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RESEARCH ARTICLE

A STUDY OF WASTE MANANAGEMENT OF DAMAGED CAR/ AUTO VEHICLE THOSE DUMPED IN WAREHOUSES THROUGH PRODUCTION LINE AND DEVELOP THE FORMULA FOR PRODUCTION RATE AND COST ESTIMATION

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ABSTRACT

This study shows that how we clean the covered land area from old/damaged car/ auto vehicle. We develop the dis assembly line to remove the auto parts from the cars/ auto vehicles and if it is recycle and reuse we recycle and reuse and if it is not recycle or reuse we dumped it properly into the earth. We also developed the formula to find out the disassembly rate and cost estimation formula to find out the this strategy is profitable or not

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INTRODUCTION

Now a day, the world face a huge problem to dumped the old cars/ auto vehicle when it is not working or damaged in an open environment or covered area. These occupied by the huge land area. That's been occurred environmental pollution (soil pollution) and occupied the space. These occupied area have in big cities therefore it capital cost is more. Therefore our aim is to give the solution to clean the land area for other beneficial purpose. Therefore this study shows that how we disassemble the old car/ auto vehicle to useful for human beings and also clean the ware houses for other storage work. We do the dis-assemblies of these cars/ auto vehicle in a predetermine assembly line(production line). and then find out which component is useful and which component are useful after heat treatment or small manufacturing works (recycle it) and which components are totally damaged or not utilized again. (If the components are not recycled then we dumped it properly). This study done in three phases (Mohammad Tarique Jamali, 2017; Mohammad Tarique Jamali, 2017; Mohammad Tarique Jamali, 2017; Mohammad Tarique Jamali, 2017).

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We create a disassembly production line in sequence of components of auto vehicle/car to be disassembled. And also give the coding of components of auto vehicle/car this coding is useful for making automatic production line using robots.
1-We develop a formula to calculate the disassembly production rate (we say disassembly rates of auto vehicle/car) when the set up time, operation time, batch size is known. We develop the formula to estimate the cost for component to be disassembled and recycle cost. And find out the profit/ loss from this disassembly and making new product/ or dumped damaged car/ auto vehicle.

First we describe some important terms: Coding of the component- every car /auto vehicle has many components. Which are assembled to form new car/ auto-vehicle? When we disassembled it we give the abbreviations form of these components or other engineering coding is called coding of the components.

Set up time: When the man or robots are loaded tool in the machine in the work station where dis assembly of the components occurred before the operation (working process on the components), the time is called set up time.

Operation time: When we process in the components through the machine, the time taken by the particular operation is called operation time.

Non operation time- When the dis assembly production line is not working is called non operation time. For example the factory work 10 hours in disassembly production line and 14 hours the disassembly production line is not working. Those 14 hours is called non operation time.

Production Rate: Number of cars/auto-vehicles processed in production line in time (minute, hours, day, month etc.) from input to output. Disassembly Production Rate- Number of damaged car/auto vehicles are disassembled in a production line in a time (minutes, hours or day) from input to output in production line.

Robotic Arm: A arm controlled by microprocessor/or computer software is called robotic arm.

Ware houses: Warehouses is a covered or uncovered land area where the damaged car/auto vehicle are stored.

Dis-assembly lead time: When the total time of processing in a disassembly production line, a batch of auto vehicles/car is called disassembly lead time.

Automation: When the assembly line/ production line control by the computer software (computer integrated manufacturing) is called automatic. For example Computer Numeric Control,Direct Numeric Control etc.

Fixed cost: The costs spend/earn in a dis-assembly production line and recycle (manufacturing of the other product) is fixed, called fixed cost. For example capital cost (land cost), direct labor cost etc.

Variable cost: The costs spend/earn in a dis-assembly production line and recycle (manufacturing of the other product) is not fixed, called fixed cost.For example indirect labor cost, office cost etc.

In first study we make an assembly line to dis-assemble the all the component of old car/ auto vehicle in a sequence. First, we dis-assemble the component like tires, wheel rim, upper body of car like doors, windscreen, roofs etc. chassis (axle ”live /rare” , shock absorber mufflers, fuel tanks etc.) , Steering assembly, , car engine, engine fan, piston, battery , radiator, clutches , fuel injector, transmission, air filters, catalytic converters, alternators , AC compressor, spark plug, brakes , pressure gauge etc. after disassembly the component of car we store in the as an out- put / storage. Then we examine the component is good / semi damaged or damaged. If the component is good than put in one store, reuse in other car/ auto vehicle. For semi damaged or damaged components, processing done by heat treatment and machining. If the component are damaged and material is iron/ tin sheet then melted it make new iron/tin sheet. And reuse it for making another product.

In second phase study, we develop the dis-assembly production rate formula on the basis of production line analysis and calculate the disassembly production rate, disassembly lead time. This formula and calculation is useful for designing the new disassembly production line of a damaged car/ auto vehicles. And these random data is also useful for setting the robotic arm to operate the disassembly of the damaged car / auto vehicle and also develop the software for microprocessor in disassembly production line to clean the warehouses (open space) where the damaged car/ auto vehicle are stored without usage. We develop a strategy to clean the environment and reduce the burden on costly land area in big cities. Therefore we dis assemble it and recycle it through an assembly line / production line. Therefore dis - assembly Production line designer required to design a disassembly production line robotic arms, who automatically disassemble the damaged cars/ auto vehicle. Here we formulate and analyze the disassemble production rate. We design a disassembly production line which are helpful for the designer to make the software for microprocessor of robotic arm which perfectly (automatically) remove the damaged car/ auto vehicle component and put in a separate storage where manufacturer examine which parts/component is recycle or reuse. Here we develop a formula to calculate the disassemble production rate and disassemble lead time using the production rate philosophy.

In third stage we develop the strategy to find out the profit or loss from this methodology we say that cost estimation. Cost analysis is very important for any development of the new methodology if this is profitable we adopt it if loss is more then we modify our analysis. Therefore in this study we estimate the dis-assembly cost for damaged car/ auto vehicles/ old car and find out the profit or loss occur. Here we set all the cost in random variable and found the profit because in bigger city the capital cost is more. we face a lot of problem to staying old /damaged car/auto-vehicle in every big city at warehouses. Therefore cleanliness of ware houses is necessary from old/damaged car / auto-vehicle in cities.

Development of dis-assembly line and disassemble the auto vehicle we do expenditure for this work. For reuse or recycling the components by manufacturing or heat treatment process we also do the expenditure. After making new product / reuse of component to sell it we earn money and the escape of land area (as a ware house of old vehicle) we also release the money. For anyexpenditure of money and earning of money have a fixed cost and variable cost. For profit Expenditure is less than earning money while loss expenditure is more than earning money. In this research paper we analyses if reprocessing the damaged /old car / auto-vehicle in disassembly production line, the process is beneficial for the industries or not for the money point of view. Here for expenditure, the fixed cost are land area where the disassembly production line is set and disassembly production line development etc. while the variable cost is removing the auto components in disassembly line, office cost, labor cost, manufacturing cost , heat treatment cost etc. For earning money , fixed cost are release land area by damaged /old car/auto-vehicle and the variable cost are reselling the new recycles components component of auto vehicle or making other product selling. Here we develop the formula to understand the particular process is beneficial for us or not.

Literature Review: In the past Industrial Engineers are designing the Production line on the basis of paced production line and un-paced production. They will give strategies of higher production rates or bowl phenomenon or critical bowl phenomenon to achieve it. Here we design the disassembly production line through priority of work not see the production line rate is maximum disassembly production rates or minimum disassembly production rate. Here our objective is to clean the warehouses (soil environment) from damaged car/ auto vehicles because the cost of land area covered by warehouses are very high. We give the idea of disassembly production rate and cost analysis of disassembly production line design. We see it is profitable or not.

Therefore here we give some researchers who give the idea of balancing and unbalancing of production line to find out the production rate or arrangement of production rates in any sequences, emphasis only two find out production rates.

Hillier and Boling (1966) showed that an un-paced line, with exponentially distributed operation times (workload distribution or operation time in work station) deliberately unbalanced in a particular way in a production line gave production rate was higher than the balanced line. They show that if end stations were assign higher workload distribution (higher mean operation time) and middle station are assigned less workload distribution (less operation time)the production rate may be improved over that of the balanced line. They called it bowl phenomenon. Hillier and So (1993) also found specific values for proportions of work to assigned to various stations in order to achieve the maximum production rate in different ways and achieved the bowl phenomenon to large production line system. Beg, (1996) showed that apart from an optimal bowl which gives highest production rate, there exists another scheme of a line arrangement which even more imbalances that gives production rate equal to that of the balanced line. They called it a critical bowl. Mohammad Tarique Jamali, (2002) developed the mathematical modeling of arrangement of workload distribution (mean operation time) of 5- workstation to find the effect of imbalance on the performance of un-paced production line.

Ahmad Nafel Adnanet al. (2016) Shows optimal efficiency improvement of automatic jack assembly production line balancing in AutokeenSdn. Bhd. (AKSB). They implements lean manufacturing to regulate works on floor has increase the production line performance. They rearrange the parts, eliminating unnecessary activities of the assembly process ,reducing the cycle time, and balancing the man power workload using line balancing through Yamazumi chart and talk time. They proved production line efficiency and current system value. In this system they not utilize the buffer storage system.

Waldemar Grezechca (2014) say that line balancing is the most important topic in manufacturing system from 1955 a lot of exact and heuristic methods are applied in industries. Despite of methods (exact or heuristics) a good performance a good criteria allow production engineer to choose the most appropriate method the quality measure or optimal solution of the balanced line includes idle times. The most well-known measure is line efficiency, smoothness index and time of line. They interpreted a formula of cycle time and maximum station load (operation time).They also give a relation between line structures and their measures of final balance process.

Yasir, (2017) showed the efficiency of the assembly line and production performance. They have main objective is to design a new alternatives plants layout and evaluation of proposed alternatives automatic layouts using systematic layout planning procedure. This research managed to provide better understanding and valuable information on the effectiveness of plant layout, which can give impact on performance of the production. They recommend improving the plant layout in order to provide a better performance in production actively and product quality. Jamali, A.Suhail and So (2015) found the The Effect of Imbalance on the Performance of Un-paced Production Line – A Mathematical Modeling Approach. In this study a five station un-paced production line with exponentially distributed operation time with no buffer capacities is consider. A practical situation where five operation times are to be assigned on five stations is investigated. Assuming that precedence restriction is minimal the operation can be permitted on stations. A number of data set with different kind of imbalance and with different degree of imbalance have been used for arriving at important conclusions. Operations on the production rate of the line are studied. This result in 60 different assignment operations on stations. The effect of such ordering on production rate is studied by calculating the percent improvement in production rate that is possible by following the best assignment over that with worst assignment. It is seen that the effect is highly significant at moderate degree of imbalance. Jamali , Prof. Arif. Suhail (2015) also see the effect of imbalance on the performance of production line when the optimal bowl is known. They conclude that the lower degree of closeness to optimal bowl have a better production rate as compare to higher degree of closeness. This relation is not perfect but fairly well in lower degree of imbalance. Jamali, Prof. ArifSuhail (2016) also sees the Effect of imbalance on the performance of un-paced production line when the optimal bowl is unknown. In this we develop a strategy for work load distribution (operation time) in production line to give the best production rate.

Pedro B. Castellucci, (2014) also see a new Look at the bowl phenomenon. This study shows the assembly line with the integer task times. For this purpose the designer modified the simple assembly line balancing problem and assembly line worker assignment in order to generate configuration exhibiting the desired format. This study was used in a simulation model to verify that the efficiency of the times could be improved if they are slightly imbalanced.

Denny J. Johnson (1999) there emphasis on short product delivery lead times and customized products configuration. They develop system those are quickly assemble small batches. While some plants are converting there assembly lines to assembly cells to achieve this goals. This result adds to sparse body of literatures on this area by examining the planned conversion of assembly line to set of parallel assembly cells in real plants. Analytical and simulation models are used to explain why the proposed cells are expected to outperform the current assembly line. Tom. Mc Namara et al. (2011) Find the un-paced production line with three simultaneous imbalance Sources. He Investigate the performance of un-paced reliable production line that are unbalanced in terms of their mean operation times, coefficient of variation and buffer capacities. Dariabattini et al. (2011) Find the New Method frame work to improve productivity and ergonomics in assembly system design. This work analyses how ergonomics and assembly system design techniques are intimately related. It also develops a new theoretical framework to assess a concurrent engineering approach to assembly systems design problems, in conjunction with an ergonomics optimization of the workplace. Its purpose is to provide professionals with a new and detailed approach to assembly system design procedures that includes ergonomics issues.

The methodological framework offered takes into account technological variables (related to work times and methods), environmental variables (i.e. absenteeism, staff turnover, work force motivation) and ergonomics evaluations (i.e. human diversity) to create a comprehensive analysis. At conclusion of the study, the work reports data and insights from two real industrial cases, where advanced simulation software is used, to validate the procedure and support methodology applicability.

Violetta Giada Cannanas et al. (2015) showed real life problem in assembly line. The aim of this work is to outline a methodology applicable to the industrial context. They managing a high number of different components and material and assure the correct line balancing to gain performance improvements assembly line and over time. They give methodology to reduce the complexity proposed and applied to reduce complexity, identify groups of components, job elements and cycle time. It utilize the kaizan assembly and lean manufacturing techniques. This allows a chocolate company to achieve the performance objective and to maintain changes steady over time confirming the validity of the approach.

Pablo Cartes et al. (2014) Give a case study on Motorcycle Manufacturing Company. They optimized and simulated the assembly line balancing problem. They compared the initial situation to heuristic methodology and by a neighborhood search method. They use ARENA software to develop different proposal. The model is validated by comparing the simulation results from the initial company scenario with the real operation results. The company has subsequently implemented their purposed schedule, obtaining remarkable improvements in productivity.

Dariabattini et al. (2008) Founds line balancing –sequencing procedure for a mixed model assembly system in case of finite buffer capacity. They make production more versatile and flexible has forced assembly line production system to change from fixed assembly line to mixed model assembly line where the output products are variation of the same base and only differ in specific customizable attributes. Thigo cantos lopes, lenardromagato and so (2016) find the buffer and cyclical sequences aware assembly line balancing problem model and steady state balancing**.** Mohammad Tarique Jamali, (2017) find assembly line methodology to the Waste management of damaged cars/ auto vehicle whose dumped in the warehouses (open Environment).Here We do the dis-assemblies of these cars in a predetermine assembly line. and then find out which component is useful and which component are useful after heat treatment or small manufacturing works and which components are totally damaged or not utilized again. (we dumped it properly).

Mohammad Tarique Jamali (2017) find a methodology which is very beneficial for making software to calculate The dis-assembly rate by using the production rate philosophy of a damaged cars/ auto vehicle whose dumped in the warehouses (A waste management philosophy) . In this study we develop the dis-assembly production rate formula on the basis of production line analysis and calculate the disassembly production rate as well as disassembly lead time. This formula and calculation is useful for designing the new disassembly production line of a damaged car/ auto vehicles. And these random data is also useful for setting the robotic arm to operate the disassembly the damaged car / auto vehicle and also develop the software for microprocessor in disassembly production line to clean the warehouses (open space) where the damaged car/ auto vehicle are stored without usage.

Mohammad TariqueJamali (2017) find how to make software To estimate The dis-assembly cost and profit / loss occur when of a damaged cars/ auto vehicle components are dumped or reuse after remanufacturing / or not . (waste management philosophy) . Cost analysis is very important for any development of the new methodology if this is profitable we adopt it . Therefore in this study we estimate the dis-assembly cost for damaged car/ auto vehicles/ old car and find out the profit or loss occur. Here we set all the cost in random variable and found the profit because in bigger city the capital cost is more . we face a lot of problem to staying old /damaged car/auto-vehicle in every big city at warehouses. Therefore cleanliness of ware houses is necessary from old/damaged car / auto-vehicle in cities.

MichaellJ.Magzine Kathrene E stake (1995) find throughput for production line with serial workstation and parallel service facilities. This study shows un-paced serial production lines with parallel service facility are examine in order to determine how their output rates may be improved through the manipulation of various design variable such as the allocation of facilities to station, allocation of work load to station and placement of buffer between station. From many empirical investigation is utilize to make observation and formulate conjunctures about the maximizing configuration for production line which have multiple service facility and finite buffers at each of several workstation in series .it provide the knowledge of equipment acquisition decision during design of manufacturing System. Carl E. Betterton, James F Cox III (2012) shows the Production rates of synchronous transfer lines using Monte Carlo simulation. Here un-paced synchronous transfer lines providing a single product. The transfer line station are arranged in series configuration have no buffer and are subject to operation dependent failure. Here Monte Carlo simulation to be a fast, flexible, easy and accurate Method of estimating throughput in line of any length and having a wide range of operating characteristics.

Arun B Rane, (2017) give vehicle assembly line approach. They say that auto mobile sector is a backbone of manufacturing sector. They studied automobile plants where repetitive task are performed one after another at different workstation. In this they give a methodology to reduce cycle time and time loss due to important factors like equipment's failure, shortage of inventory, absenteeism, set up , material handling, rejection and fatigue to improve output within given cost constraints. They give scientific approach to validate these factors, corresponding cost and output to optimize assembly line. Carl E. Betterton, (2009) shows Espoused drum Buffer – rope flow comfort in serial lines A comparative study of simulation model. This study documents an investigation of drum-buffer- rope(DBR) scheduling and Flow control methodology in single –product serial production lines. DBR Flow control is reviewed and importance of correctly representing this type of flow control mechanism in serial line is discussed departure from valid DBR conceptual and Simulation modeling is illustrated. Seonmin Kim , K Roskoe Devis (2003) this study show An investigation of output flow control, bottleneck flow control mechanism in various simple lines scenario.

Flow control mechanism have been a business wide information system such as enterprise resources planning and supply chain, better planning and scheduling and control of the business transformation process is required in order to achieve increase through put, reduced inventory , shorter lead times and reduced tardiness. **Mahesh C Gupta, et al. (2002)** This study shows the TOC – based performance measures and five focusing steps in job shop manufacturing Environment. Theory of constraints (TOC) views a company as a set of interdependent processes working hormone to achieve the profit goal of company as a whole and this at emphasizes total system performance over localized measure to guide operational decision. This demonstrate the usefulness of employing TOC based global performance measure to make operational decisions(e.g. product mix , continuous improvement inventory management, production planning and scheduling) to strengthen the internal supply chain in relatively complex environment. Here an ARENA based Simulation model is presented Seonmin Kim et al. (2003).

They Investigation of flow mechanism in semi-conductor Wafer Fabrication. The Semi-conductor wafer Environment Fabrication manufacturing Environment is one of the most difficult in which to plan and control . Long and Re-entrant routing and high yield loss on new product are two characteristics that impact system performance. This study investigate two simplified flow control mechanism to determine if they offer promise in this complex environment. Most scheduling and control system are data investigation and required time feedback. The result indicates that these newer planning and control mechanism which offer a system prospective perform well when compared with a real time, data intensive, flow control mechanism. Dannis E Blumenfeld, (2005) shows An analytical formula for throughput of a production line with identical station and random failure. The derivation is based on equation developed for a line flow model that takes into account the impact of finite buffer between work stations. The formula applies in the special case of a line with identical workstation and buffer of equal size. It is closed from expression that shows the mathematical relationship between the system parameter, that can be used to gain basic insight into the system behavior at initial design state.

Shaaban and T Mcnamara (2011) Improving The Efficiency of Un-paced Production Line by unbalancing service time mean. They investigate the benefits of deliberately unbalancing operation time means for non-automated production time . The lines were simulated under the steady state condition, with various values of time length, buffer storage size degree of imbalance and patterns of imbalance. The primary measure of efficiency was idle time and average buffer level. Output data were analyzed using a set of statistical method to the ranking of configuration and independent design parameter and dependent variable and found bowl arrangement and monotone decreasing order. Buxey, 2007 Shows Production flow line Design – A review. This problem associated with the design and operational manual production flow line systems are identified and discussed. Research finding and currently available techniques are examined in a light of these problem and nature of both past and present is critically examined in an attempt to develop strategies for future work. Naveen Kumar , (2013) found the Assembly line balancing –A review of developments and trends in approach to industrial application. Assembly line balancing is to Know how task are to be assign to work station , so that the predetermine goal is achieved. Minimization of the number of workstation and maximization of the production rate are the most common goal. This study present the review of different works in area of assembly line balancing and tries to find out latest development and trends available in industries in order to minimize the total equipment cost and number of workstation. Mohammad TariqueJamali (2017) Environmental Engineering book shows the fundamental project book and give the philosophy to clean the environments through new and old methodology . Give the research methodology of waste management of solid, waste water managements, water harvesting and to clean the air effectively. When through waste water management and agriculture waste produce biogas and biomass energy. If this philosophy are utilize we clean the environment and also produce the energy and convert it into electrical energy and also found the natural fertilizers we say it manure.

Jiltusharsheth, (2016) shows the study of waste managements in Ahmedabad generate 4000 metric tons of waste daily. They say that MSW comprises of more than 50% of organic waste rest are electronic and other solid waste. The organic waste are recycle makes manure (natural fertilizers) making biomass gas etc. but the solid waste like industrial scrap, autovehicle /car and other metallic waste are a big problem they does not studied. Odile Schwarz-Herion (2008) say that solid wastes constitutes a growing problem and every year it is increasing. They say that the solid wastes are categorized as residual waste bin, recyclable waste bin and bio waste. They say that recyclable waste are industrial solid waste like aluminum copper, ferrous like metals whose are dumped in after use or a scrap from industries. In present study shows to clean the environments (soil pollution) occupied by the waste or damaged car/ auto vehicle those dumped in warehouses. These dumped cars are clean through strategies called dis assembly production line. This disassembly production line is arranged in a systematic way we say it priority of component to be disassembled. We also develop the disassembly production rate formula and cost estimations and see that this strategy is profitable or not.

Objective of Present work

Following are the objective of our work. These are given below

- To clean the land area (warehouses) occupied by the damaged car/ auto vehicle through assembly line.
- To use the systematic approach to disassembled the cars/auto vehicles through robotics arms and production line .Therefore we give the random values of set up time and operation time.
- To observe set up time and operation time data are chosen from through manual dis assembly by the skilled worker and then this time are set in the automatic machine and robotic arm microprocessor.
- To give the coding of the disassembled the components. This coding is helpful for making computer software and utilize as computer numeric control manufacturing, direct numeric control and computer integrated manufacturing.
- To develop the formula for disassembly production rates for disassembled the damaged car/auto vehicles

when the set up time, operation time, non-operation time and lot size (batch size) is known.

- To observe some components are fully damaged it is dumped properly and some components are small damaged and recycle it and reuse is other purpose or new cars/ auto vehicle after heat treatment or manufacturing process / casting process.
- To estimates the cost of disassembly of the components, dumped, recycle, manufacturing, heat treatments and costing and also making a disassembly line.
- To estimates cost of rescue of land area covered by the damaged of auto vehicle/car, sell of recycle components.
- To develop the formula for profit or loss by this cost estimation of this strategy.

MATERIALS AND METHODS

In first phase (Mohammad Tarique Jamali, 2017) here we take a batch of 100 damaged car/ auto vehicle. Disassemble by an assembly/ production line as that manner the coding are given for utilizing the robotics arm. We take one by one car as an input then make a coding. These are For wheels of car D1 means disassembly of car wheels. They have nearly two major components these are

D11- Disassemble tire, D12- Disassemble rim. For storage we tire and rim we say that SD11 for disassemble tire, SD12 for disassemble rim. Examine this if good use it another car if damages recycle the rubber tire and recast the Al alloy rim

For car Body

D2 – disassemble the car body. D21- disassemble the car wind screen, doors , D22- disassemble the car roofs. SD21- storage for door sheets and fibers wind screen. SD22- Storage for roof (tin sheet or Al Alloy sheet). Examine this if good use it another car if fiber glass is damaged then dumped it. For Al Alloy or tin sheet we recast it or give small heat treatment and other manufacturing process.

For chassis. D3- disassemble the chassis. D31- disassemble the rare axle, D32- disassemble the live axle, D33- disassemble the shock absorber, D34- disassemble the muffler, D35- disassemble the Fuel tank. Similarly for storage. SD31- storage of the rare axle, SD32- storage of the live axle. SD33- storage of the shock absorber, SD34- storage of the muffler. SD35- storage of the Fuel tank. Similarly if the component is good reuse another car and if damaged recast or recycle it.

For Car Engine. D4 – disassemble the car Engine. D41- disassemble the Engine Fan, D42- disassemble the piston. D43- disassemble the transmission assembly, D44- disassemble the Battery. D45- disassemble the Fuel injector , D46 - disassemble the radiator.Similarly for storageSD31- storage of Engine fan, SD32- storage of the piston SD33- storage of the transmission assembly, SD34- storage of the radiatorD35- storage of the Fuel Injector Similarly if the component is good reuse another car and if damaged recast or recycle it. Similarly For car Accessories D5 – disassemble car Accessories. D51, D52, D53, D54, D55, D56 for disassemble the steering assembly, brakes, pressure gauge, clutches, spark plug, and an alternator respectively.

And for storageSD51, SD52, SD53, SD54, SD55, SD56 for the storage of steering assembly, brakes, pressure gauge, clutches, spark plug, alternator respectively. Similarly if the component is good reuse another car and if damaged recast or recycle it. We draw a propose disassembly (Assembly/ Production line) here. For a sequence given above in coding for robotics arm

The Example of assembly line of a disassembled caris as fallows

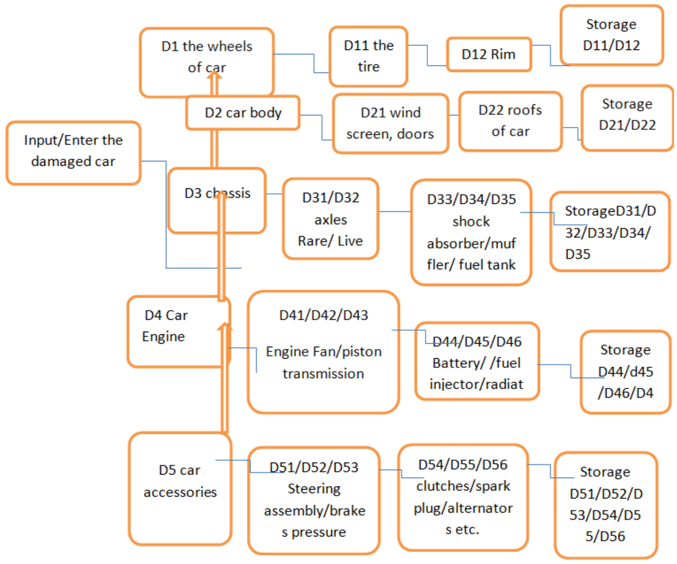

Figure of assembly line of a disassembled car /auto vehicle

In second phase study here in a dis -assemble production line we take the batch size of 100 damaged cars / auto vehicle to dis -assemble it. For calculating the dis-assemble rate we developeda simple formula. The strategy as fallows. Here we know that t there are five major component and other are assumed to be subcomponents of a damaged cars / auto vehicle to dis- assembled them by a robotic arm [1,9,17].These are shown below in a tabular form to calculate the set up time in hours (h) and operation time in (h). We use the abbreviation for set up time for dis-as assemble part is STD $_{ij}$and for operation time disassembles part is OTD $_{ij}$ where i for main components for damaged car/auto vehicle and j for sub component of that main component. Then we know that from tabulated values occur in this study

The Disassemble Lead Time = DLT. Total Number of Dis assembled component = $\Sigma Di + \Sigma D_{ij}$

Damaged Car / auto vehicle Batch size = DB. Non- operation time of robotic Arm of disassemble the component are = T_{nop} Therefore we formulate the disassemble lead time as on the basis of production rate formula by an assembly line/ production line.

$$DLT = ((\Sigma Di + \Sigma D_{ij}) (T_{STDU} + DB \times T_{OTDU} + T_{nop}))$$

Disassemble production rate (R_{Pd}) when emphasis given to the component D3

First we calculate operation time rate 3 say T_{pd}

$$T_{pd} = (T3_{SU} + DB \times T3_{AV} + T_{nop}) / DB$$

We Know that

$R_{pd} = 1/ T_{pd}$

In third phase (Mohammad Tarique Jamali, 2017) For calculating the dis-assemble (disassembly production line and recycling the components etc.) expenditure cost and earning money for releasing the land area and recycles the components reselling. Here we know that there are five major component and other are assumed to be subcomponents of a damaged cars / auto vehicle to dis- assembled them by a robotic arm [17, 18]. These are shown below in a tabular form to calculate fixed cost and variable cost of all of these disassemble components expenditure and also calculate the earn money for all these components as for fixed cost and variable cost. We do the coding for this this is helpful for making software (computer Program) to calculate the profit or loss.

These are calculated in tabulating form: For expenditure, the fixed cost are Land area and development of disassembly production line we say that it is capital cost. It will be assume that for 10 years here we calculate the fixed cost for every 100 (batch) Damaged Car/ auto vehicle. Earning fixed cost for rescue land are also calculate for every 100 (batch) damaged cars/ auto vehicle.
For variable cost we say that

Variable cost of the components (VCC) are equal to Components disassembly cost (CDC) + Labor cost (LC) +Manufacturing cost /heat treatment cost (MHC) + Miscellaneous Cost (MC). Miscellaneous Cost (MC) are that the cost are not fully defined but it is used in expenditure like stationery for office work, maintenance cost and office cost etc.

Therefore we say that

VCC = CDC+ LC+MHC+MC

EVCC (Earning Variable Component Cost) = Selling cost of the components = $\Sigma D_{ij} SC$

For first main component D1 means disassembly of car wheels which have suppose two sub components like D11- Disassemble tire, D12- Disassemble rim from damaged car / auto vehicle therefore D11 CDC means disassemble tire cost, D11 LC means disassemble tire labor cost vice versa in a tabulated form.Here each component are in tabulated form. This tabulated form easy for calculation as well as making software.

Therefore we develop the strategies to calculate variable cost of expenditure in damaged /old car/ Auto vehicle disassembly is

Variable components Cost (VCC) = $\Sigma V D_i + (\Sigma V D_{ij} 1 + \Sigma V D_{ij} 2 + \Sigma V D_{ij} 3 + \Sigma V D_{ij} 4 + \Sigma V D_{ij} 5)$

For batch production car are assumed to be 100 therefore VDC are . Variable component Cost (VCC) = $100 X (\Sigma V D_i + (\Sigma V D_{ij} 1 + \Sigma V D_{ij} 2 + \Sigma V D_{ij} 3 + \Sigma V D_{ij} 4 + \Sigma V D_{ij}5))$

Similarly for earning variable cost for 100 (assumed for batch production) cars

Earning variable Component cost (EVCC) = 100 x (sum of all the selling components cost)

EVCC = $100X (\Sigma EV D_{ij} 1 + \Sigma EV D_{ij} 2 + \Sigma EV D_{ij} 3 + \Sigma EV D_{ij} 4 + \Sigma EV D_{ij} 5)$

Fixed for Expenditure are

Expenditure Fixed cost (EFC) = Capital cost (Land cost) + Development of disassembly line cost. But for earning Fixed cost = Rescue Land area by the Damaged /old cars / auto vehicles

= Capital cost (CC)

Therefore

Profit or loss = ((Capital cost (CC) + Earning variable Component cost EVCC) – (Expenditure Fixed cost (EFC)+ Expenditure variable Component cost (VCC))). Profit or loss = ((CC + EVCC) - (VCC + EFC))

If the expenditure is more than the earning loss occur. If the expenditure is less than the earning profit occur

RESULTS AND DISCUSSION

The design of assembly line of Disassemble Production rate is given above. Here in a dis -assemble production line we take the batch size of 100 damaged cars / auto vehicle to dis - assemble it. For calculating the dis-assemble rate we developed a simple formula. The strategy as fallows Here we know that t there are five major component and other are assumed to be subcomponents of a damaged cars / auto vehicle to dis- assembled them by a robotic arm [17].These are shown below in a tabular form to calculate the set up time in hours (h) and operation time in (h). we use the abbreviation for set up time for dis-assemble part is $STD_{ij}$and for operation time disassemble part is OTD_{ij} where i for main components for damaged car/auto vehicle and j for sub component of that main component.

The tables are given below: For first main component D1 means disassembly of car wheels which have suppose two sub component like D11- Disassemble tire, D12- Disassemble rim from damaged car / auto vehicle.

Table 1. Disassembly of car wheel s(D1)

Disassemble component	Set up time (h)	Operation time (h)
Disassemble tire D11	STD11 = 1	OTD11 = 0.5
Disassemble rim D12	STD12 = 1	OTD12 = 0.3
Total $\Sigma D_{ij} = 2$	$\Sigma STD_{ij} = 2$	$\Sigma STD_{ij} = 0.8$

$T1_{SU} = \Sigma STD_{ij}/ \Sigma D_{ij}$ = 1 hours
$T1_{AV} = \Sigma STD_{ij}/ \Sigma D_{ij}$ = 0.8/ 2= 0.4 hours
Where $T1_{SU}$ = average set up time for disassemble component 1
$T1_{AV}$ = average operation time for disassemble component 1

Similarly for second main component disassemble the car body D2 which have sub component like D21- disassemble the car wind screen, doors, D22- disassemble the car roofs

Table 2. Disassemble the car body (D2)

Disassemble component	Set up time (h)	Operation time (h)
D21	STD21 = 2	OTD21 = 0.6
D22	STD22 = 1	OTD22 = 0.4
Total $\Sigma D_{ij} = 2$	$\Sigma STD_{ij} = 3$	$\Sigma OTD_{ij} = 1.0$

$T2_{SU} = \Sigma STD_{ij}/ \Sigma D_{ij}$ = 3/2 = 1.5 hours
$T2_{AV} = \Sigma STD_{ij}/ \Sigma D_{ij}$ = 1/ 2 = 0.5 hours
Where $T2_{SU}$ = average set up time for disassemble component 2
$T2_{AV}$ = average operation time for disassemble component 2

Similarly for third main component disassemble the chassis D3 which have sub component like. D31- disassemble the rare axle, D32- disassemble the live axle, D33- disassemble the shock absorber, D34- disassemble the muffler, D35- disassemble the Fuel tank.

Table 3 Disassemble the chassis (D3)

Disassemble component	Set up time (h)	Operation time (h)
D31	STD31 = 1	OTD31 = 0.5
D32	STD32 = 1	OTD32 = 0.5
D33	STD33 =0.5	OTD33 = 0.2
D34	STD34 = 0.5	OTD34 = 0.1
D35	STD35 =1	OTD35 = 0.2
Total ΣD_{ij}	$\Sigma STD_{ij} = 4$	Σ OTD $_{ij}$ = 1.5

$T3_{SU} = \Sigma STD_{ij} / \Sigma D_{ij} = 4/5 = 0.8$ hours
$T3_{AV} = \Sigma STD_{ij} / \Sigma D_{ij} = 1.5/5 = 0.3$ hours
Where $T3_{SU}$ = average set up time for disassemble component 3
$T3_{AV}$ = average operation time for disassemble component 3

Similarly for four main component disassemble the car Engine D4 which have sub component like D41- disassemble the Engine Fan, D42- disassemble the piston,D43- disassemble the transmission assembly , D44- disassemble the Battery, D45- disassemble the Fuel injector , D46 - disassemble the radiator.

Table 4. Disassemble the car Engine (D4)

Disassemble component	Set up time (h)	Operation time (h)
D41	STD41 = 1	OTD41 = 0.3
D42	STD42 = 0.5	OTD42 = 0.2
D43	STD43 = 1	OTD43 = 0.3
D44	STD44 = 0.5	OTD44 = 0.2
D45	STD45 = 0.5	OTD45 =0.2
D46	STD46 = 0.5	OTD 46 =0.2
Total ΣD_{ij}	$\Sigma STD_{ij} = 4$	Σ OTD $_{ij}$ = 1.4

$T4_{SU} = \Sigma STD_{ij} / \Sigma D_{ij} = 4/6 = 0.67$ hours
$T4_{AV} = \Sigma STD_{ij} / \Sigma D_{ij} = 0.23$ hours
Where $T4_{SU}$ = average set up time for disassemble component 4
$T4_{AV}$ = average operation time for disassemble component 4

Similarly for four main component disassemble the car Accessories D5 which have sub component like D51- disassemble the steering assembly, D52- disassemble the brakes, D53- disassemble the pressure gauge, D54- disassemble the clutches, D55- disassemble the spark plug, D56 for disassemble alternator.

Table 5. Disassemble the car Accessories (D5)

Disassemble component	Set up time (h)	Operation time (h)
D51	STD51 = 1	OTD41 = 0.3
D52	STD52 = 2	OTD42 = 0.4
D53	STD53 = 1	OTD43 =0.2
D54	STD54 = 0.5	OTD44 = 0.1
D55	STD55 = 0.1	OTD45 =0.1
D56	STD56 =0.1	OTD 46 = 0.1
Total ΣD_{ij}	$\Sigma STD_{ij} = 4.7$	Σ OTD $_{ij}$ = 1.2

$T5_{SU} = \Sigma STD_{ij} / \Sigma D_{ij} = 4.7/6 = 0.78$ hours
$T5_{AV} = \Sigma STD_{ij} / \Sigma D_{ij} = 1.2 / 6 = 0.2$ hours
Where $T5_{SU}$ = average set up time for disassemble component 5
$T5_{AV}$ = average operation time for disassemble component 5

First we calculate the Dis- assembly average set up time that we know that

Table 6. Disassemble of the damaged car/ auto vehicle main component (D_i)

Disassemble component	Set up time (h)	Operation time (h)
D1	$T1_{SU} = 1.0$	$T1_{AV} = 0.4$
D2	$T2_{SU} = 1.5$	$T2_{AV} = 0.5$
D3	$T3_{SU} = 0.8$	$T3_{AV} = 0.3$
D4	$T4_{SU} = 0.67$	$T4_{AV} = 0.23$
D5	$T5_{SU} = 0.78$	$T5_{AV} = 0.2$
Total ΣD_i	$\Sigma Ti_{SU} = 4.75$	$\Sigma Ti_{AV} = 1.63$

We know that average set up time and average operation time given below
$T_{STDU} = \Sigma Ti_{SU} / \Sigma D_i = 4.75/5 = 0.95$
$T_{OTDU} = \Sigma Ti_{AV} / \Sigma D_i = 1.63/5 = 0.326$

Then we know that

The Disassemble Lead Time = DLT
Total Number of Dis assembled component = $\Sigma Di + \Sigma D_{ij}$
Damaged Car / auto vehicle Batch size = DB

Non- operation time of robotic Arm of disassemble the component are = T_{nop}

Therefore we formulate the disassemble lead time as on the basis of production rate formula by an assembly line/ production line

$DLT = ((\Sigma Di + \Sigma D_{ij}) (T_{STDU} + DB \times T_{OTDU} + T_{nop}))$

Disassemble production rate (R_{Pd}) when emphasis given to the component D3

First we calculate operation time rate 3 say T_{pd}

$T_{pd} = (T3_{SU} + DB \times T3_{AV} + T_{nop}) / DB$

We Know that

$R_{pd} = 1/ T_{pd}$

Result - we assume the timing as given in the above table we found the following results

$DLT = ((\Sigma Di + \Sigma D_{ij}) (T_{STDU} + DB \times T_{OTDU} + T_{nop}))$
$(\Sigma Di + \Sigma D_{ij}) = (5+ (2+ 2+ 5+ 6+6)) = 26$

$T_{STDU} = 0.95$, $T_{OTDU} = 0.326$

BD = 100 , T_{nop} = 12 hours (assume the robotic arms are working in 12 hours)

Then DLT = (26 (0.95 +100 X 0.326 + 12)) 1.184.3 hours
$T_{pd} = (T3_{SU} + DB \times T3_{AV} + T_{nop}) / DB$

= (0.8 + 100X 0.3 + 12) / 100 = 0.428 hours / piece

$R_{pd} = 1/ T_{pd} = 1/ 0.428 = 2.33644$ piece / hours

$R_{pd} = 2.34$ pieces / hours

From here we found the Disassemble production rate of the damaged car is 2.34 pieces per hours when we give the emphasis of the main component of chassis D3 . This is good for dis assemble the car/ auto vehicle. For calculation of Disassembly cost the Tabulated cost table is given below. For first main component D1 means disassembly of car wheels which have suppose two sub component like D11- Disassemble tire, D12- Disassemble rim from damaged car / auto vehicle therefore D11 CDC means disassemble tire cost, D11 LC means disassemble tire labor cost vice versa given in table below

Where i ,j means 1, 2, 3 ,4 ,5…………………

Therefore variable cost of expenditure for the component Dis- assembly car wheels are given below

The variable cost of components of disassembly car wheels are

$\Sigma V\ D_{ij}\ 1 = (\Sigma\ D_{ij}CDC + \Sigma\ D_{ij}LC + \Sigma\ D_{ij}MHC + \Sigma\ D_{ij}MC) = (2+3+ 6 +4) = \$15$

Table 1. Disassembly of car wheels (D1)

Disassemble component	CDC ($)	LC ($)	MHC ($)	MC ($)	Selling cost SC (earning)($)
Disassemble tire D11	D11CDC = 1	D11LC= 2	D11MHC =3	D11MC =2	D11 SC =15
Disassemble rim D12	D12CDC = 1	D12LC= 1	D12MHC =3	D12MC =2	D12 SC = 20
Total VCC = ΣVD_{ij}	Σ Dij CDC =2	Σ $_{Dij}$LC= 3	ΣD_{ij}MHC =6	ΣD_{ij}MC =4	ΣD_{ij} SC = 25

Table 2. Disassemble the car body (D2)

Disassemble component	CDC ($)	LC ($)	MHC ($)	MC ($)	Selling cost SC (earning) ($)
D21	D21CDC = 2	D21LC = 2	D21MHC = 0*	D21MC =1	D21 SC = 0*
D22	D22CDC = 1	D22LC = 2	D22MHC = 2	D12MC =1	D22 SC = 5
Total VCC = ΣVD_{ij}	Σ Dij CDC =3	Σ $_{Dij}$LC =4	ΣD_{ij}MHC =2	ΣD_{ij}MC = 2	ΣD_{ij} SC = 5

Table 3. Disassemble the car chassis (D3)

Disassemble component	CDC ($)	LC ($)	MHC ($)	MC($)	Selling cost SC(earning) ($)
D31	D31CDC = 3	D31LC = 3	D31MHC =5	D31MC =3	D31 SC = 20
D32	D32CDC =3	D32LC =3	D32MHC =5	D32MC = 3	D32 SC =20
D33	D33CDC =1	D33LC =1	D33MHC =0*	D33MC = 1	D33 SC =0*
D34	D34CDC = 1	D34LC =1	D34MHC =0*	D34MC =1	D34 SC =0*
D35	D35CDC = 3	D35LC = 3	D35MHC =3	D35MC = 2	D35 SC = 10
Total VCC = ΣVD_{ij}	Σ Dij CDC =11	Σ $_{Dij}$LC =11	ΣD_{ij}MHC =13	ΣD_{ij}MC =10	ΣD_{ij} SC = 50

Table 5. Disassemble the car Accessories (D5)

Disassemble component	CDC ($)	LC ($)	MHC ($)	MC ($)	Selling cost SC(earning) ($)
D51	D41CDC= 4	D41LC=3	D41MHC =0*	D41MC=3	D41 SC =0*
D52	D42CDC = 4	D42LC =3	D42MHC =0*	D42MC =2	D42 SC =0*
D53	D43CDC =2	D43LC =1	D43MHC = 0*	D43MC =2	D43 SC =0*
D54	D44CDC = 2	D44LC =1	D44MHC =2	D44MC =2	D44 SC =5
D55	D45CDC =1	D45LC =1	D45MHC =0*	D45MC =1	D45 SC =0*
D56	D46 CDC =1	D46LC =1	D46 MHC =1	D46MC =1	D46 SC =5
Total VCC = ΣVD_{ij}	Σ Dij CDC= 14	Σ $_{Dij}$LC =10	ΣD_{ij}MHC =3	ΣD_{ij}MC =11	ΣD_{ij} SC = 10

Table 6. Disassemble of the damaged car/ auto vehicle main component (D_i)

Disassemble component	Disassembly main Component cost CDC	Disassembly Labor cost DLC
D1 car wheels	D1CDC = 3	D1 DLC =3
D2 car body	D2CDC = 3	D2 DLC =4
D3 car chassis	D3 CDC =5	D3 DLC =4
D4 car Engine	D4 CDC =5	D4 DLC =4
D5 car Accessories	D5 CDC =5	D5 DLC =4
Total $\Sigma V D_i$	ΣD_i CDC = 21	ΣD_i LC= 19

Variable cost for earning are $\Sigma EV D_{ij}$ 1 = ΣD_{ij} SC = \$25

Similarly for second main component disassemble the car body

D2 which have sub component like

D21- disassemble the car wind screen ,doors , D22- disassemble the car roofs therefore D21 CDC means disassemble car wind screen cost, D21 LC means disassemble wind screen labor cost vice versa given in table below

Therefore variable cost of expenditure for the component Disassembly car body are given below

The variable cost of components of disassembly car body are

$\Sigma V D_{ij}$ 2 = (ΣD_{ij}CDC + ΣD_{ij}LC + ΣD_{ij}MHC + ΣD_{ij}MC)= (3+ 4+ 2 +2) = \$ 11

Variable cost for earning are $\Sigma EV D_{ij}$ 2 = ΣD_{ij} SC = \$5

Similarly for third main component disassemble the chassis D3 which have sub component like.

D31- disassemble the rare axle, D32- disassemble the live axle,D33- disassemble the shock absorber , D34- disassemble the muffler ,D35- disassemble the Fuel tank therefore D31 CDC means disassemble car rare axle cost, D31 LC means disassemble rare axle labor cost vice versa given in table below

Therefore variable cost of expenditure for the component Disassembly Car Chassis are given below

The variable cost of components of disassembly car chassis are

$\Sigma V D_{ij}$ 3 = (ΣD_{ij}CDC + ΣD_{ij}LC + ΣD_{ij}MHC + ΣD_{ij}MC) = (11+11+13+10)= \$45

Variable cost for earning are $\Sigma EV D_{ij}$ 3 = ΣD_{ij} SC = \$50

Similarly for four main component disassemble the car Engine D4 which have sub component like D41- disassemble the Engine Fan, D42- disassemble the piston,D43- disassemble the transmission assembly , D44- disassemble the Battery ,D45- disassemble the Fuel injector , D46 - disassemble the radiator therefore D41 CDC means disassemble car engine fan cost, D41 LC means disassemble car engine fan labor cost vice versa given in table below

Therefore variable cost of expenditure for the component Dis-assembly Car Engine are given below The variable cost of components of disassembly car chassis are

$\Sigma V\ D_{ij}\ 4 = (\Sigma\ D_{ij}CDC + \Sigma\ D_{ij}LC + \Sigma\ D_{ij}MHC + \Sigma\ D_{ij}MC) = (14+12+12+12)=\$50$

Variable cost for earning are $\Sigma EV\ D_{ij}\ 4 = \Sigma\ D_{ij}\ SC = \$50$

Similarly for four main component disassemble the car Accessories D5 which have sub component like D51- disassemble the steering assembly,D52- disassemble the brakes,D53- disassemble the pressure gauge, D54- disassemble the clutches,D55- disassemble the spark plug,D56 for disassemble alternator. Therefore D51 CDC means disassemble car Accessories cost, D31 LC means disassemble Accessories labor cost vice versa given in table below

Therefore variable cost of expenditure for the component Dis-assembly Car Accessories are given below. The variable cost of components of disassembly car chassis are

$\Sigma V\ D_{ij}\ 5 = (\Sigma\ D_{ij}CDC + \Sigma\ D_{ij}LC + \Sigma\ D_{ij}MHC + \Sigma\ D_{ij}MC) = (14+10+3+11)= \$38$

Variable cost for earning are $\Sigma EV\ D_{ij}\ 5 = \Sigma\ D_{ij}\ SC = \$\ 10$

For Disassembly the main components of the car only Cost of Labor and Cost of disassembly car main components are effective . there are given below in tabulated form
Therefore main components variable cost are

$\Sigma V\ D_i = (\Sigma\ D_i\, CDC + \Sigma\ D_i\, LC) = (21 +19)=\$\ 40$

Therefore variable cost of expenditure in damaged /old car/ Auto vehicle disassembly is

Variable components Cost (VCC) = $\Sigma V\ D_i + (\Sigma V\ D_{ij}\ 1 + \Sigma V\ D_{ij}\ 2 + \Sigma V\ D_{ij}\ 3 + \Sigma V\ D_{ij}\ 4 + \Sigma V\ D_{ij}\ 5)$

For batch production car are assumed to be 100 therefore VDC are

Variable component Cost (VCC) = 100 X $(\Sigma V\ D_i + (\Sigma V\ D_{ij}\ 1 + \Sigma V\ D_{ij}\ 2 + \Sigma V\ D_{ij}\ 3 + \Sigma V\ D_{ij}\ 4 + \Sigma V\ D_{ij}5))$

Similarly for earning variable cost for 100 (assumed for batch production) cars. Earning variable Component cost (EVCC) = 100 x (sum of all the selling components cost)

EVCC = 100X $(\Sigma EV\ D_{ij}\ 1 + \Sigma EV\ D_{ij}\ 2 + \Sigma EV\ D_{ij}\ 3 + \Sigma EV\ D_{ij}\ 4 + \Sigma EV\ D_{ij}\ 5)$

Fixed for Expenditure are

Expenditure Fixed cost (EFC) = Capital cost (Land cost) + Development of disassembly line cost

But for earning Fixed cost = Rescue Land area by the Damaged /old cars / auto vehicles

= Capital cost (CC)

Here we assume that for development of disassembly line and land cost is assumed for 10 years therefore we used here only for 100 cars for batch production is to be \$3000 for 100 car

While the earning Fixed cost or capital cost of rescue land area by the Damaged /old cars / auto vehicles are more Therefore we assume to be Equal to \$ 10000

Therefore

Profit or loss = ((Capital cost (CC) + Earning variable Component cost EVCC) – (Expenditure Fixed cost (EFC)+ Expenditure variable Component cost (VCC)))

Profit or loss = ((CC + EVCC) - (VCC + EFC))

If The expenditure is more than the earning loss occur. If The expenditure is less than the earning profit occur. For examination of profit or loss we assume the Expenditure of the component and earning of the components in above table . here all cost are random values depends on observation of disassemble the components (assumption basis) it will be change.

* here we explain that if the component are fully damaged the value of manufacturing cost and selling cost become zero.
Therefore according to the developed formula

For batch production car are assumed to be 100 therefore VDC are. Variable component Cost (VCC) = 100 X $(\Sigma V\ D_i + (\Sigma V\ D_{ij}\ 1 + \Sigma V\ D_{ij}\ 2 + \Sigma V\ D_{ij}\ 3 + \Sigma V\ D_{ij}\ 4 + \Sigma V\ D_{ij}5))$. VCC = 100 X (40 + (15 +11+ 45 +50+ 38)) = =100 X199 = \$ 19900
Similarly for earning variable cost for 100 (assumed for batch production) cars. Earning variable Component cost (EVCC) = 100 x (sum of all the selling components cost)

EVCC = 100X $(\Sigma EV\ D_{ij}\ 1 + \Sigma EV\ D_{ij}\ 2 + \Sigma EV\ D_{ij}\ 3 + \Sigma EV\ D_{ij}\ 4 + \Sigma EV\ D_{ij}\ 5)$
EVCC = 100 X (25+ 5 + 50 + 50 +10) = 100 X 140 = \$14000

Therefore

Profit or loss = ((Capital cost (CC) + Earning variable Component cost (EVCC) – (Expenditure Fixed cost (EFC)+ Expenditure variable Component cost (VCC)))

Profit or loss = ((CC + EVCC) - (VCC + EFC))

Here Capital cost (CC) for earning = \$8000 (assumption)
Expenditure Fixed cost (EFC) = \$ 3000 (assumption)

= ((10000 + 14000) – (3000 + 19900)
= 24000 – 22900 = \$1100

Here we see that if capital cost for rescue land area is more than triple than the profit is possible . we not increase the selling cost because these items are not new and are second for use.

Conclusion

from the result we give some conclusion which are favorable to the dis-assembly production line designers. These are Choose the random time for first calculated by manual robotics arm to disassembled the damaged car components and set these values in a microprocessor (software). then the assembly line process automatically by robotic arm. Production line designer also designed the optimal dis assemble rate to give the priority accordance to the design of dis-assemble time /

production time[2] in a particular satiation. Production line designer also calculate the Efficiency and effective ness[3] of the disassemble production line through un-paced production line philosophy.

- We develop the fully automatic disassemble production line with optimal production rate to achieve through bowl phenomenon[4] in un-paced production line.
- If capital cost of lands area is more, than we apply the reprocessing (Recycle) of old car / damaged car
- If wastage of old car/ damaged car/ auto vehicle are Problem for environment than we apply the reprocessing (Recycle) of old car / damaged car
- This formula is beneficial for the Car industries/ Auto vehicle who exchange the old car to new cars. They pick up old cars / damaged car in minimum amount and set a disassembly there and utilize more components to make new modified components.
- Software engineer make a software to calculate the exact profit or loss for every car to utilize this coding

Need/ Scope of Study: If you see the outside of the major cities of any country you find out the storage of the auto vehicle/ cars. These cars/ auto vehicle are stored in many uses there are not utilize at all. The man have a habit if new version of car / auto vehicle comes in market he purchase the new one and not utilize in old car/ auto vehicle he dumped in open space(warehouses) and if car is old and not work or due to accident damage occur then he also dumped in open space . Therefore a huge storage occurred in all the major cities in develop as well as developing countries. These occupied storage (warehouses) causes soil pollution as well as the land area covered by these warehouses is costly because it is situated in major cities without any uses. Therefore we give a strategy through a production line to disassemble the all components and these components are re-utilized through recycling the components by heat treatments/ manufacturing process. We design an automatic disassembly production line where work are carried on robotics arm .We also develop the formula for disassembly production rate and estimation of cost analysis and find out the profit /loss.

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