



SAFERA project no. 22

Smart PROcess INdustry CranEs

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Smart PROcess INdustry CranEs

(project acronym SPRINCE)

Development of organizational factors indicators.

Questionnaire activity WP2.1



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University of Messina



University of Belgrade



University of Defence

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Responsible: Faculty of Mechanical Engineering - University of Belgrade (*FME UB*)

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QUESTIONNAIRE

LEADERSHIP AND ADMINISTRATION

1	Question	Possible Score	Actual Score
1.1	Does the organisation at the corporate or at the local unit level have a defined role (commitment) of management in the policy of the Process Safety Management?	10	
1.2	Is the general policy statement:		
	a. Contained in manuals?	2	
	b. Posted in various locations?	2	
	c. Included as a part of all rule booklets?	2	
	d. Referred to in all major training programs?	2	
	e. Other? (Describe)	2	
1.3	Are responsibilities for process safety and health issues clearly defined in each manager's task description?	10	
1.4	Are the annual objectives, related to the process safety and health issues, established for all management personnel? Are they included as an important consideration in their regular annual appraisals?	15	
1.5	What percentage of the total management team has participated in formal training courses, conferences or Process Safety Management seminars, over the last three years?	10*	
1.6	Does a Safety Committee or something similar exist?	5	
	a. Are the Committee members from different organisational units and of different educational levels?	5	
	b. Does the Committee meet regularly and document that appropriate recommendations are implemented?	5	

Total Points

70

*X % = X/10 score (i.e. 60% = 6 score)

INFORMATION ABOUT PROCESS SAFETY FOR CRANE TRANSPORT SYSTEMS

2	Question	Possible Score	Actual Score
2.1	Are specifications of all materials (parts, cargoes) which are handled by the crane transport system available?	5	
	a. Is a complete on-site inventory of all handled materials (parts, cargoes) by the crane transport system defined?	3	
	b. Is this information available to both the maintenance and management personnel?	3	
2.2	Do quality control procedures in place and practiced to ensure that all materials (parts, cargoes), which are handled by the crane, meet specifications?	20	
2.3	Is a block flow diagram or a simplified process flow diagram available to aid in the crane operator's understanding of the process?	4	
2.4	Is a process scheme available for each unit at the site where the crane operate?	2	
2.5	Is equipment of the crane manufactured in accordance with applicable standards and does it contain the required documentation?	20	
2.6	Does the documentation show that all equipment of the crane are designed, maintained, controlled and attested in compliance with good and safe engineering practices?	4	
2.7	Does the equipment of the crane have reports on the following (attests)?	(10)	
	a. Materials of construction.	1	
	b. Design codes and employed standards.	1	
	c. Electrical equipment specification.	2	
	d. Design documentation.	1	
	e. Regulations and standards by which safety components of the crane are manufactured.	5	
2.8	Are procedures in place, ensuring that each responsible for process management of the crane has a working knowledge of the process safety, appropriate to his/ her responsibilities?	4	
2.9	Is a documented compilation of all the above Process Safety Information maintained at the unit?	5	

Total Points

80

RISK ANALYSIS

3	Question	Possible Score	Actual Score
3.1	What percentages of process units at the facility, where materials (parts, cargoes) are handled by cranes, have had a formal Risk Analysis for cranes?	10*	
3.2	Has a priority order been established for conducting future Risk Analysis for the crane transport system?	5	
	Does the established prioritisation address the following factors?		
	1. The quantity of toxic, flammable or explosive material that is handled by the crane.	5	
3.3	2. The number of people, whose safety is threatened in the process of transportation, including those in the immediate proximity of the location, as well as those around the location.	8	
	Is the Risk Analysis for the crane transport system performed taking into account the following:	(40)	
	a. The hazards of the process.	7	
	b. A review of previous incident reports.	9	
	c. Engineering and administrative controls applicable to the hazards and their interrelationships.	4	
	d. Consequences of the failure of engineering and administrative controls.	4	
	e. Facilities layout.	5	
	f. Ergonomic adjustment.	6	
g. Risk assessment by the Kinney method in the Risk Assessment Act.	5		
3.4	Was the Risk Analysis conducted by person who had a formal training for utilisation of the method?	12	
3.5	After the hazard identification, are more detailed quantitative and/or qualitative techniques for the analysis required?	20	
Total Points		100	

*X % = X/10 score (i.e. 60% = 6 score)

MANAGEMENT OF CHANGES

4	Question	Possible Score	Actual Score
4.1	Does the facility have a written procedure for the crane that must be followed whenever new facilities are added or changes are made to existing system (change of capacity, speed, etc.)?	10	
	Are authorisations clearly defined regarding this procedure?	6	
4.2	Are the following types of changes (starting or ending order, organisational changes, etc.) included in such stated procedure?	14	
4.3	Is there a clear understanding of what constitutes a “temporary change” and is there a defined procedure on how to control “temporary change”?	5	
4.4	Do the procedures for changes specifically require the following actions whenever a change is made to a process?		
	a. An appropriate Process Hazard Analysis for the unit.	5	
	b. An update of all affected operating procedures.	4	
	c. An update of all affected maintenance programs.	4	
	d. A modification of process schemes and other safety information.	4	
	e. A notification to all employees, working in the area where the change is made, and a provision of the proper training.	3	
	f. A notification to all contractors affected by the change.	3	
4.5	When changes are made in the operating process or/and operating procedures, are there written procedures requiring that the impact of these changes on the equipment and the construction materials are reviewed to determine whether they will cause an increase of the rate of deterioration or failure or will result in different failure mechanisms in the process equipment?	12	
4.6	When the equipment or the construction materials are changed through the replacement or maintenance of items, is there a system to formally review any change to ensure that the new material or equipment is safe to use?	10	
Total Points		80	

OPERATING PROCEDURES

5	Question	Possible Score	Actual Score
5.1	Are written operating procedures available to both operating and maintenance personnel in all units?	10	
	Do the operating procedures clearly define the responsibility of each person for the operation in their applicable area?	5	
5.2	Are the following operations covered in all Standard Operating Procedures?		
	a. Initial start-up.	2	
	b. Normal operation.	2	
	c. Normal shutdown.	2	
	d. Emergency shutdown.	5	
	e. Restart-up.	2	
5.3	f. Safety systems and their functions.	3	
	Are the following elements described in the standard procedures related to safety and health at work?		
	a. Characteristics and risk of materials (parts, cargos) to be transferred.	3	
	b. Preventive measures including personal protective equipment and permits for the safe performance of works.	4	
5.4	c. Control measures that must be implemented in the case of physical contact.	3	
	Are the Standard Operating Procedures written in a clear, concise and understandable manner?	10	
5.5	Are there adequate procedures for the transfer of information between crane operators shifts?	10	
5.6	How frequently are operating procedures formally reviewed to ensure they reflect current operating practices and are updated as required? (Choose one answer)	(11)	
	- At least annually or as changes occur.	11	
	- Each two years.	5	
	- Only when major process changes occur.	2	
5.7	- No schedule has been established.	0	
	How often is an evaluation made of the level of compliance of the working practice with written procedures? (Choose one answer)	(8)	
	- Every 6 months.	8	
	- Yearly.	4	
5.7	- Each 3 years.	2	
	- Not done.	0	
Total Points		80	

WORK SAFETY

6	Question	Possible Score	Actual Score
6.1	Have safe work practices been developed and implemented for employees and contractors to provide for the control of hazards during operation or maintenance, including:	(14)	
	a. Hot work.	2	
	b. Temporary brake due to crane system installation.	2	
	c. The entrance to the enclosure above which performs installation and dismantling of the crane.	2	
	d. Access to the means of crane transport to perform assembly and disassembly work, cranes and maintenance agents and interrogators entrance.	2	
	e. Vehicle entry.	2	
	f. Procedures of entry and handling of trucks for mounting - dismounting of crane equipment.	2	
	g. Periodical inspection and maintenance of crane system.	2	
6.2	Do all the safe work practices listed below require a work authorisation or permit prior to initiating the activity? - Hot work. - Line breaking procedures. - Lockout/tagout. - Confined space entry. - Opening process equipment. - Entrance into a facility by maintenance, contract, laboratory. - Vehicle entry. - Crane lifts. - Handling of particularly hazardous materials (toxic, radioactive, etc.). - Inspection or maintenance of in-service equipment.	10	
	If yes, do the permit procedures include the following?	(3)	
	a. Records that represent an evidence of the procedure's completion.	1	
	b. Operation instructions and work safety instructions.	1	
	c. Procedure for checking out from work/operation.	1	
6.3	How often does the service or the responsible for the health and safety of operations conducts evaluation of compliance of working practices with written procedures? (Choose one answer)	(10)	
	- Every 3 months.	10	
	- Every 6 months.	6	
	- Yearly.	4	
	- Not done.	0	
6.4	Is there a revision of the procedure of work order issuance regarding the crane at least every three years?	10	
6.5	Have surveys been conducted to determine whether working environments are consistent with ergonomic standards?	5	
	If the deficiencies were found in the past, are they corrected?	3	

Total Points

55

TRAINING

7	Question	Possible Score	Actual Score
7.1	Is there a written procedure that defines the required training (related to the work and the operational safety) that has to be received by newly hired operator or maintenance personnel of the crane?	20	
7.2	Is there a written procedure that defines the amount and contents of the training for the operator, regarding the workplace of the crane, in addition to the general training provided in 7.1?	20	
7.3	Does the procedure described in 7.2 require the inclusion of the following?		
	a. The specificity of the process that serves the crane in terms of safety and health risks.	4	
	b. Training in the area of the specificity of the crane operations (the specificity of the different crane manufacturers).	4	
	c. Training on site, in the case of emergency.	4	
	d. Operating practices that ensure the safety at work.	3	
	e. Appropriate basic skills for operators and maintainers of the crane.	3	
7.4	After the completion of the training of operators and maintainers, which method is used to determine whether employees are familiar with the information presented? (Choose one answer)	(15)	
	- Both performance test and opinion of instructor.	15	
	- Performance test only.	10	
	- Opinion of instructor.	6	
	- There is no verification.	0	
7.5	How often are operators and maintainers of the crane transport system given of formal refresher training? (Choose one answer)	(15)	
	- At least once every three years.	15	
	- Only when major process changes occur.	10	
	- Never.	0	
7.6	What is the average amount of training given to each operator and maintainer of the crane transport system per year? (Choose one answer)	(10)	
	- 11 days/year or more.	10	
	- 8-10 days/year.	7	
	- 4-7 days/year.	5	
	- 2-3 days/year.	3	
	- Less than 2 days/year.	0	

7.7	a. Is the training for the operators and maintainers of the crane in accordance with their needs?	8	
	b. Are the training needs periodically reviewed and updated?	4	
7.8	Are the following incorporated in the plant's formal training programs for the operators and maintainers of the crane?		
	a. Qualifications for trainers have been established and are documented for each trainer.	5	
	b. Written lesson plans have been reviewed and approved to ensure complete coverage of the topic.	5	
	c. Next to the theoretical, there is a practical training with the real crane.	5	
	d. All records of conducted training are kept for each employee and for period that is defined with procedures.	5	

Total Points

130

MECHANICAL INTEGRITY

8	Question	Possible Score	Actual Score
8.1	Does the plan for periodical inspections include the following:	(10)	
	a. All equipment of cranes needing periodical inspection has been identified?	2	
	b. The responsibilities to conduct the periodical inspections have been assigned?	2	
	c. Inspection frequencies have been established for all equipment of cranes?	2	
	d. The methodology for periodical inspections of all equipment of cranes has been specified?	2	
	e. Periodical inspection records for all equipment of cranes have been defined?	2	
8.2	Does the periodical inspection plan, referred to in 8.1, include a formal external visual inspection program for all equipment of cranes?	7	
8.3	Does the periodical inspection plan include detailed inspection of support steel structures of the cranes at least every five years?	10	
8.4	Is each carrying part and security system component of cranes controlled, in the time periods set out in 8.1, to identify the causes of deterioration or failure?	5	
	a. Are there any records about it, which could be used to define the program preventive maintenance?	3	
	b. Are the aforementioned records used to analyse the time for the periodic review indicated in 8.1?	3	
8.5	Is the measure of the dimensions (width, height, thickness) of the critical cross-sections of cranes conducted?	3	
	a. Locations of critical cross-sections are determined by:	(4)	
	1. Maximum load of the structure.	2	
	2. Deterioration of the structure regardless the place of maximum loads (corrosion, cracks ...)	2	
	b. Are dimension measurement locations clearly marked on the inspection drawings?	1	
	c. Are thickness measurement methods up to date?	1	
	d. Are the results of measurements used to predict remaining work life and adjust frequency of the future periodical inspections?	2	
8.6	Is there a written procedure regarding methodology changes, i.e. changes in frequency of inspections?	5	

8.7	Are all inspections, tests, repairs or replacements documented immediately?	4	
	Does the documentation include all of the above information? <ul style="list-style-type: none"> - Date of inspection, test, repair or replacement - Name of the person that performed the inspection, test, repair or replacement - Identification of the software over which the inspection took place, test, repair or replacement - Description of inspections, tests, repairs or replacement - Results of the inspection - Recommendations on the basis of the results of the inspection, test, repair or replacement 	3	
8.8	Is there a written procedure, which requires that all identified deficiencies on all equipment of cranes should be removed in a safe manner as soon as possible?	5	
	If defects are noted, are decisions to continue to operate the equipment based on sound engineering assessments of fitness for service?	3	
8.9	Is there a complete and up-to-date central file collecting information and reports of all periodical inspection program?	3	
	Is this file information available to everyone who is involved in the process?	2	
8.10	Have all employees, involved in the equipment maintenance of the crane, been trained in an overview of the process and risk assessment?	5	
8.11	Are all employees, who work on equipment maintenance, trained in all procedures applicable to their tasks, to ensure that they can perform their tasks in a safe and efficient manner?	5	
8.12	Are the instructors licensed to hold training in accordance with the applicable regulations and standards?	5	
8.13	Are training programs conducted for contractors' employees that work on the crane before operations start?	5	
8.14	Does a preventive maintenance program of equipment of the crane system exist?	6	
	Does that program meet following criteria:		
	a. All safety-critical items of the crane are identified and noted.	2	
	b. Records of preventive maintenance program are kept.	2	
	c. Work is being completed on scheduled time.	1	
8.15	Does the facility have procedures regarding the installation and maintenance of the crane which include the following:	(5)	
	a. Evidence of proper materials of construction.	1	
	b. Evidence that the equipment is manufactured according to the design and certified according to current regulations and standards.	2	
	c. Evidence that equipment of the crane is maintained in compliance with codes and standards.	1	
	d. Evidence that there is a list of all spare parts for equipment of the crane.	1	

8.16	<p>Are there constant and progressive records for all cranes, which include all of the elements below?</p> <ul style="list-style-type: none"> - Producers report on the existing regulations compliance with a list of data and manufacturers certificates on all the supplied equipment - Identification number - Results of all inspection, adjustments, changes, re-assessments that have occurred during crane-operations. 	5	
8.17	<p>Are procedures in place for maintenance of the crane sufficient to ensure that all design repair and alteration done on it are in accordance with the code to which the item was built, as well as with health and safety regulations?</p>	5	
Total Points		120	

PRESTART-UP SAFETY PROCEDURE

9	Question	Possible Score	Actual Score
9.1	Does the company policy require a formal Risk Analysis for crane when acquiring new a new one and/or when general <i>remount (modifications)</i> is done on existing one?	10	
9.2	Is there a written procedure before acquiring a new crane or modifying significantly the existing one?	10	
	Do written procedures include the following before the acquisition of a new crane or significant modified modification of the existing crane?	(50)	
	a. Written procedure for determining of the number of operating cycles per hour which is required for <i>new/remounted</i> cranes.	10	
	b. Written procedure for determining of the operation duration over a period of 24 hours for a <i>new/remounted</i> crane.	10	
	c. Written procedure for determining of the maximum and minimum load to be transported by a <i>new/remounted</i> crane.	5	
	d. Written procedure for determining of the average capacity per cycle of a <i>new/remounted</i> crane.	10	
	e. Written procedure which, based on previous three procedures, sets required drive class of the load lifting mechanism for a <i>new/remounted</i> crane.	10	
	f. Written procedure for determining the driving speed of a <i>new/remounted</i> crane.	5	
	g. Written procedure for determining the navigation system (cabin, remote control, floor control) of a <i>new/remounted</i> crane.	5	
	h. Written procedure for determining the working conditions (temperature, humidity, dustiness, explosive environments) of a <i>new/remounted</i> crane.	5	
	i. Written procedure for defining the required number of mechanisms for the load lifting and for their way of operating (one or more mechanisms for lifting, modes - independently or tandem) of a <i>new/remounted</i> crane.	5	
	j. Written procedure for requirements of <i>new/existing</i> paths for a <i>new/remounted</i> crane.	5	

9.3	Is there a written procedure that requires the inspection of all equipment, prior the start-up, to confirm that it has been installed in accordance with the design specifications and manufacturer's recommendations?	10	
	a. Does the procedure require formal inspection reports at each appropriate stage of fabrication and construction?	5	
	b. Does the procedure define the corrective action and follow-up needs when deficiencies are found (follow-up until equipment is in provided state)?	5	
9.4	There is a written prestart-up procedure for acquired equipment of new/ <i>remounted</i> crane in order to determine:	(20)	
	a. that all mechanical devices operate in accordance with applying standards/regulations.	5	
	b. that all control devices operate in accordance with applying standards/regulations.	5	
	c. that all electrical components operate in accordance with applying standards/regulations.	5	
	d. that all safety components (limit switches of all mechanisms, anti-collision devices, braking devices and similar) operate in accordance with applying standards/regulations.	5	
9.5	Is there a written procedure that requires that records of handover of the new/ <i>remounted</i> crane is made and sent to the facility management?	5	

Total Points

135

INCIDENT INVESTIGATION OF INSTALLED CRANE TRANSPORT SYSTEM

10	Question	Possible Score	Actual Score
10.1	Is there a written procedure for the investigation of the cause of incident/accident?	10	
	Does the procedure require that findings and recommendations from investigations should be addressed in order to prevent new similar incidents?	5	
10.2	Does the procedure require that the investigation team has to include:	(6)	
	a. A member trained in accident investigation techniques.	3	
	b. A member that is familiar with process operations related to the crane.	3	
10.3	Is there a standard form of recorded accident/incident investigation that includes the following information?	(22)	
	a. Date of incident.	1	
	b. Date of the begin of the investigation.	1	
	c. Description of the incident.	5	
	d. Determination of the causes of incident.	5	
	e. Evaluation of the potential severity and frequency of recurrence.	5	
	f. Recommendations to prevent the recurrence of the incident.	5	
10.4	Based on a review of failure records, does it appear that the established incident investigation procedures for the crane are being followed?	5	
10.5	Is the adequate staff (engineers, crane operators..) involved in incident/accident failure analysis (which are caused by failure of the equipment of the crane), in order to discover related cause?	10	
10.6	Are reports of incident/accident investigation submitted to suppliers of the crane and is there a written procedure by which suppliers are obligated to prove that incident was not caused by their mistakes?	7	
10.7	During past year, have incident reports related to cranes been transmitted to all other units at the site that use the same or similar crane?	4	
10.8	Does the procedure for the incident reporting require its findings to be incorporated into future risk analysis?	6	

Total Points

75

SUPPLIERS/CONTRACTORS

11	Question	Possible Score	Actual Score
11.1	Does the contractor selection procedure for the crane include the following when awarding the contract?	(12)	
	a. A review of the contractor's licences for the design, execution and operational health and safety (engineers full-time employed with contractors).	3	
	b. A review of the contractor's financial capabilities (realised cash flow from activities involving supplying cranes, positive annual financial balances, etc.).	3	
	c. A review of the documentation related to the experience and skills necessary to safely and efficiently perform work (lists of references of supplied crane transport systems).	3	
	d. Evidence that the potential contractor is a domestic supplier legally registered for the performance of the given activity or an authorised partner of a foreign manufacturer of the equipment.	3	
11.2	Before the start of the delivery and installation, is the supplier of the crane advised by written documents about:	(8)	
	a. All known potential hazards of the process and of the contractor's work.	2	
	b. Safe-work practices during the installation of the crane.	2	
	c. Entry and access to the object procedures.	2	
	d. All applicable procedure changes in the case of emergency.	2	
11.3	Are pre-job meetings held with suppliers of the crane to review the scope of the work, as well as all activities deriving from it, taking into account requirements for safety and health insurance for all contractors and suppliers employees.	3	
11.4	If it is determined that an employee at the supplier does not comply with the required safety measures and health at work on the site, is there a written procedure which obliges the supplier to comply with remarks given on site.	5	
11.5	Is there a written procedure according to which all employees of the supplier, who work on maintaining the existing crane, undertake to respect all the requirements of health and safety at work in the execution of works?	7	

Total Points

35

MANAGEMENT SYSTEM ASSESSMENTS

12	Question	Possible Score	Actual Score
12.1	How often does the organisational unit in charge for operational health and safety conduct an evaluation of the facility's Process Safety Management system of the crane? (Choose one answer)	(10)	
	- Every year.	10	
	- Every three years.	7	
	- Not done.	0	
12.2	Does the developed action plan meet the needs as indicated by the last assessment?	10	
12.3	Does the assessment team for the evaluation of the facility's Process Safety Management system of the crane include people with the following skills:	(10)	
	a. Skills regarding the technique for the evaluation of the facility's Process Safety Management system of the crane.	5	
	b. Skills regarding the process being evaluated.	5	
12.4	Is the breadth and depth of the evaluation appropriate for the crane transport system?	10	
Total Points		40	