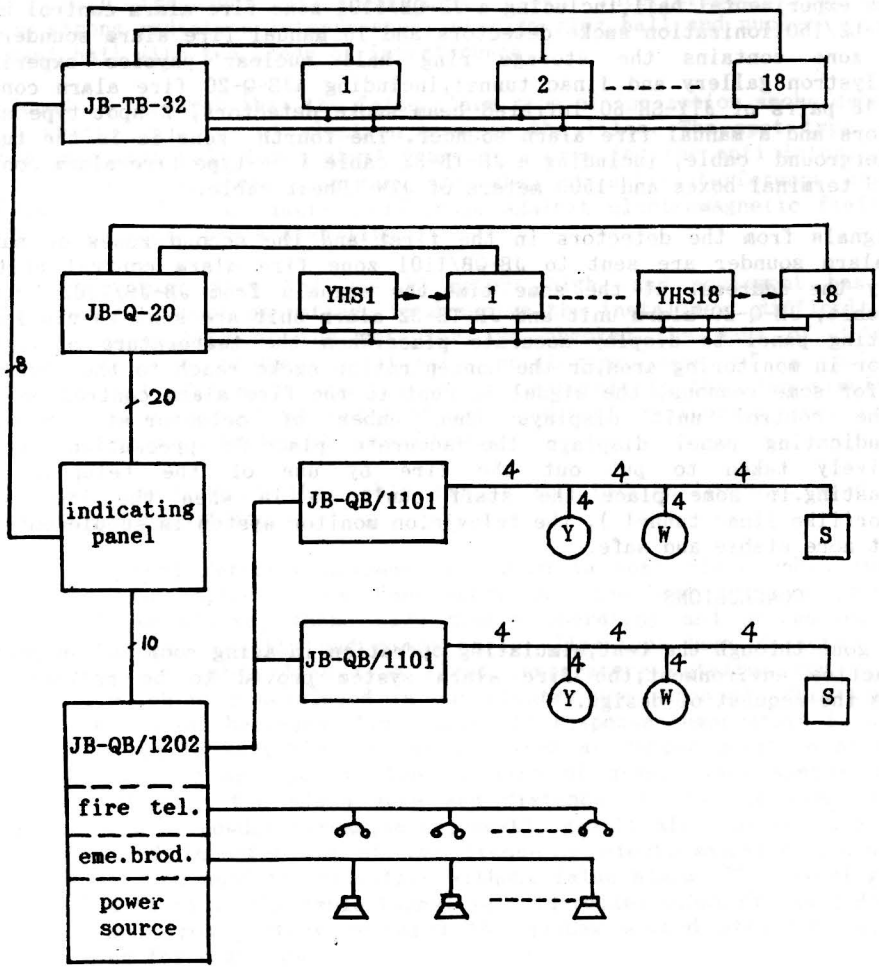

Fig.1 Schematis of automatic fire alarm system