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Analysis of the quality problems during production process of the stud frame of the stretching station

Manuela Ingaldi[1]

[1]Institute of Production Engineering, Faculty of Management, Czestochowa University of Technology, Armii Krajowej 19B, 42-201 Czestochowa, Poland, +48 34 3250 399, e-mail: manuela@gazeta.pl

Abstract The stud frame of stretching station WSH 400/15 was the main subject of the researches presented in this paper. The aim of the article was the quality analysis of the stud frame during its production process. Construction and scheme of production process of stud frame was presented. Analysis of main areas which generate incompatibilities of researched element was made. Proposals of process improvement with the help of relation diagram and affinity diagram were presented.

Key words: stretching station, relation diagram, affinity diagram

1. Characteristic of stud frame and its production process

The stretching station WSH – 400/15 was the main subject of the research presented in this paper. The stretching station is one of the elements of belt conveyors used in maining. It is used to stretch carrying belt (Miner guide 1976). It can be used in underground maining plants in non – methane and methane fields in excavations rated among level "a", "b" or "c" of danger of methane explosion and level "A", "B" or "C" of danger of coal dust explosion as an installation which needs to be unplugged with maximum increase of methane concentration to 2% (Installation and operation instruction of the stretching station). In Table 1. technical characteristic of the researched station is presented.

Table 1. Technical characteristics of the stretching station WSH – 400/15

Parameter	Value of parameter
Force of pulling of two robes: – nominal – maximal	 80 kN 120 kN
Speed of robe	0,12 m/s
Diameter of robe	16 mm
Installed capacity	15 kW
Supply voltage of engine	500 V or 1000 V

Source: Installation and operation instruction of the stretching station

Production process of the research stretching station is very long and complicated, the station consists of many elements and component. So only one ele-

ment – the stud frame – was chosen. In Figure 1 the construction of studied stud frame is presented.

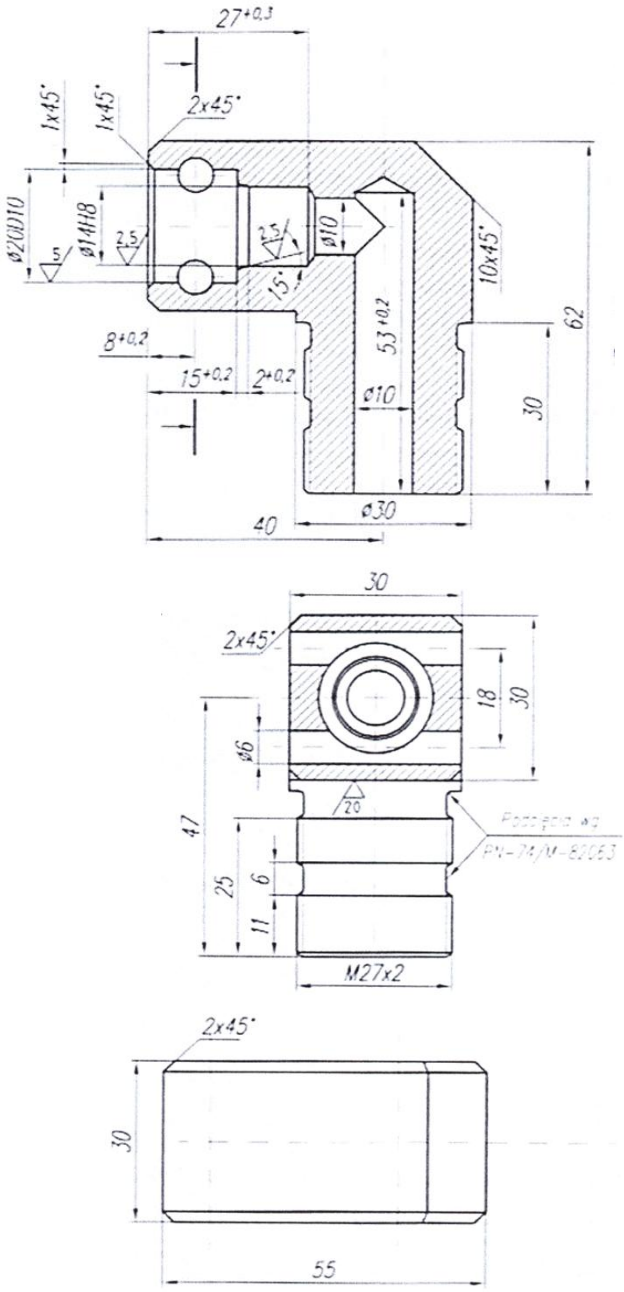

Fig. 1. Construction of stud frame

Source: Installation and operation instruction of the stretching station

In Figure 2. the production process of studied stud frame in technical depiction is presented (ULEWICZ R., BORKOWSKI S. 2008).

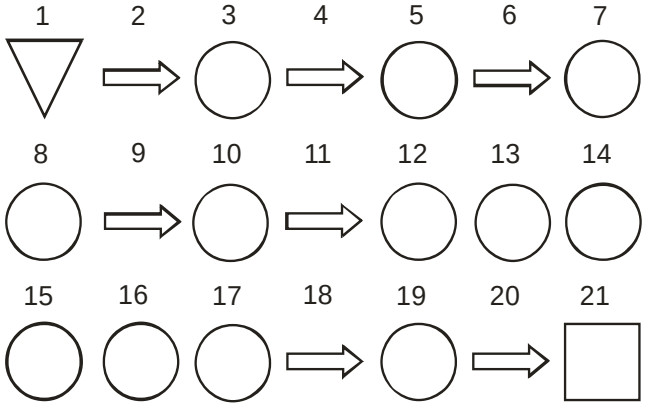

Fig. 2. Scheme of production process of the stud frame in technological depiction

Source: own study

The operations specified in the production process of the stud frame are following:
1. Storage.
2. Transport of metal plates to preparatory department (cutting automaton).
3. Burning of external shape with allowance of 5 mm on every side according to pattern.
4. Transport (locksmith of preparatory department).
5. Trimming.
6. Transport (vertical mill machine).
7. Clamping on a table.
8. Bilateral milling to size 30x63x55.
9. Transport (lay – out stand).
10. Lay – out.
11. Transport (turning lathe stand).
12. Planning of front to size 62.
13. Turning ϕ30.
14. Threading.
15. Drilling.
16. Boring ϕ20D10.
17. Blunting of edges.
18. Transport (locksmith of preparatory department).
19. Trimming.
20. Transport (montage stand).
21. Control of final product.

2. Analysis of areas which generate incompatibilities of stud frame

In Table 2. the areas which can have influence on generating of incompatibilities of stud frame were compiled. The researches were carried out in 2007 and 2008.

Table 2. Percentage part of areas which have influence on occurrence of incompatibilities of the stud frame

		Man	Management	Method	Material	Machine
Month	X	41	8	11	18	22
	XI	29	11	14	22	24
	XII	17	15	15	24	29
	I	26	4	30	11	29
	II	39	11	7	12	31
	III	29	13	19	26	13
	IV	39	11	7	12	31
	V	29	13	19	26	13
	VI	26	4	30	11	29
	VII	44	7	12	18	19

Source: own study

Its noticeable that in researched period most of incompatibilities were cause through fault of workers. This group of incompatibilities did not dominate only in December, January and June. In first months of researched period incompatibilities cause trough fault of machines were also significant. Only in March, May and August participation of machine was smaller than 20%. Management had the smallest influence on occurrence of incompatibilities, its participation arrived to 15% only in December.

3. Proposals of process improvement

In order to present the proposal of process improvement, relation diagram and affinity diagram, described in paper (KARDAS E. 2012), (BORKOWSKI S., ČOREJOWÁ T. 2004), (KONSTANCIAK M., JAGUSIAK M. 2011), (LESTYÁNSZKA ŠKŮRKOVÁ K., ŠESTÁK M. 2009), (PIEKARA A., DZIUBA S.T., KOPEĆ B. 2012), (SYGUT P., 2013) were used.

In order to detection of incompatibilities which are caused during production process of stud frame, relation diagram was used. With the regard of the fact that the highest amount of incompatibilities were cause through fault of workers, relation diagram was presented for this group of incompatibilities. This diagram was presented in Figure 3.

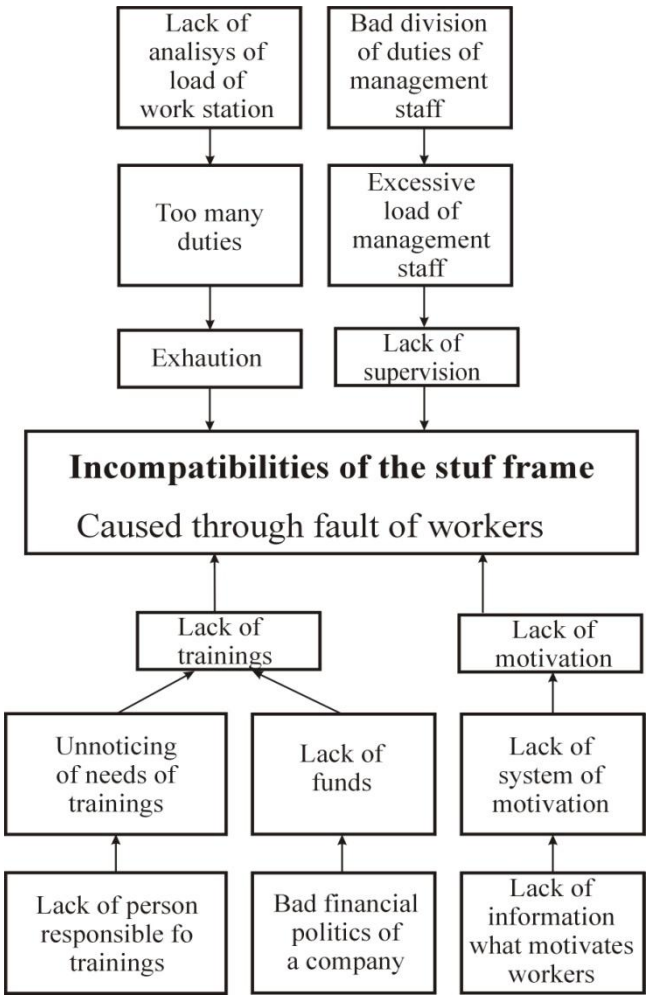

Fig. 3. Relation diagram

Source: own study

Affinity diagram is a next tool used in order to presentation of proposal of process improvement. In Figure 4 affinity diagram of incompatibilities of stud frame was presented. Individual proposals were divided in 5 groups.

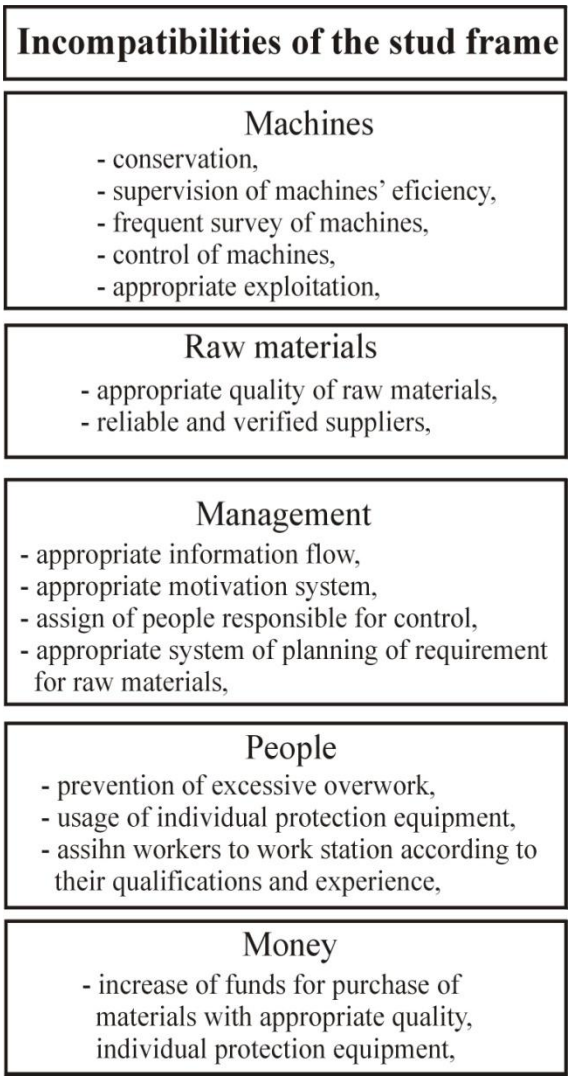

Fig. 4. Affinity diagram

Source: own study

4. Conclusions

Stud frame is one of elements of stretching station WSH 400/15 used in belt conveyor in mining. It was shown that the highest percentage of incompatibilities of stud frame occurred during production process was cause through fault of workers. The main reasons of this incompatibilities were: exhaustion, lack of supervision or control, lack if training of workers and lack of appropriate system of motivation. The main areas for which proposal of process improvement were presented were machines, raw materials, management, people and money.

References

1. *Miner guide*, Vol. 5. Pub. Śląsk, Katowice 1976 (in Polish).
2. *Installation and operation instruction of the stretching station*. WSN – 400/15 (in Polish).
3. ULEWICZ R., BORKOWSKI S. 2008. *Production management. Production systems*. Pub. Humanitas, Sosnowiec (in Polish).
4. KARDAS E. 2012. *Quality analysis of pig iron produced in one of Polish steelworks.* In: Materials Science Forum, vol. 706-709, p. 2146-2151.
5. BORKOWSKI S., ČOREJOWÁ T. 2004. *Instruments of management problem solving*. Pub. Wyższej Szkoły Zarządzania i Marketingu, Sosnowiec (in Polish).
6. KONSTANCIAK M., JAGUSIAK M. 2011. *Improvement of the Production of the Hard-Drawn Wire*, In: Improvement of Production Processes. Monography. Ed. Stanisław Borkowski, Marek Krynke. Publish. TRIPSOFT, Trnava, p. 60-71.
7. LESTYÁNSZKA ŠKŮRKOVÁ K., ŠESTÁK M. 2009. *The capability of turning process by screws production*, In: Production engineering. Novosibirsk State Technical University, p. 49-56.
8. PIEKARA A., DZIUBA S.T., KOPEĆ B. 2012. *The use of ishikawa diagram as means of improving the quality of hydraulic nipple. chapter 15*. [In:] Toyotarity. Quality and machines operating conditions, Monograph. Ed. S. Borkowski, J. Selejdak, Oficyna Wydawnicza Stowarzyszenia Menedzerów Jakości i Produkcji and Faculty of Logistics, University of Maribor, Celje 2012, p. 162-175.
9. SYGUT P. 2013. *Process of quality improvement in the company producing building materials*. Production Engineering Archives, 1/2013, p. 16-18.