

NETWORK SECURITY AT FMCG SECTOR

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ABSTRACT. - **Network Security at Fmcg Sector.** FMCG plans might be suspended as a temporary solution in case poor economical climate. Many cases only some divisions of the factory need to be closed the rest can produce further. This situation usually affects the supply chain integrity procedures. Nowadays most of the plants are using computerised corporate governance, but this systems are usually developed as a bundle for the original factory layout. As soon as we take away a major part from the system, most of the procedures might be affected. This situation generates additional risks and hazards. The article describes how the suspension affects the plant's BMS, SCADA and Industrial Governance Procedures at the FMCG plants. The article describes some points to calculate with, supporting the FMCG Top Management with technical information.

Keywords: „FMCG Supply Chain, Water Supply Safety, BMS and SCADA Security”

1. INTRODUCTION

As the economic climate was sinking from 2008[1], most of the companies had to operate their divisions with massive savings [2]. To reduce the costs there are several solutions for the management, but usually the first two decisions are to cut on labor costs and reduce the maintenance costs. This savings are instants. Both might have major effect on the product: people are less motivated to work as before and all the gears lifecycle starts to shrink as a result of poor maintenance. If the saving is not enough or the market shows still a bad climate, the top management has to show still some profit. They might have to optimize the size of the manufacturing plant to reduce the costs.

In case of crisis the priority is to make savings, as this savings can help the company to survive. There are other places to do savings within a company, but usually energy saving investments cannot deliver payback within a year, so this solution is not a good option in case of a bad cash-flow. If we determinate, that the product quality cannot attenuate by leaving major or minor commodity out of the product the next major saving after labor prices is to cu the maintenance costs.

Cutting maintenance costs can act up as savings within the financial year, but the planned preventive repairs are alternate to reactive tasks. This issues can be measured as overall quality and KPI fall. Even some parts of the factory layout are kept at a good service level, depending on the demand, some other parts can lose

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their original functions. They might be seen within their lifecycle in a very bad stage especially if the planned preventive maintenance was eliminated. After some time, if the market is still bad, this part of the factory can be suspended.

Most food supply chain systems must follow at least one Quality Management System (QMS) supporting the food safety [3]. This covers the water and air systems also, as they are part of it. In case of major fault within the QMS, many customers can be affected. The end of the day, if the Company has bad reputation in quality, it can lose its customers quickly. The saving might cause poor maintenance plan, and the un-loyal people can mess with Quality Assurance Procedures. So as soon as the Top Management turns up with a Saving Plan, the Security Procedures should be reviewed and the regularity of the checks must be extended. Actually this situation shows up in the book as increased Security Costs, and this cost of course must be much less than the planned saving. If the regular maintenance is not done properly as a result of the saving instructions, in a longer term the availability of the manufacturing gears are shrinking.

If the saving is not enough, some part of the plant must be closed. As soon as the plant is closed, there are no labor costs and not even maintenance costs, but the manufacturing must be reallocated to the rest of the plants. If there was 2 shifts only, and the plan is to pull in 3 shift work on a smaller area, will increase the maintenance costs, reduce the labor and energy costs. Usually the top management want a good quality product for as cheap as possible. Even the management wants a cheap supply chain, they must follow all legal requirements, and as part of HACCP [4] they must organize regular audits to meet all required standards. In case of financial crisis a food manufacturing plant might be suspended even after a passed audit. Some cases only part of the factory is closed. Changing is not good for the quality integrity and this situation is not ideal for the customer.

Usually the cash flow crisis starts earlier than a closing procedure. There are several points where savings can be managed such like administration, mid management, maintenance, suppliers. In followings the text focuses on networks within the company. Water, electric, IT, a pressurized air and waste water systems are all effected.

2. CASE STUDY: SUSPENDING A MEAT MANUFACTURING PLANT AND IT'S NETWORKS

Let's imagine that as a result of profit optimization, the management wants to suspend 60 % of a manufacturing plant, so they want to reallocate 30% of the manufacturing to another factory and make 3 shifts at the original location. Prior to any decision all plans have to be pre-calculated. Basically this is the Saving Forecast Plan. Usually, this calculations are made by economists, and all the works in the physical meaning have to be sorted by the local Engineering Management. Any factories can be seen as a matrix connections. The factory is a "black box", we put material, labor, operation management and procedures together and the products are coming out on the gate. Within the manufacturing area there are

information links, which usually helps the manufacturing process. Link can be between human and human, but we can define connection between human and machine, machine and product, computer and management and many other. To understand major risks in the manufacturing object we can point out several technical networks, which are very common within FMCG sector. For a good plan all manufacturing - including all networks within the company - must be surveyed and the risks of losing any of them should to be estimated. The following networks can be found in an average meat factory:

- Electrical supply and lighting
- BMS, this system controls the facilities, such like air handlers, boilers, freezers office areas.
- Computer network. This system allows the staff to send reports, and allows quick communication.
- RF ID network. Used for product tracking
- Access control system. Access within the factory must be limited for quality and integrity reasons.
- Fire alarm network
- Ammonia determination network. Used for determinate ammonia in a case of central cooling system.
- Pressurized air system. Most technology requires it.
- SCADA. This system handles technical parameters of the manufacturing, like acidity, temperature and process timeframes, water temperatures.
- Water Supply Network including Hot Water and Waste Water Systems.

All this networks are part of the manufacturing. Any of them are missing, can cause malfunction, poor quality or integrity failio. As soon as we try to separate the systems, we can face up with unexpected design strategy. Usually we can experience, that during the original design process the place was not designed for any separation at all.

3. SEPARATING WIRED NETWORKS

Reviewing the networks, the 11kV supply, the waste water system, the boiler house and the steam supply might to be straight away major issue. As most factories have only one power supply feed, the plant cannot be separated totally. Some parts of the original layout must be kept. Even fire alarm system and RF data center is usually in the main building, they are able to be separated much quicker as they are connected only with hard wired links, not pipes. We can set up a plan which network can be separated easily and which requires external permission or pricy refurbishment.

Table 1. Networks at an average FMCG plant. List made by the author.

SWOT of networks at an FMCG manufacturing plant					
Type of network	Name of network	Strengths	Weakness	Opportunities	Threats
Wired	SCADA	Nearly real samples of the technology processes	Requires skilled programmers, costs are high	Refit SCADA centre meeting higher quality requirements	System communication fallos
Wired	Electric Power SYSTEM	Essential and easy transportable source	Costs of energy higher than gas	New substation gives better lifecycle results	Electric shock during rebuilding, disturb transformer quality
Wired	Building Management System	Allows online parameter checks of facilities	Easy access for the	Energy efficiency and environment parameter optimisation.	Sub station loss, interior software communication fallo
Wired	CAT5	Quick view for the market and orders	can cause communication integrity fallos and data loss	Higher security level can be pulled in without humane ellenőrzés, as part of the separation.	Data loss and competitor data fishing.
Wired	RFID and alarm	Track human activity within plant	Human based integrity risks are high.	Using existing substations more sample points can be installed free of charge	
Wired	ACS				
Wired	FA	Save life in case of fire	Fake alarms.	smaller system, less fake faults	addressing risks
Piped	AMMONIA	Very efficient environment friendly cooling system	Requires clear steel piping. Very dangerous gas	Must be suspended at this specific site.	Requires building permission.
Piped	CWS and HWS	own water sources are next to the plant.	Requires water standard pipes only.	Nearly free of costs source of water supply	Infections, water quality risks.
Piped	STEAM	High power transport ability	Requires steel piping and condensate return system. Not easy to separate.	Well oversized.	Dangerous network, requires building permission. Freezing risk when isolated.
Piped	AHU-s	Fresh filtered air supply essential for manufacturing.	Mechanical piping and machinery, relayed on BMS STEAM and	Re commissioning units	Weight on roof.

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4. SEPARATING PIPED NETWORKS

Hot and cold water supply are absolutely essential for food manufacturing. Most of the products are containing added clean water as well. Water is used for cleaning procedures in a big amount. Actually to suspend water systems are quiet easily manageable, as most systems have built in shut off valves and all dead legs might be drained down as a last result with pressurized air. Most of the piping can survive a few years, but an unused water pipe can corrode even from inside. All regulate and shut off valves can be seized after a while, which makes much harder the restart as time flies.

Technological gas pipe systems – like CO₂, Vacuum, O₂ -are also easily manageable in the technical meaning. Actually until the pipes are free of leaks, and all valves are fully moved often to prevent seizing, this lines can survive decades if they are well plugged in the ends. As in most cases copper, stainless or plastic systems are in use, also the inside of the pipes are usually moisture free, there is no potential risk of corrosion. Depending on the type of the gas, prior to any reuse of the system it must be pressure tested and re-commissioned, which is a legal requirement in the EC. The highest risk for the management is, if they wish to reuse the lines after the crisis it might take a long time to get the new permissions, and sort the paperwork. Most cases the management acts up as piping is still in use, but has much less load on it. Actually this action might end up in fatal accident, as this lines become unmaintained for a longer period and the system might lose its original parameters.

There are used much more dangerous gases in the FMCG sector for the technology. This lines can contain ammonia, alcohol vapor, high pressured steam, burnable gases, like acetylene, methane, propane. The ammonia system due to legal requirements cannot be just separated or closed within the factory. Depending which part we are in the EU but mostly the Fireman and the Rescue Services must be involved in case of any suspension request.

Usually this plants have centralized compressor room with redundantly built compressors. As ammonia is a dangerous gas [5], the system requires suspension plan which design takes. This part of the cooling industry is well regulated in the EU, as a result of many accidents. [6]

The network also determinates a normal cooling capacity and a system efficiency for the normal use. Should the management wish to suspend more than about 25% of the cooling lines, it might end up dead legs in the ammonia system. The saving comes just from cutting the energy bill. Actually as most companies are buying electricity for a specified period. Even the plant is not used, the cost might stay same or become more. Centralized industrial cooling networks need special care in case of separation.

5. SEPARATING HUMAN CONNECTIONS

Human communication might have better interlock and feedback system than any BMS or SCADA. In case of crisis the communication line between the management and the staff becomes usually formal. Actually it is not easy to understand at the lower level as an employee, that aggressively managed savings can save the future of the company, especially if someone loses his/her main income. If we check the two parties one side loses profit only until the other might loose existence or home, even sometimes the life quality.

Factory suspension ends up usually group redundancies. This task must be handled with special care and professional communication, which task belongs usually to the HR department. Human gives different response than any technical devices. In local towns, staff also might have relatives or mates within the gate. This issue might result in a higher risk of malicious damage or vandalism which must be filtered prior to any redundancies.

The decision is not easy for the management. Usually they want to keep the best staff ever for the company, but if they have to lay off a mother and a father at the same time is not a popular decision even for the deathliest manager. If they make the woman redundant, more than lightly the man will want to give some kind of revenge, and after being shocked the working performance will be probable worse than before. Technically is better so send both of them, or keep both of them in part time.

As soon as the company is being suspended, usually most of the materials, tools, equipment start to disappear instantly. Obvious decision for the management is to make the Security Procedures much tighter prior to giving any formal

orientation to its staff. All formal information should be given in a positive aspect promising support for the families.

6. DIFFERENCE BETWEEN NETWORKS

As seen on Fig 2. most network can be described as a graphs. This graphs can describe the main connections and the main supply points. They describe the best point to make the system smaller or the might even describe which is at the best part to extend. There are several methods how to manage action plans, but in most cases the biggest risks could be identified. One of the methods are to compare the graph and to write a SWOT analysis on them. The graph describe the size of the system, than their SWOT describes their main features, so anyone in the management might able to make a good decision using this information. This method to write estimation for the process is only one of the many, and the method depends on the company's in-house culture, and the available timeframe for the task.

Piping networks can be described with linear graphs, but some very rear application might have a circle type install. If we have a circle type network, some parts might be closed, without losing the rest of the system.

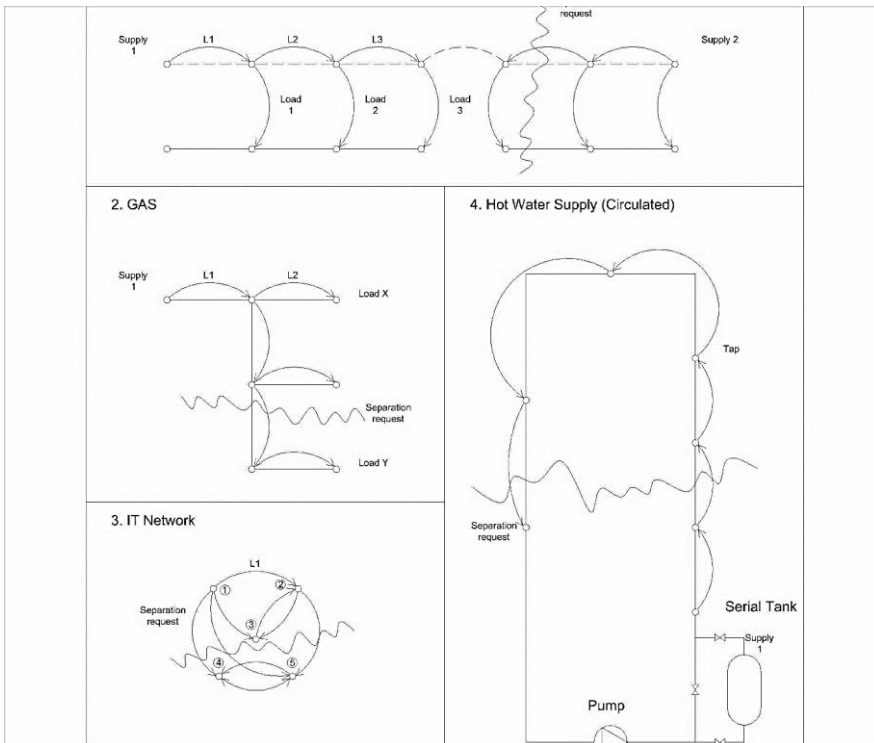


Fig. 2. Graphs of the main networks. Drawn by the Author.

Wiring network can be much more complicated, such as linear, circle, star, or more complex. The complexity leaves the ability to use the system with extra redundancy. In case of electric networks system can have 2 or more supply, also built in battery backup. Other wired networks like RF ID system has more complex graph, as software address is part of the network. It is very rare to use software based equipment in water systems in a standard FMCG company, but in the future we can estimate IP addressed water taps or linked toilet flushers also which can make harder the separation.

Table 1. SWOT of the main networks. Made by the Author.

SWOT for piped network	
Strenght 1. Usually well designed 2. Big added values for the technology 3. Big savings in case of suspension	Weaknesses 1. Smaller infrastructure gives bottlenecks 2. Needs trainings 3. Re-designing is a must
Opportunities 1. Energy efficiency 2. Much less cost of energy 3. Old asset can be scrapped	Threats 1. Requires well experienced staff 2. Risk of dangereus gas loss 3. Much legals issues
SWOT for wired network	
Strenght 1. No risk of leaks 2. Usually well designed 3. Easy to insulate	Weaknesses 1. IT network dataloss 2. Integrity risks 3. Hacking
Opportunities 1. Quickly managable 2. Easy to extend or suspend 3. Not much legal issues	Threats 1. Risk of electrical shock 2. Risk of fire after a while 3. Risk of data loss 4. Risk of copper "loss"
SWOT for human based inhouse network	
Strenght 1. Know-how 2. Able to solve things 3. Able to find other ways	Weaknesses 1. Might become agressive 2. Unmotivation shows up 3. Bad information goes quick
Opportunities 1. Capital of connections 2. Bright ideas 3. Moving together	Threats 1. Potential risk of straik 2. riks of unwated staff migration 3. Other intergity issues

CONCLUSION

Prior to any action plan during a crisis, the management must have a clear view about the asset within the company. The operation management must be competent in economical, legal and technical and social tasks as well. Best practice if the action plan is communicated correctly to the employees. Prior to any communication the security procedures must be reviewed. The action plan acts on many networks within the company. Highest risks might be with the social capital. All hazard materials filled pipings and the electric networks should be suspended in a great care. As soon as the crisis disappears the new layout must meet with the actual legal requirements.

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