Performance Analysis of Some Independent Variables in Unreliable Manufacturing Industry

Anupom Barua
PhD student, ME dept., CUET, Bangladesh
anupom19phd@gmail.com

Dr. Md. Tazul Islam, Dr. Sajal Chandra Banik and Dr. Md. Sanaul Rabbi
Professor, ME dept., CUET, Bangladesh
tazul2003@cuet.ac.bd, baniksajal@cuet.ac.bd, rabbi@cuet.ac.bd

Abstract

This research articles proposes the mass of industrial capital which implies the fast advancement of the plant arrangement of creation, portrayed by significantly more inflexible, complex, and unpredictable divisions of work, both inside and between production system. As these frameworks are inclined to disappointment with use and age, premium in the improvement of efficient support techniques has developed exponentially. Block replacement preventive maintenance policy (BRP), under which units are replaced at failure or at fixed intervals which is wasteful is more irrespective of the unit age perspective age-based preventive maintenance policy (ARP). The current experiment comprises of recognize just as impacts of some control factors such as independent variables for both support and stock control strategy for a single product disappointment inclined weighty assembling cell point of view Bangladesh. The main objectives of this paper are to decide the main impacts and interaction impacts of three independent variables (Initial random amount of time with general distribution, Servicing time, Buffer stock capacity) by a factory recorded information is solid for example huge 95% confidence level if there should be an occurrence of improvement of the components of the system under the MRP with HPP restorative and preventive maintenance policy. This performance is tested for better understand about its dynamic model to meet the independent variables conduct on an inconsistent disappointment inclined weighty assembling unit creation and furthermore prevalence and stochastic conduct of the assembling industry. The simulation is done by statistical software SPSS 26

Keywords: Independent variable, Age-based replacement policy (ARP), Block replacement policy (BRP), Modified Block replacement policy (MBRP), SPSS 26

1. Introduction

A successful support system is concerned about expanding hardware uptime and office execution while adjusting the related assets exhausted and at last the expense. We want to guarantee that we are getting adequate profit from our speculation successful support system has grown exponentially. (F. Berthaut et al., 2011) and (Carnero Moya, 2004) A Process whose future conduct can't be precisely anticipated from its past conduct (with the exception of the current or present conduct) and which includes irregular possibility or likelihood is called Markov process. An ideal control speculation which controls the stream speeds of parts through a structure subject to sporadic dissatisfactions and fixes, is called Hedging point policy. A framework which is permitted or not permitted to accomplish something as far as steady age is called Age edge. A framework which is permitted or not permitted to do something to a particular time is called Time threshold. A stockpile of data sources held as a hold to protect against unforeseen deficiencies or requests is called Buffer stock. A Stochastic cycle is basically an assortment of arbitrary factors recorded by time. It will be valuable to think about independently the instances of discrete time and constant time. MB_1 is the altered square substitution action which happens at fixed preventive support plan. MB_2 is the altered square substitution action which is happens at disappointments before fixed preventive support plan. Corrective maintenance (CM) happens at disappointment, while preventive maintenance (PM) happens while a framework is working, which infers efficient assessment, location and avoidance of disappointments Triantaphyllou et al. (1997).

1.1 Objectives

The main objectives of this paper are to identify major independent variables in an unreliable manufacturing system and to analyze major independent variables in an unreliable manufacturing system. The rest of the report is organized as follows: Chapter-2 6 presents the introduction. Chapter-2 Description of single product failure-prone manufacturing system literature review. Chapter-3 presents Methodology of MBRP/HPP. The analytical approach based on collected data describe the design of experiments; analysis of variance to be significant is presented in Chapter-4. presents the Data collection. Chapter-5. presents the Results $ discussion with analyzing procedure of SPSS Statistics. independent variables in SPSS statistics and performance analysis on MBRP and specifically describes behavior of the and the co-relation of production with above independent variables inventory control parameter initial preventive time T_{MB1}, stock capacity (S) & servicing time (S_T) which are mainly based on main effects and interaction effects to verify the model policy is significant for 1% chart and 5% chart at 0.05 level. Finally, Chapter-6 presents the conclusion, Chapter-7 presents the acknowledgement, Chapter-8 presents the references.

2. Literature Review

These changes have been reached out to the production area, as this is the one most clearly drew in with the usefulness and viability of the mechanical cycles. This concern has been moved to support, for the most part considered to be a wellspring of expenses, and by and by associated with more fundamental issues, from an assessment reliant upon the possibility of reasonability, thus pursuing the fundamental understanding. The implications in progress and upkeep prescribe the need to change the point of convergence of support systems, usually focused on transient issues (usage of resources, costs, etc) towards the prospect of longer-term goals (truly, viability and procedure).
F. Berthaut et al. (2011) substitution of parts or consumables, and Carnero Moya (2004) objective is summarized age and square replacement of a structure subject to shocks. Triantaphyllou et al. (1997). foster model for choosing the primary guidelines in maintenance decision. Square substitution PM strategy block-replacement policy (BRP), under which units are superseded at dissatisfaction or at fixed ranges kT (k = 1, 2, 3 and so forth), despite the unit time. Analytical hypothesis of steadfastness is proposed by Barlow and Proschan et al. (1965), it seems, by all accounts, to be more commonsense to execute and to supervise than the ARP since it needn't bother with following unit ages and doesn't change the PM organizing after each support action.

Some systems have been described to deal with the introduction of the old-style. Cox et al. (1962) and Blaming et al. (1965) described supportable speculation and besides replacement frameworks. A basic doubt of both the fundamental EOQ and EPQ models, Penticoa (2009) is that stock outs are not permitted. Under conditions of interest confirmation, in any case, it is attainable to show that, expecting customers are consistently willing, but not actually happy, to hold on for movement, organized defer buys can look good, whether or not they cause some authentic or proposed cost. Stock outs are not permitted provoked the headway of both EOQ and EPQ models for the two; Bhat et al. (1969), Tango et al. (1978) and Murthy and Nguyen et al. (2011) proposed extended square replacing system with used things. By using used things. Barua et al. (2019) described the effects of independent variables in unreliable single-product heavy manufacturing cell.

3. Methods

3.1 Variable Selection

From our better agreement, we realize that dependent variable ought to evaluate at the predictable level i.e., it is a range or extent variable.
The independent variables should each include somewhere around two unmitigated, independent (unrelated) groups. Presently those independent variables which impacts the decrease of machinability. In previous work, F. Berthaut et al. (2011) the creators considered comprise arbitrary likelihood of production time. He likewise chose support stock limit and so on was chosen for free factors for subordinate factors. For the better performance of preventive maintenance, perspective Bangladesh, the author like to select new independent variable which is random servicing time with other independent variables (initial random probability of production time, buffer stock capacity), etc.

3.2 System Description

The production business can convey a biggest constraint of u_{max} to acquire to completed great production demand d, with u_{max}> d. The production is dependent upon a risk of failuret, described as T_f factors with irregular time. The production machine is fixed to fall random time T_{cm} and preventively kept up with for an arbitrary timeframe T_{pm} where T_{cm} and T_{pm} are random factors with general likelihood circulations. Furthermore PM, fabricating industry is taken out until the finish of the maintenance movement. Along these lines, the interest for finished goods is fulfilled by the safety stocks. After the resumption of the production, producing industry can satisfy need accumulated without intruding on the ordinary interaction. As displayed in Figure 2, the goal is the limits development of the elements of the framework under the BRP/HPP and MBRP/HPP.

3.3 Model Assumptions

The model viable incorporates the accompanying ordinarily conceded assumptions. Chang (2010)

1. Failure is promptly recognized.
2. Precise servicing is quite far is thought of.
3. The probability of production is disappointment by preventive maintenance.
4. All fundamental assets are quickly accessible when required.
5. Preventive Maintenance and exercises restore the joining business industry and also as good as for new functional state. And
6. Should be trained properly under the supervision of supervisor with respect to time before planned CM & PM.

3.4 Theory overview

Joint production and preventive maintenance issues in assembling frameworks has been introduced for utilizing the ideal control hypothesis of some independent variables. To control the independent variables through a framework subject to arbitrary disappointments and fixes, Kimemia and Gerschwin et al. (1983) and Akella and Kumar (1986) showed a calculation for controlling the production in flexible assembling frameworks. The Hedging point policy involves the development of an outcome respectively. For an unreliable maintenance methodology, the fixed interest rate and stochastic interest rate is presented as below (F. Berthaut et al., 2011):

$$u(t) = \begin{cases} u_{max} & \text{if } x(t)<S \\ d & \text{if } x(t)=S \\ 0 \text{ under maintenance action} & \end{cases}$$

where S is the limit of the safety stock, additionally called point in the ideal control circle, x (t) is the maintenance which is the stock level at a predefined time t, and u (t) is the business production rate of making a foreordained degree of stock x (t). Strategies are brings about the gathering safety stock with where production limit is (u = u_{max}), (u = d) and (u = 0). Kimemia and Gerschwin et al. (1983)] and Akella and Kumar et al. (1986) indicates he actual control of production rate in a failure-prone inclined assembling framework.

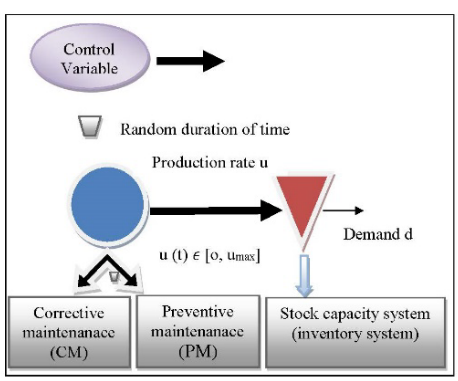

Fig. 1 Consideration of single product failure-prone heavy manufacturing system, Barua et al. (2019)

3.5 Methodology of BRP/HPP

For a good cost examination of the ARP/HPP and BRP/HPP has never been handled in the writing. For sure, calculations of the specific maintenance and stock all out cost during a maintenance cycle with the ARP or the BRP vary, and they are difficult to get without working on suppositions. Truth be told, all proposed insightful methodologies are restricted to the examination of only one maintenance cycle dependent on the recharging hypothesis to such an extent that the stock intermittently arrives at a similar level (i.e., the cradle level) after Corrective maintenance or preventive maintenance (Akella et al., 1986), (Feng et al., 2000), (Hu et al., 1995)

3.6 Methodology of MBRP/HPP

As per the successful dynamic and stochastic conduct of the assembling business, there proposed to loosen up these prohibitive suspicions. Figures. 2–4 represent some potential situations of the assembling business genuine elements as per the stock level development. Figure 2 feature that the maintenance cycle starts the stock level declines equivalent to (- d) and potentially dips under 0 (if there should arise an occurrence of lack), which brings about punishment costs. When functional, the stock level increments at rate (u_{max}-d). If the collecting business machine doesn't crash and burn or then, at that point, periodic like the case in the majority of the proposed canny model. Chen (2009)

Figure 2 and Figure 3 show Improvement of the components of the system under the BRP/HPP and MBRP/HPP that can be measure as measure:

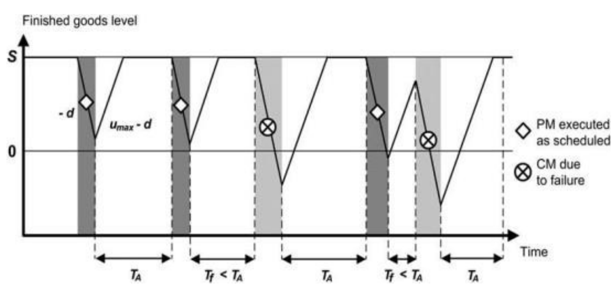

Fig. 2 Improvement of the components of the system under the ARP/HPP, F. Berthaut et al. (2011)

1. Range [T, 2T]: The maintenance cycle starts along preventive maintenance equivalent to (- d). Toward the finish of the PM activity, stock level increments with (u_{max} - d) and is then kept up with at level S.
2. Range [2T, 3T]: When nothing disappointment happens, the assembling business measure is closed A disappointment then, at that point, happens and triggers a remedial mediation, which is finished before the finish of the cycle. Production continues right away before the following PM activity planned at moment 3T. The fixed machine then, at that point, makes due until the following planned PM activity.
3. Range [3T, 4T] : Under the BRP/HPP (Figure 3), a PM activity is proceeded as booked, then business becomes functional and doesn't fall flat until the following PM booked at moment 4T, permitting the stock level to increment and to arrive at level S.

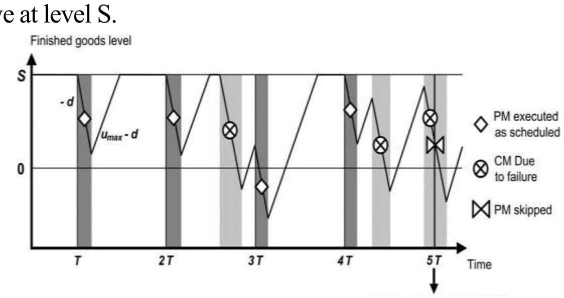

Fig. 3 Improvement of the components of the system under the BRP/HPP, F. Berthaut et al. (2011)

Under the MBRP/HPP (Figure 3), the PM movement is basically skipped and the stock level ascents quicker, up to its greatest at S, when inventory is stretch [3T-T_{MB2}, 3T] and due until 3T. It very well may be noticed that the

MBRP/HPP will create less PM activities, and accordingly less new functional gear's that will be taken out and dismissed, and thusly, less stock deficiencies.

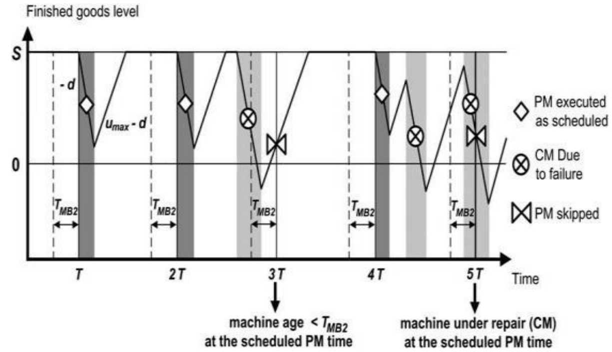

Fig. 4 Improvement of the components of the system under the MBRP/HPP, F. Berthaut et al. (2011)

4. Range [4T, 5T]:

Both the BRP/HPP and MBRP/HPP have a similar powerful conduct, at span [5T-T_{MB2}, 5T] and [4T, 5T]. A reproduction policy which verifying those control variables only for MBRP as for analysis of variance is significant is done by using a statistical software SPSS 26.

4. Data Collection

For each joint preventive maintenance and production/inventory control policy, two (for the ARP/HPP and BRP/HPP) or three (for the MBRP/HPP) independent variables and one dependent variable (the incurred cost) are considered. In this chapter we are going to verify the MBRP. We define a new variable S_T for servicing time, such that $T_{MB2} = S_T * T_{MB1}$ and $0 \leq S_T \leq 1$, to make sure that $T_{MB2} \leq T_{MB1}$. The design of experiments defines how the control factors can be varied to determine the effects of the main factors and their interactions on the incurred cost of production with a minimal set of simulation experiments. Barua et al. (2019)

Due to the convexity property of the cost function, complete for the MBRP/HPP policy a factorial analysis 23 is considered here by which designs of experiments are carried out. Four replications were conducted for each combination, and 32 (23*4) simulation runs were made for the MBRP/HPP. Detection & verification of the residual error is also obtained. Non-significant effects are ignored or added to the residual error. Mean value and standard error are obtained for main effects and interaction effects.

Using SPSS 26, the control variables T_{MB1}, S, S_T are verified about their effects on production from the collected production historical data from a failure-prone manufacturing unit of a company. 45.20, 42.50, 45.40, 44.50, 43.60, 45.00, 42.00, 44.80, 4 4 .00, 44.20, 44.60, 43.50, 46.40, 46.00, 46.00, 45.60, 43.00, 42.80, 42.50, 42.80, 46.00, 46.00, 46.60, 46.40, 44.00, 43.50, 43.00, 42.60, 45.00, 45.00, 45.80, 45.20 which all of its units/day.

5. Results and Discussion

The resolution approach and the results are detailed in a step-by-step manner for the basic case presented in Table 4.2. The manufacturing system considered here is designed to produce at a maximum production rate 25% higher than the demand rate. The stochastic time variables that describe the time between failures and the CM and PM durations follow the first and second values within parentheses indicate the mean and the standard deviation for the lognormal distribution.

We are going to simulate total 32 runs so here we only simulate ANOVA by collection data such as: 45.20, 42.50, 45.40, 44.50, 43.60, 45.00, 42.00, 44.80, 44.00, 44.20, 44.60, 43.50, 46.40, 46.00, 46.00, 45.60, 43.00, 42.80, 42.50, 42.80, 46.00, 46.00, 46.60, 46.40, 44.00, 43.50, 43.00, 42.60, 45.00, 45.00, 45.80, 45.20 which all of its units/day.

Now we are going to simulation run by SPSS 26 for analysis of variance with T_{MB1}, S, S_T with historical prod value which is given in Table 1 :

Table 1 Historical data parameters of this experiment case

Control parameter/variable on	REP 1	REP 2	REP 3	REP 4
1	45.20	42.50	45.40	44.50
T_{MB1}	43.60	45.00	42.00	44.80
S	44.00	44.20	44.60	43.50
T_{MB1}*S	46.40	46.00	46.00	45.60
S_T	43.00	42.80	42.50	42.80
T_{MB1}* S_T	46.00	46.00	46.60	46.40
S_T*S	44.00	43.50	43.00	42.60
T_{MB1}*S* S_T	45.00	45.00	45.80	45.20

We should go our hypothesis assumptions is: (1) T_{MB1} will have no significant effect on yield. (2) S will have no significant effect on yield (3) S_T will have no significant effect on yield (4) T_{MB1} & S_T will have no significant effect on yield (5) T_{MB1} & S will have no significant effect on yield (6) S & S_T will have no significant effect on yield (7) T_{MB1}, S & S_T will have no significant effect on yield. By ANOVA analysis, if there is no significant effect on yield i.e., significant value or p-value>0.05 then the hypothesis is accepted. When significant value or p-value<0.05 then the hypothesis is rejected i.e., our hypothesis is null which mean that our result is significant

Click the model button and there would be presented as shown in Figure 5

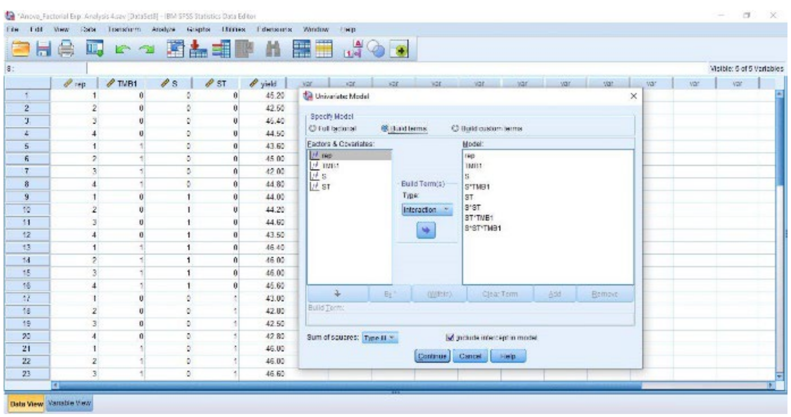

Fig. 5 Transformation of variables in window

1.Click the Continue button we should be returned to the Univariate dialogue box.
2. Now click the OK button. This will generate the output.
3. It is important to say that, the simulation result except between-subjects' factors, descriptive statistics, levene's test of equality of error variances, test between subject effects.

5.1 Numerical Results

Test of between-subjects effects of independent variables:

The only column of the concern F column or F-ratio & the significance level is the p-value.

T_{MB1}

So, the 1st thing we discuss is the $T_{MB1.}$ So, the 1st factor is T_{MB1} and the p-value is 0.000 and of course has less than 0.05 which is the test probability less than 0.05 with 95% confidence level. So, we should be rejected null hypothesis for the 1st factor which is $T_{MB1.}$ There is a 0% chance of getting result random chance which is good shown in Table 5.2.

This p-value could be calculated from an analogue Table (5% & 1% significant Table).

S

The 2nd thing we discuss is the Stock capacity S. So, the 2nd factor is S and the p-value is 0.256 which is not very good. It is greater than 0.05 with 95% confidence level. So, we can reject the null hypothesis for the 2nd factor which is S.

S_T

The 4th factor of our examine is Servicing time S_T. Its p-value is 0.467 which is not very good. It is greater than 0.05. So, in this case we would fail to reject the null hypothesis.

Table 2 Test of between-subjects effects

Tests of Between-Subjects Effects

Dependent Variable: yield

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	44.193	10	4.419	6.870	.000	.766
Intercept	63323.508	1	63323.508	98437.154	.000	1.000
rep	.343	3	.114	.178	.910	.025
TMB1	23.290	1	23.290	36.205	.000	.633
S	.878	1	.878	1.365	.256	.061
TMB1 * S	.475	1	.475	.739	.400	.034
ST	.300	1	.300	.467	.502	.022
S * ST	2.703	1	2.703	4.202	.053	.167
TMB1 * ST	8.303	1	8.303	12.907	.002	.381
TMB1 * S * ST	7.900	1	7.900	12.281	.002	.369
Error	13.509	21	.643			
Total	63381.210	32				
Corrected Total	57.702	31				

T_{MB1} & S

So, the next factor we want to discuss the combination of two T_{MB1} & S. So, the interaction of T_{MB1} & S and the p-value of this interaction is 0.400. It is which is not very good. It is greater than 0.05. So, in this case we would fail to reject the null hypothesis.

T_{MB1} & S_T

The next factor we want to discuss the combination of two T_{MB1} & S_T. So, the interaction of T_{MB1} & S_T and the p-value of this interaction is 0.002. It is also less than 0.005. So, we would be rejected the null hypothesis for 3rd factor which is T_{MB1} & S_T. This is a 0.02% chance of getting result random chance which is good.

S & S_T

The next factor we want to discuss the combination of two S & S_T. So, the interaction of S & S_T and the p-value of this interaction is 0.053. It is also greater than 0.005. It is which is not very good. It is greater than 0.05. So, in this case we would fail to reject the null hypothesis.

T_{MB1}, S & S_T

So, the next factor we want to discuss the combination of two T_{MB1} & S. So, the interaction of T_{MB1} & S and the p-value of this interaction is 0.002. It is also less than 0.005. So, we would be rejected the null hypothesis for 3rd factor which is T_{MB1} & S. This is a 0.02% chance of getting result random chance which is good.

5.2 Graphical Results

Descriptive statistics of independent variables

Table 1 indicates how much way last in each group the month on 4 repetitions. The mean of estimate and descriptive statistics is not found in same. It is mainly due to that, in the descriptive statistics, the mean is found by dividing the summation. In the other hand, the mean of estimate is considered on the based upon the sample size.

Estimate marginal means (T_{MB1})

T_{MB1} at 0 is 43.80 ton/day
And T_{MB1} at 1 is 45.50 ton/day.

T_{MB1} is an independent variable which is random probability of distribution of production time. We need to analyze the main effect of this independent variable, where our dependent variable is prod/yield.

Profile plot is given in Figure 5.1. The graph presents the information of production on the estimated marginal means (tons/day) with respect to 4 repetitions (rep) (per unit) in estimated marginal means of yield in case of T_{MB1} (0 & 1).

It is briefly indicating that while production is going on, in case of T_{MB1} at 0, the estimated marginal means is 43.52 at repetition (rep) 1. The production sets also at repetition (rep) 2 the estimated marginal means is 43.52. The production is steady rise to reach approximately 43.63 at repetition (rep) 3. At repetition (rep) 4, the production felt steadily to reach approximately 43.57.

In case of T_{MB1} at 1, the estimated marginal means is 45.23 at re5petition (rep) 1. The production sets also at repetition (rep) 2 the estimated marginal means is 45.23. The production is steady rise to reach approximately 45.34 at repetition (rep) 3. At repetition (rep) 4, the production felt steadily to reach approximately 45.28 shown as in figure 6 .

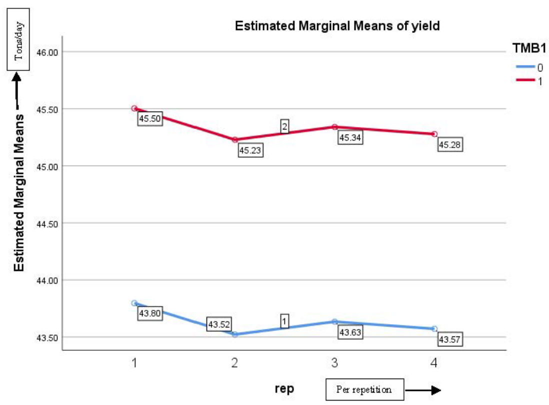

Fig. 6 Profile plot of T_{MB1} (in case of 0 & 1)

Estimate marginal means (S_T)

S_T at 1 is 44.55 ton/day

And S_T at 0 is 44.75 ton/day.

S_T is an independent variable which is random probability of distribution of production time.

Profile plot is given in Figure 5.2. The graph presents the information of production on the estimated marginal means (tons/day) with respect to 4 repetitions (rep) (per unit) in estimated marginal means of yield in case of T_{MB1} (0 & 1).

It is briefly indicating that while production is going on, in case of S_T at 1, the estimated marginal means is 44.28 at repetition (rep) 1. The production sets also at repetition (rep) 2 the estimated marginal means is 44.39. The production is steady rise to reach approximately 44.28 at repetition (rep) 3. At repetition (rep) 4, the production felt steadily to reach approximately 44.33.

In case of S_T at 0, the estimated marginal means is 44.47 at repetition (rep) 1. The production sets also at repetition (rep) 2 the estimated marginal means is 44.47. The production is steady rise to reach approximately 44.58 at repetition (rep) 3. At repetition (rep) 4, the production felt steadily to reach approximately 44.52 shown as in figure 7.

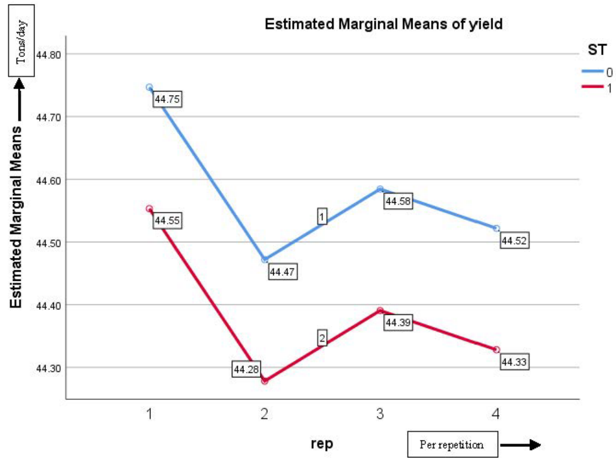

Fig. 7 Profile plot of S_T (in case of 0 & 1)

Estimate marginal means (S)
S at 0 is 44.48 ton/day
And S at 1 is 44.82 ton/day.

S is an independent variable which is buffer stock capacity. We need to analyze the main effect of this independent variable, where our dependent variable is prod/yield.

Profile plot of random servicing time S given in figure 5.3. The graph presents the information of production on the estimated marginal means (tons/day) with respect to 4 repetitions (rep) (per unit) in estimated marginal means of yield in case of buffer stock capacity S (0 & 1).

It is also indicating that while production is going on, in case of S at 0, the estimated marginal means is 44.21 at repetition (rep) 1. The production sets also at repetition (rep) 2 the estimated marginal means is 44.21. The production is steady rise to reach approximately 44.32 at repetition (rep) 3. At repetition (rep) 4, the production felt steadily to reach approximately 44.26.

In case of S at 1, the estimated marginal means is 44.54 at re5petition (rep) 1. The production sets also at repetition (rep) 2 the estimated marginal means is 44.54. The production is steady rise to reach approximately 44.65 at repetition (rep) 3. At repetition (rep) 4, the production felt steadily to reach approximately 44.59 shown as in figure 8.

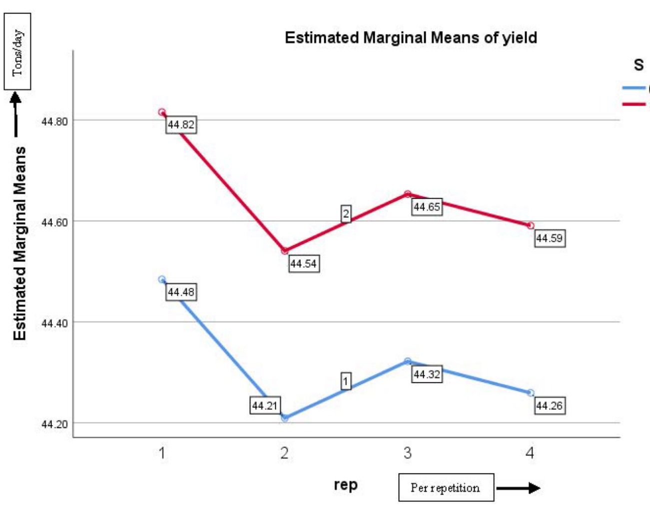

Fig. 8 Profile plot of S (in case of 0 & 1)

5.3 Proposed Improvements

Suggested for better arrangement in Fig. 2 to Fig. 4 according to information examination SPSS 23 is:
(a) To dissect significant free factors on a solitary item disappointment inclined assembling industry. (b) To check genuine information of the free factors on a solitary item disappointment inclined assembling industry. (c) To give another square substitution strategy/stock control strategy for disappointment inclined weighty assembling industry viewpoint Bangladesh. (d) To test the theory if there should arise an occurrence of free factors for 95% certainty level as to beneath 5% errors and so forth should be possible.

5.4 Validation

Stock control procedure for a singular machine, single thing creating industry has been depicted. The stock control procedure relies upon supporting point strategy, that allows the construction of a prosperity stock to fence against demand lacks during conclusion periods achieved by therapeutic and preventive activities.
(a) A general generation strategy has been seen to imitate the real unique and stochastic lead of the gathering industry. Offered model relaxes many adjusting and ludicrous speculations considered by a couple of makers in various responsibilities, for instance:
(b) (1) disappointment events are not allowed when fostering the finished stock; (2) the stock level is infrequent pace of occasional cycle; (3) healing and support exercises have immaterial delays; and (4) disregarded solicitations in view of need.

6. Conclusion

ANOVA analyses are carried out on the collected data, as presented in Table 4.1 for the MBRP/HPP is simulated by SPSS 26 version. Marginal mean of predicted value with collected data (production, tons/day) with respect to 4 no. repetition (per unit) with random duration is occurred at 0 & 1. Marginal mean of T_{MB1} at 0 is 43.80 and T_{MB1} at 1 is 45.50 is obtained. Similarly, marginal mean of S at 0 is 44.48 and S at 1 is 44.82. Similarly, marginal mean of S_T at 0 is 44.75 and S_T at 1 is 44.55 is also obtained. The marginal mean for these three independent variables is obtained in significant level, i.e., p-value>0.05

The model is satisfactory for 0.05% confidence level such as (1) Corrected model, at F (10,21) = 6.870, Significant, p =.000 (from Table 5.2) (2) Intercept, at F (1,21) = 98.437.154, Significant, p =.000 (from Table 5.2), (3) T_{MB1} at F (1,21) = 36.205, Significant, p =.000 (from Table 5.2), (4) T_{MB1} & S_T at F (1,21) = 12.907, Significant, p =.002 (from Table 5.2), (5) T_{MB1}, S & S_T at F (1,21) = 12.281, Significant, p=.002 (from Table 2).

The model does not satisfy for 0.05% confidence level such as (1) rep at F(3,21) = 0.178, Significant, p =0.910 (>0.05) (from Table 5.2) (2) S at F(1,21) =1.365, Significant, p = 0.256 (>0.05) (from Table 5.2), (3) T_{MB1} & S at F(1,21) = 0.739, Significant, p = 0.400 (>0.05) (from Table 5.2), (4) S_T at F(1,21) = 0.467, Significant, p = 0.502 (>0.05) (from Table 5.2), (5) S & S_T at F(1,21) = 4.202, Significant, p = 0.053 (>0.05) (from Table 2)

These result means that our three independent variables with respect to production are not significant at all. The interaction effects Corrected model, Intercept, T_{MB1}, T_{MB1} & $S_{T,}$ T_{MB1}, S & S_T which are significant. So, random servicing time for modified block replacement policy (MBRP) is satisfactory i.e., significant for applying beneficial advantages. So, our three estimated independent variables are significant in term of Alpha level in term of 95% confidence level i.e., 0.05 level.

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Biographies

Md. Tazul Islam received the B.Sc. and M.Sc. degrees in Mechanical engineering from the Bangladesh University of Engineering and Technology (BUET), Dhaka in 1982 and 1986 respectively. He has done the Ph.D. degree from Bangladesh University of Engineering and Technology (BUET), Dhaka, Bangladesh in 1995. Now he has been a faculty member as a **Professor** with the Mechanical Engineering Department, Chittagong University of Engineering and Technology. His research interest includes Fluid mechanics and Machinery, Renewable energy and Refrigeration and Air Conditioning.

Sajal Chandra Banik received the B.Sc. degree in Mechanical engineering from the Bangladesh University of Engineering and Technology (BUET) in 1998 and received the M.Sc. degree in Mechatronics from Germany in 2005. He has done the Ph.D. degree in Robotics & AI from Japan in 2009. Now he has been a faculty member as a **Professor** with the Mechanical Engineering Department, Chittagong University of Engineering and Technology. His research interest includes Design and development of structures and models Computer related calculations and programming, Machine learning and interaction, Logistic system Biorobotics, Cognitive robots, Multiagent robotic system.

Md. Sanaul Rabbi was born in Rangpur city, Bangladesh, in 1985. He received the B.Sc. and M.Sc. degrees in Mechanical engineering from the Chittagong University of Engineering and Technology, Chattogram, in 2008 and 2013 respectively. He has done the Ph.D. degree in NDT from Saga University, Japan, in 2018. From 2017 to 2018, Mr. Rabbi was a visiting researcher with the "Ulterasonic Laboratory". Since 2008, he has been a faculty member as an **Professor** with the Mechanical Engineering Department, Chittagong University of Engineering and Technology. His research interest includes non-destructive evaluation & testing, composite materials, structural health monitoring, control engineering, industrial automation, production & operations management.

Anupom Barua was born in Boalkhali near the Chattogram city, Bangladesh, in 1987. He received the B.Sc. and M.Sc. degrees in Mechanical engineering from the Chittagong University of Engineering and Technology, Chattogram, in 2009 and 2016 respectively. From 2009 to 2011, he worked as an Assistant Engineer (Maintenance) at T.K Chemical Complex Ltd. (Paper Unit) in Kalurghat Heavy I/A, Chattogram. He also worked as a Research Assistant in Mechanical engineering department at CUET from 2012 to 2016. Since 2019, he has been a Ph.D. student with the Mechanical Engineering Department, Chittagong University of Engineering and Technology. His research interest includes Operation Research, Advanced industrial management, Computer methods in industrial engineering, Fundamentals of management of technology, Economic principles and engineering economy, Production & operations management, Project management, Human resources management.