

Large-Scale Industrial Company Alarm Receiving Centre Modernization Design

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Abstract: - Particular functional blocks of Large-Scale Alarm receiving Centre modernization Design creates core contribution of this research paper. In the introductory chapter the valid legislation and the resulting requirements for the design, location, construction, technical equipment, operations and personnel are described. Moreover, the methodology of evaluation of the Alarm receiving Centre quality is proposed and applied to the particular company. The particular modernization related to selected areas such as communication or ergonomic layout of the workplace is then specified on the basis of the evaluation results. Moreover, the design of particular renovations is provided, including appropriately chosen technology and manufacturer, respectively provider.

Key-Words: - Alarm Receiving Centre Design, Security Assessment, Evaluation , Modernization, Ergonomic,

1 Introduction

Important role in today's society is represented by security issues. Security threats to both public institutions and private entities are increased due to globalization and the related acceleration of communication, transportation and logistics. In the case of large enterprises is important for the future prosperity organization appropriately protect its material and immaterial assets. Even displeased employee, competitor, or the event of natural disasters nature could be the source of danger. The time during which it is established adverse events acting and performing appropriate response in such cases is crucial and the amount of subsequent damage is directly depended on it. The surveillance and alarm receiving centers create one of the cornerstones of corporate security. Their task is in addition to monitoring of connected systems are also a number of other activities, from early notification of employees of the Integrated Rescue System units, enterprise crisis and emergency teams to managing and organizing the Fire Rescue Squad intervention units undertaking rescue and relief work. The existing legislation and primarily the specific needs of the company itself are significant within the Alarm Receiving Centre establishment and subsequent operation definition process. The task of the management of the undertaking is therefore continually analyze security threats and their level of risk, and create the necessary

precautions. The Alarm Rescue Centre modernization could be particular example of precaution. Since the Alarm Receiving Centers increasingly work based on information systems, it can be assumed for the gradual development of these technologies and innovation. Any modernization requires in most cases considerable amounts of financial means. Life and health of employees, company property and the environment protection is important an investments in this area are adequately justified. Complex manufacturing processes are characteristic for the large manufacturing companies. These in many cases utilize the hazardous substances both for humans and the environment. The various people and vehicles are often presented in the area, whether they are employees of the company or external suppliers or customers. For this reason, it is necessary to appropriately monitor and guard all critical elements of business infrastructure such as power substations, storage of hazardous substances, data and communication networks. For these purposes the Alarm Receiving Centre (ARC) is utilized in the large scale industry company.

2 Large-Scale ARC's Requirements

ARCs of Large-Scale companies should be able to maintain relatively complex variety of system functions. These could be:

- Intruder & Hold-Up (I&HAS) Alarm systems status monitoring.
- Occupational accidents and fires notification.
- Environmental threads observation (water level rising, quality of atmosphere).
- Alert notification of employees.
- Communication with IRS.

On the basis of these functions the specific requirements were specified. This functionality was divided into three main blocks which are illustrated via Figure 1.

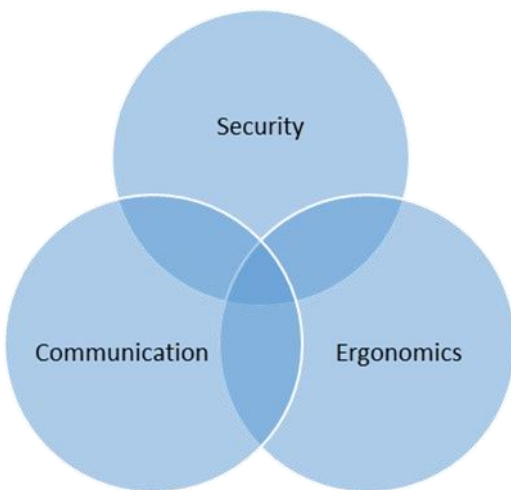


Figure 1: Functional requirements of ARC

2.1 Security

Ensuring the safety of the personnel and also the integrity and operability sustainability are main objectives of ARC security. Sophisticated Security Assessment (SA) should be the initial base for the ARC’s security requirements establishment process. SA is utilized in four phases illustrated in Figure 2.

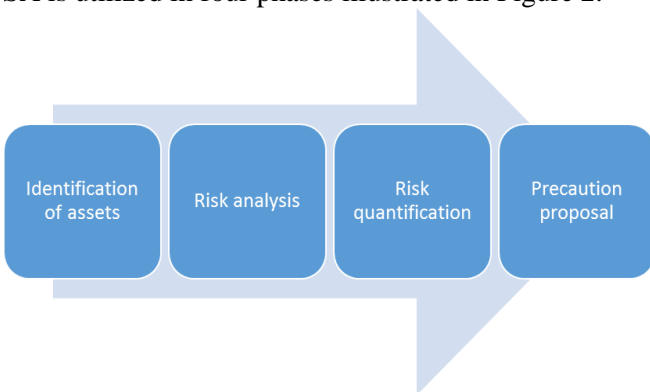


Figure 2: Security Assessment process

The ARC is an exposed asset itself in context of the ARC’s Security. If there is an alarm, emergency,

etc., it is important that an adequate response to the situation took place in the shortest possible time and according to predetermined procedures. The partial or complete functional disable may result in damage to the health and lives of employees and persons attended inside company, and property and the environment.

In addition to general emergency threats to ARC it is important to take into account revenues resulting threats to the enterprise of current events, political situation, the changes you make in business, etc. [1]. The probability of identified threats is determined within the risk quantification phase. A number of quantitative and qualitative analytical methods such as ETA, FTA, HAZOP[2] are used for this purpose. This process is based on the vulnerability of individual assets to the identified threats. The exact precaution proposal is designed in next step. Its main purpose is to minimize identified threats execution probability.

Table 1: European standards related to particular functional blocks of ARC Security

I&HAS character	European standard related
- attack from outside	ČSN EN 50131-1, ČSN EN 50131-7, EN 50131-4
- fire	EN 54-, EN 54-14
- entrance/exit	-
- gas	-
- communication	EN 50136-1
- assault	EN 50131-1
- personnel safety	-
- signalization	EN 50136-1
- video surveillance	EN 50132-7

2.2 Communication

High quality inner and outer communication utilize important element in terms of ARC’s integrity. The appropriate notification of:

- persons concerned (employees, suppliers, etc.),
- corporate emergency,
- crisis teams,
- safety units and IRS;

should be realized by ARC’s operator in case of crisis situation of unusual event. Huge range of technologies are utilized within large enterprises for this purpose.

2.2.1 Telephone connection

This type of connection is already well underway in digital form (PBX) and is still a reliable solution for

business communications. In addition to the connection to the public switched telephone network (PSTN) is often found in large industrial applications mainly for economic reasons, the company's own telephone network. Although this solution is relatively expensive in terms of cost, provides the company with the future many advantages. These include in particular:

- centralized administration;
- scalability of the system;
- easy extension (modular systems);
- integration within the enterprise network;
- reduce operating costs;
- communication security increase.

Modern enterprise PBX extensions allow the IP communications platform operating on the principle of common data network, which facilitates the integration of a communication system to other enterprise information applications (databases, accounting systems, etc.).

2.2.2 IP telephony

A gradual migration to IP telephony is utilized nowadays. This trend has several causes. In the past, usually within a business operated by using the system for voice communication and data transmission, leading to inefficient use of communication lines, higher costs of equipment for individual systems and above all the necessity of administration for each system separately. In the case of use of the corporate data network for voice communications (VoIP) leads to a significant reduction in the cost of telecommunications services, savings range from 20-40%. Furthermore, it simplifies the management of the system, which can be remotely over IP networks. Another benefit of this solution is easy to access and centralized distribution applications, such as call management, messaging, etc. [3].

Although use of VoIP communication begins regarded as standard, use of this type of systems across the enterprise brings with it a number of security threats, particularly in the area of IT. Attacks on VoIP infrastructure itself are not too frequent, the greatest danger is due to a common network weaknesses - shortcomings in networks, operating systems, errors, programming errors, etc. These attacks can be divided into 3 groups:

- authentication (unauthorized use of data),
- integrity (or drop),
- privacy (risk of interception call).

2.2.3 Mobile services

In addition to fixed telephone lines and radio stations the mobile technology GSM may be

deployed in ARC's communication. The public mobile telecommunications networks or. dedicated mobile networks for crisis management is used in this type of communication. In the case of corporate communication can be the contractual agreement with the mobile service provider (operator) to ensure that when an emergency extra services, such as ensuring priority access to services, information sending SMS messages to those individuals present in a given area, the automatic display of information about emergency numbers on the displays mobile phones, etc. but if there is an incident of a wider range, a situation may occur when mobile services will be unavailable due to network load. For this reason, the GSM technology combined with ARC recommended as a backup option information transmission [4].

2.3 Ergonomics

The ergonomics of the working environment is closely linked not only with job performance, but especially with the health of workers. In practice, it is common normative and legislative requirements are not met, although they should be mandatory as per § 349 of Act No. 262/2006 Coll., The Labor Code. [5].

A stable year-round temperature conditions can be generally assumed within the area of ARC. High risk for the operator may be in danger during the summer overheating due to high temperatures, depending on where the ARC is located in the building (eg. the upper floors of buildings, etc.). As dispatchers reside in areas DPPC relatively long period of time, it is necessary in the context of ergonomic workplace design and relevant legislation to ensure optimal temperature and air flow in the working environment, eg. with an air conditioning, fans, etc. Risk of sunburn, heatstroke and associated nausea, headache, fatigue should be expected in the case of ARC. They may lose the ability dispatcher promptly and effectively respond to emerging hazards and increases the risk of harm to the health of employees, property and the environment. The main aspects influencing ARC's ergonomics are following:

- Risk factors,
- ARC arrangement.

2.3.1 Risk factors

Employer is obliged to regularly and promptly identify and minimize risk factors work occurring at the workplace [6]. Mainly mental and visual load or adverse climatic conditions is assessed in the case of ARC.

2.3.2 ARC arrangement

Work activity performed in DPPC sitting with minimal physical activity (work with PC, etc.) falls under Government Decree No. 361/2007 Coll. Class I. the requirements for the working environment of ergonomics, hygiene, microclimate conditions to dimensions of work, etc. is defined by this legislative work document. It is necessary to take this regulation into account when designing the dispatcher layout.

3 ARC Evaluation Framework

The unique evaluation methodology was proposed on the basis of specified functional requirements of ARC. The checklist form was chosen as an evaluation method. Proposed checklist form is presented in Table 2. It consists of a series of questions broken down into several categories specific to the operation centers of large manufacturing companies. Specific questions are asked simply and efficiently in order to answer them without extensive knowledge of the issue. Preval if the checklist in one of the categories listed below negative response, it is necessary to focus on that area and to deepen the analysis leading to identify specific deficiencies. This process however requires comprehensive knowledge and should be performed by persons with sufficient experience and expertise.

4 ARC Requirements and Design

Modernization is based on assumption the ARC has already been under operation and that is reason why the complete design is not necessary. The modernization consists in optimization of sectional technologies. The aim is to ensure sustainability within the next ten years of operation. From evaluation results and based on analysis of company management requirements the following functional ARC blocks were specified:

- Communication,
- Recording,
- Ergonomics.

4.1 Communication requirements

Following requirements were stated as an optimization issue within communication functional block:

- advanced telephonic functions (call parking, conference, redirecting),
- call multitasking,
- caller identification,
- caller position determination,
- optical and acoustic calls signalization.

4.2 Recording requirements

Following requirements were stated as an optimization issue within recording functional block:

- automatic recording of radio and telephonic communication including phone numbers,
- recording from following devices:
 - o system telephone,
 - o analog telephone.
 - o IP telephone,
 - o radio,
 - o fax.
- recordings achieving for 5 years,
- recordings remote accessibility.

4.3 Ergonomics requirements

Following requirements were stated as an optimization issue within recording functional block:

- workplace optimization for 2 operators,
- hands-free implementation.

4.4 Communication optimization

There are two possible solutions within the optimization of communication. The first variant is based on professional system Siemens OpenScape Xpert, which is dedicated for dispatching site. It's a complex hardware and software solution consists of several parts. The core of the system is forged by couple of servers, which are ensuring communication management and particular dispatching site maintenance. Server System Manager (SM) utilizes the database which contains information about users, setup of dispatching site etc. and also servers for their distribution within data infrastructure of the company. Server Multi Line Controller (MLC) is maintaining whole communication between dispatching site and switchboard HiPath 4000 (PBX). Besides the communication with SM server database is possible to realize recording including remote access and dispatching site monitoring through MLC sever. Software platform OpenScape Xpert enables simultaneous service of several communication channels from switchboard PBX depended on number of licenses.



Figure 3: OpenScape Xpert interface

Second variant presents software solution Siemens AC-Win IP, which is intended for connecting and dispatching workplaces. Platform is realized as a MS Windows application on PC. Connection is based on HG3500 module o system HiPath 4000. The system is capable of following functions:

- call and operation monitoring,
- call management,
- paging,
- call information archiving.

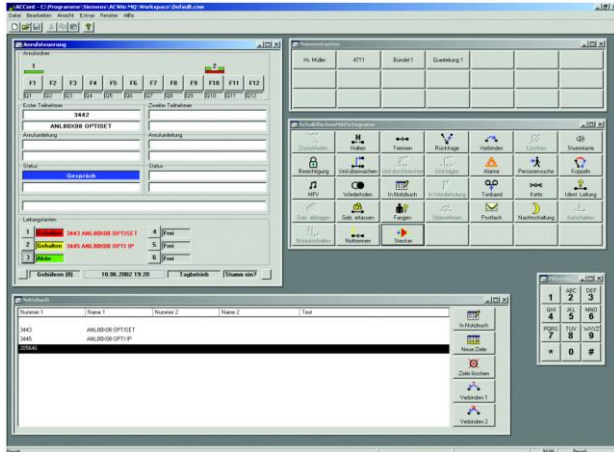


Figure 4: AC-Win IP MQ interface

4.5 Communication recording optimization

Recording device modernization was designed in two variants. In first an upgrade of contemporaneous device was designed, in second the brand new equipment was chosen. The major requirement on communication recording is localization of caller. This function could be available via recording device. Recording of communication is also designed in two variants. The first one is based on current device called DAVOS which is in operation in the company. Server or

operation PC have to complain minimal configuration requirements. It is recommended to utilize multiple hard drive array RAID (RAID 0,1,5,10) to ensure data integrity. This solution distinguish particularly its low price, however it appears temporarily.

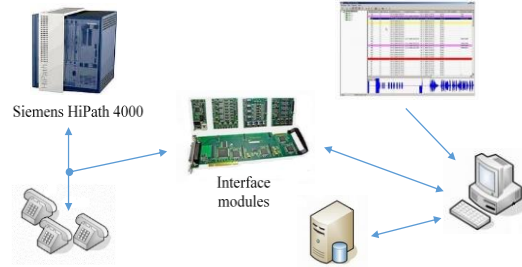


Figure 5: Block scheme of DAVOS/PBX

Universal device ReDat3 made by producer Retia. was designed as an alternative to DAVOS. This device is capable to record and archive voice and data communication simultaneously. It supports wide scale of communication technologies (analog, digital, radio and VOIP), and also could monitor activity on PC display. It represents modular system on hardware and software layer. Number and type of recorded lines is depended on number of analog and digital inputs of extending modules and licenses. Maximal capacity is defined as:

- 200 analog and digital channels,
- 300 IP channels,
- 25 display screens.

ReDat3 utilizes also huge scale of audio compression formats, including technologies of leading world producers (Cisco, Matra, Ericsson and Siemens) [11].

Moreover, it is possible to extend ReDat3 by application server, which is capable via software modules. In case of objective model company the following modules are considered as useful:

- LineMonitor (playing and directing of recording via PC)
- Indicator (acoustic/visual indication of channel state)
- Encryptor (recordigs security against misuse and modification)
- StorageManager (long term archiving manager),
- ScreenMaster (detection of events on PC desktop).

Recording unit utilizes the RAID technology and moreover it is equipped by redundant power supply. Moreover it is necessary to fit recording unit with eight-port analog inputs card and also eight port

digital inputs card and equivalent number of software licences.

4.5 Ergonomics

The ARC is recently operated by one person. Newly designed workplace have to be constructed for operation by two people, along with equivalent hardware equipment. For the purposes of company management was designed model of dispatching workplace in Google Skechup Pro, which you can see in Figs. 6a nd 7.

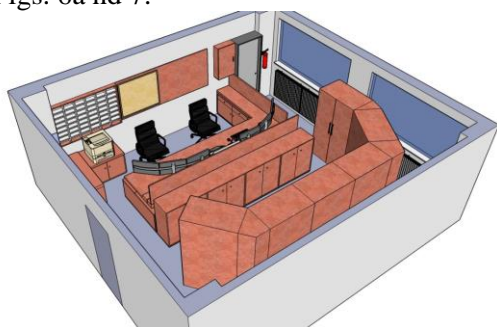


Figure 6: Dispatching workplace situated within ARC.

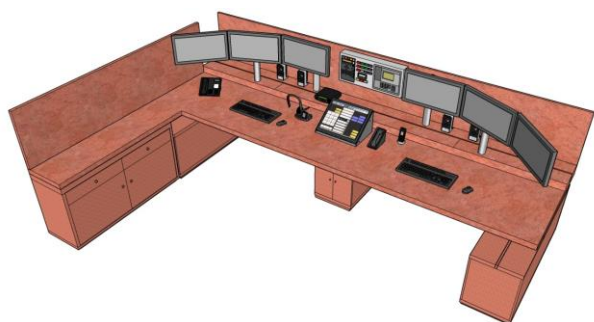


Figure 7: Dispatching workplace for two operators.

5 Conclusion

The ARCs forms one of the cornerstones of corporate security. Early detection of danger and perform adequate response significantly reduces potential damage to health, property and the environment. For large manufacturing companies that are experiencing the treatment of hazardous substances, moving large numbers of people, etc., this assumption applies doubly. For this reason, the vast majority of large-scale production facilities equipped with its own monitoring center, which performs tasks arising from the specific risks of the enterprise. The all necessary information are included within the initial step of this research

paper, on its basis the design of the methodology was provided. As a finale step, the methodology was used for purposes of real design of ARC.

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Table 2: Evaluation methodology checklist

	QUESTION	Y	N	NOTE
ARC Security	Is ARC situated with regard to potential risks?			
	Meets the ARC space minimum construction requirements?			
	ARC is secured by:			
	• I&HAS?			
	• Video Surveillance Systems?			
	• EFS,			
	• ACS,			
• Physical security?				

	<ul style="list-style-type: none"> Mechanical barrier systems? 			
	They object AEC established regime measures?			
	Is the power systems of ARC sufficient redundancy?			
	Progress regularly test the functionality of ARC systems?			
	They are developed and updated emergency plans?			
ARC Utilization	ARC is used for:			
	<ul style="list-style-type: none"> fire reporting? 			
	<ul style="list-style-type: none"> reporting accidents at work? 			
	<ul style="list-style-type: none"> environmental threats monitoring? 			
	<ul style="list-style-type: none"> notification of employees and other persons present on the premises? 			
	It ARC continuously (24 hr. / Day) served?			
ARC Communication and connection	They are in communication ARC exploitation:			
	<ul style="list-style-type: none"> analog telephone 			
	<ul style="list-style-type: none"> digital phone 			
	<ul style="list-style-type: none"> IP telephony 			
	<ul style="list-style-type: none"> radio 			
	<ul style="list-style-type: none"> mobile 			
	<ul style="list-style-type: none"> broadcasting 			
	Communication systems are protected against power failure (eg, redundancy management)?			
	Communication routes are adequately protected against mechanical damage?			
	Communication routes are adequately protected against electromagnetic			

	interference?			
	It is used PBX?			
	There are all types of communications recorded?			
	The recording device is properly secured and backed up?			
ARC Operation	ARC is operated simultaneously two or more dispatchers?			
	Alternate operators in regular shifts?			
	It workplace avoidance of risk factors in terms of microclimate conditions?			
	Is ARC ergonomically shaped?			