



Reduction of E- Waste and Improve Productivity in an Electronics Industry.

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Abstract

Central issue of the present study is electronic-waste (e-waste) that is rising as a brand new environmental challenge for twenty first century. The rapid climb of the electronic and IT trade, gift client culture, increasing rates of consumption of electronic product have lead to fateful environmental consequences. E-waste, while recycling, is also risky due to toxicity of a number of the substances which contains several cancer-causing agents. The implications and toxicity is thanks to discharge of lead, mercury, cadmium, metallic element and alternative virulent substances. Developed countries export this waste within the type of donation to developing countries. China and some Asian nations, where environmental standards are low, are the most important recipients of e-waste which, in most cases, is processed illicitly. The environmental burden of e-waste is born by people that sleep in developing countries. Despite varied laws and directives in developed countries, the e-waste management is uncontrollable. The current study focuses on the effect of usage, marketing and use of the electronic waste on the natural setting. Key Words: E-waste, environmental challenges, e-Electronic Scraps, e-waste management

Keywords : DMAIC, lean manufacturing, lean-six sigma, six sigma

INTRODUCTION

"Electronic waste" could also be outlined as discarded computers, workplace equipment, diversion device natural philosophy, mobile phones, TV sets, and refrigerators. This includes used natural philosophy that are destined for use, resale, salvage, recycling, or disposal. Others are re-usables (working and fixable electronics) and secondary scrap (copper, steel, plastic, etc.) to be "commodities", and reserve the term "waste" for residue or material that is drop by the client instead of recycled, as well as residue from use and utilization operations. as a result of many surplus natural philosophy are oftentimes commingled (good, recyclable, and non-recyclable), many public policy advocates apply the term "e-waste" broadly speaking to any or all surplus natural philosophy. Electron beam tubes (CRTs) are thought_about one in all the toughest varieties to recycle.

Effects of E-Waste constituent on health

Source of e-wastes	Constituent	Health effects
Solder in printed circuit boards, glass panels and gaskets in computer monitors	Lead (PB)	<ul style="list-style-type: none"> • Damage to central and peripheral nervous systems, blood systems and kidney damage. • Affects brain development of children.
Chip resistors and semiconductors	Cadmium (CD)	<ul style="list-style-type: none"> • Toxic irreversible effects on human health. • Accumulates in kidney and liver. • Causes neural damage. • Teratogenic.
Relays and switches, printed circuit boards	Mercury (Hg)	<ul style="list-style-type: none"> • Chronic damage to the brain. • Respiratory and skin disorders due to bioaccumulation in fishes.
Corrosion protection of untreated and galvanized steel plates, decorator or hardner for steel housings	Hexavalent chromium (Cr) VI	<ul style="list-style-type: none"> • Asthmatic bronchitis. • DNA damage.
Cabling and computer housing	Plastics including PVC	Burning produces dioxin. It causes <ul style="list-style-type: none"> • Reproductive and developmental problems;

		<ul style="list-style-type: none"> • Immune system damage; • Interfere with regulatory hormones
Plastic housing of electronic equipments and circuit boards.	Brominated flame retardants (BFR)	<ul style="list-style-type: none"> • Disrupts endocrine system functions
Front panel of CRTs	Barium (Ba)	Short term exposure causes: <ul style="list-style-type: none"> • Muscle weakness; • Damage to heart, liver and spleen.
Motherboard	Beryllium (Be)	<ul style="list-style-type: none"> • Carcinogenic (lung cancer) • Inhalation of fumes and dust. Causes chronic beryllium disease or berylliosis. • Skin diseases such as warts.

MANAGEMENT OF E -WASTE

Because of uncertainty of the ways to manage, electronic junks lie unattended in homes, offices, warehouses etc. and its commonly mixed with family wastes, that are finally disposed off at landfills. This necessitates implementable management measures. In industries management of e-waste ought to begin at the purpose of generation. This will be done by waste step-down techniques and by property product style (Ramachandra T.V. & Saira Varghese K., 2004). Waste step-down in industries involves adopting:

- Inventory Management,
- Production-Process Modification,
- Volume Reduction,
- Recovery and Utilise.

INVENTORY MANAGEMENT

Proper management over the materials employed in producing method is a crucial thanks to cut back waste generation (Freeman, 1989). By reducing each, the number of venturous materials employed in the method and also the amount of excess raw materials available, the amount of waste generated will be reduced. This could be tired 2 ways i.e. establishing material-purchase review and management procedures and inventory pursuit system.

Developing review procedures for all material purchased is the initiative in establishing a listing management program. Procedures ought to need that each material should be approved before purchase. Within the approval method, all production materials area unit evaluated to look at, whether they contain venturous constituents or various hazardous materials area unit obtainable. Another inventory management procedure for waste reduction is to confirm that only required amount of a fabric is ordered. This can need the institution of a strict inventory pursuit system. Purchase procedures should be enforced to make sure that materials area unit ordered solely associate with need basis.

PRODUCTION-PROCESS MODIFICATION

Changes should be created within the production method, which can scale back waste generation. This reduction is accomplished by a lot of economical use of input materials within the production method. Potential waste reduction techniques are weakened into 3 categories.

- Improved operational and maintenance procedures,
- material amendment and

PROCESS-EQUIPMENT MODIFICATION.

Improvements within the operation and maintenance of method instrumentality may result in vital waste reduction. This will be accomplished by reviewing current operational procedures and examination of the assembly method for methods to boost its potency. Instituting normal operation procedures will optimise the

employment of raw materials within the production method and scale back the potential for materials to be lost through leaks and spills. A strict maintenance program, that stresses corrective maintenance, will scale back waste generation caused by failure. Nursing employee-training program may be a key component of any waste reduction program. Training ought to embrace correct operational and handling procedures, correct instrumentality use, counselled maintenance and examination schedules, correct method management specifications and correct management of waste materials.

Hazardous materials utilized in either a product formulation or a production method should be replaced with a less dangerous or non-hazardous material. Implementation of this waste

-reduction technique might require just some minor changes or it should need intensive new method instrumentality. As an example, a printed circuit manufacturer will replace solvent- based product with water-based flux and at the same time replace solvent vapor degreaser with detergent elements washer.

VOLUME REDUCTION

Volume reduction includes those techniques that take away the venturesome portion of a waste from a non-hazardous portion. These techniques area unit typically to scale back the quantity, and therefore the value of eliminating a waste product. The techniques that may be wont to cut back waste-stream volume may be divided into two general categories: supply segregation and waste concentration. Segregation of wastes is in several cases an easy and economical technique for waste reduction. Wastes containing differing types of metals may be treated one by one so the metal worth within the sludge may be recovered. Concentration of a waste stream might increase the probability that the fabric may be recycled or reused. Recovery and use

This technique might eliminate waste disposal prices, scale back staple prices and supply financial gain from a in demand waste. Waste is recovered on-the-scene, or at an off-site recovery facility, or through put down trade exchange. Variety of physical and chemical techniques like reverse diffusion, electrolysis, condensation, electrolytic recovery, filtration, activity etc are accessible to reclaim a stuff. As an example, a printed-circuit board manufacturer will use electrolytic recovery to reclaim metals from copper and tin-lead plating bathtub. However, usage of risky merchandise has very little environmental profit if it merely moves the hazards into secondary merchandise, that eventually ought to be disposed of. Unless the goal is to revamp the merchandise to use non-hazardous materials, such usage may be a false resolution.

OBJECTIVE OF STUDY

- Reduction of virgin material for total volume production.
- Reduction of potential recycled materials
- Reduction in energy requirement for production and processing
- Increased productivity by materials productivity based on ratio of economic output to material input piece wise

- Efficient and improved energy productivity
- Reduction in waste production and reduction in waste disposal in terms of economic output in terms of per unit of material disposal
- Increase in ratio of resource input per unit of end- user service to assesses resource use against the useful function gained and maintained for the macroeconomic indicator etc.

METHODOLOGY

- DMAIC refers to a cycle of process improvement that is data-driven and aims at improving, optimizing, and stabilizing business processes and designs. A Six Sigma project is driven by the DMAIC improvement cycle.
- it is a five-phase strategy for improving a wide variety of organizational processes, whether it's software development, manufacturing, or some other process. While it's associated with , SIX SIGMA this strategy can also be applied to lean and other process-improvement strategies. DMAIC is a data-driven problem-solving technique designed to identify and address inefficiencies in a process, which improves its outcomes and makes these improvements more predictable.
- The acronym stands for the five phases — Define, Measure, Analyze, Improve, and Control, and it is pronounced “duh-may-ik.”
- The DMAIC methodology has its roots in the PDSA (“plan, do, study, act”) cycle developed by statistician Walter A. Shewhart at Bell Laboratories in the 1930s. But the technique as we know it today has been shaped by some of the largest organizations in the world.

Lean Six Sigma

DMAIC




The Five Phases of DMAIC

1. Define

During this phase, we select the most critical and impactful opportunities for improvement. This phase is also about mapping the process, focus, scope, and the ultimate goal as well as understanding how the problem affects all stakeholders. The way to jumpstart a DMAIC cycle is by crafting the problem statement.

Problem Statement :-

During closing inventory we have found too much rejected driver in E-waste and scrap area. Rapidly increasing volume of electronic waste, the improper disposal of e-waste, lack of awareness among people, and inadequate infrastructure and regulations for e-waste management, leading to severe environmental and health impacts. In Our case Driver waste increased due to various technical reasons.

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- Input wire short
 - Fuse missing
 - Alco dry
 - Transformer lifting
 - Output wire dry
 - Mosfet short

2. Measure

- The Measure phase is where baselines are drawn to assess the performance of a given process. Without having sound benchmarks for comparison, it's difficult to track improvements. Hence, at this stage, we:
 - Develop the data collection methods to be used to measure success
 - Recognize input, processes, and output indicators
 - Collect and examine current state data
 - Outline the failure modes and effects analysis
 - Implement process capability analysis
- The use of visual management tools such as control charts, bar charts, and run charts etc. can help you achieve better results at this stage

COST OVER LAST ONE YEAR (2021-2022)

Cost of Material	Cost of manpower	Total cost / pcs				One Driver Cost	Cost saving /pcs
14	7.5	21.5				20W FL WANG 77	55.5
						30W FL WANG 117	95.5
						50W FL WANG 135	113.5

Note :- Total production last year – 265583 Nos Driver Rejection 1.25% (3675 Nos) Cost /Year – 346500 Rs

Note: - 15 % Scrap Value:- (3675-551) = 3124 Nos. Cost Saving par Year – 3 lac. One driver cost – 95.5

Total Material cost	14
Component cost	8
Epoxy cost	6

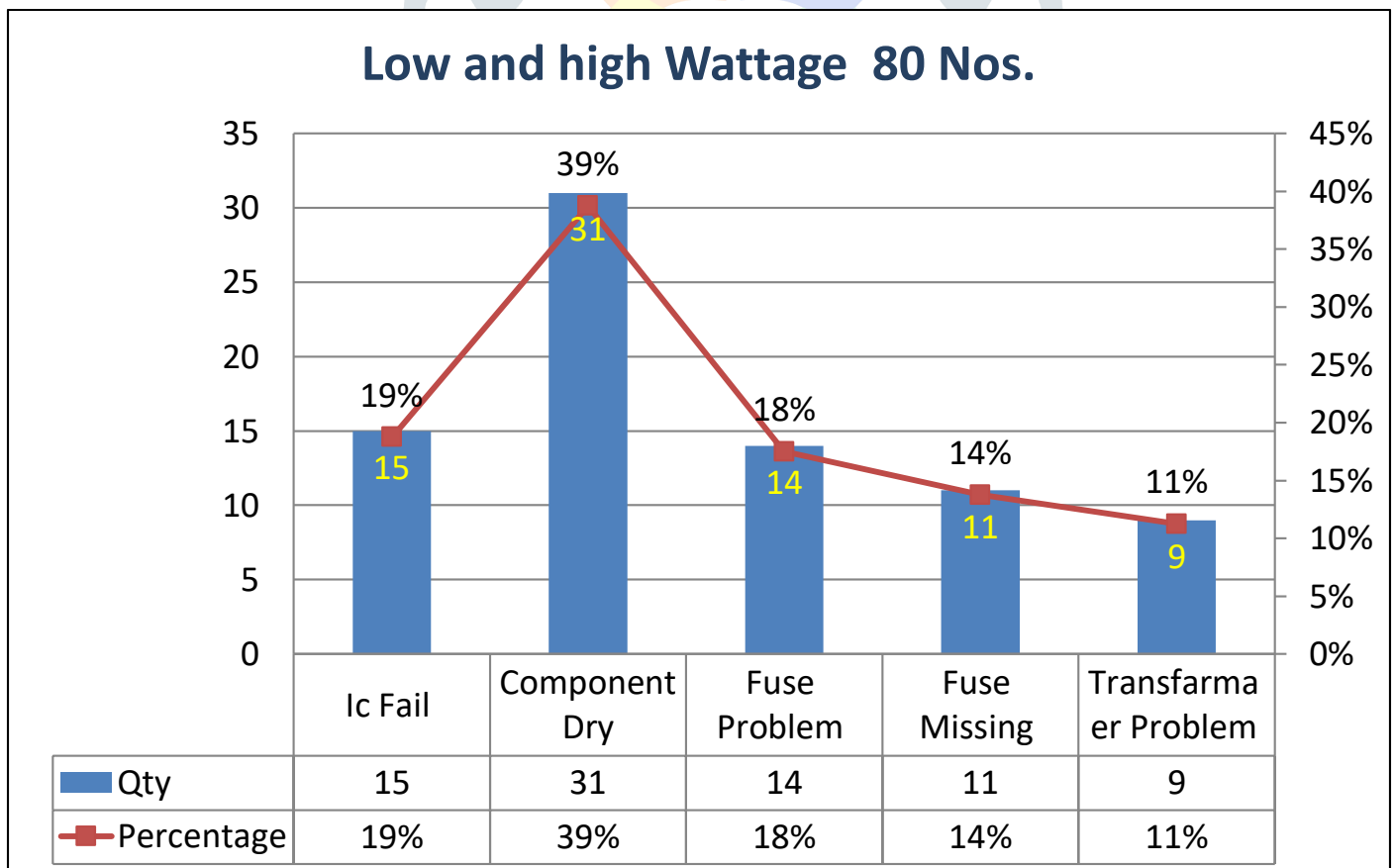
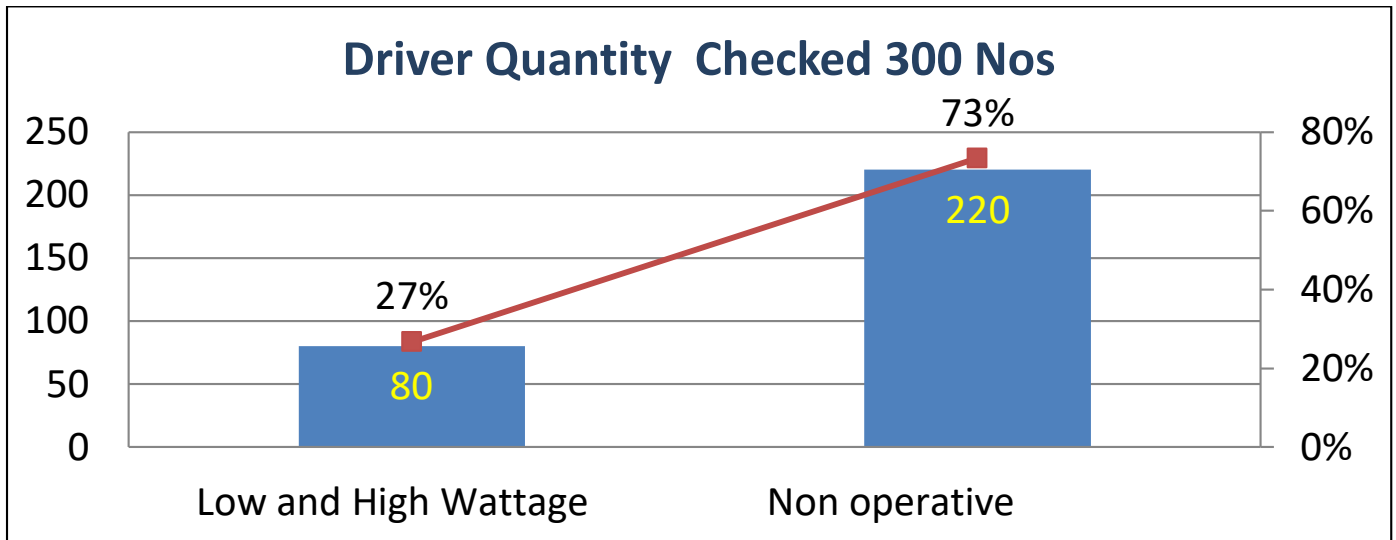
Cost of manpower/Hour	Driver rework in 1 Hour	Manpower cost /Pcs
37.5	5	7.5

3. Analyse

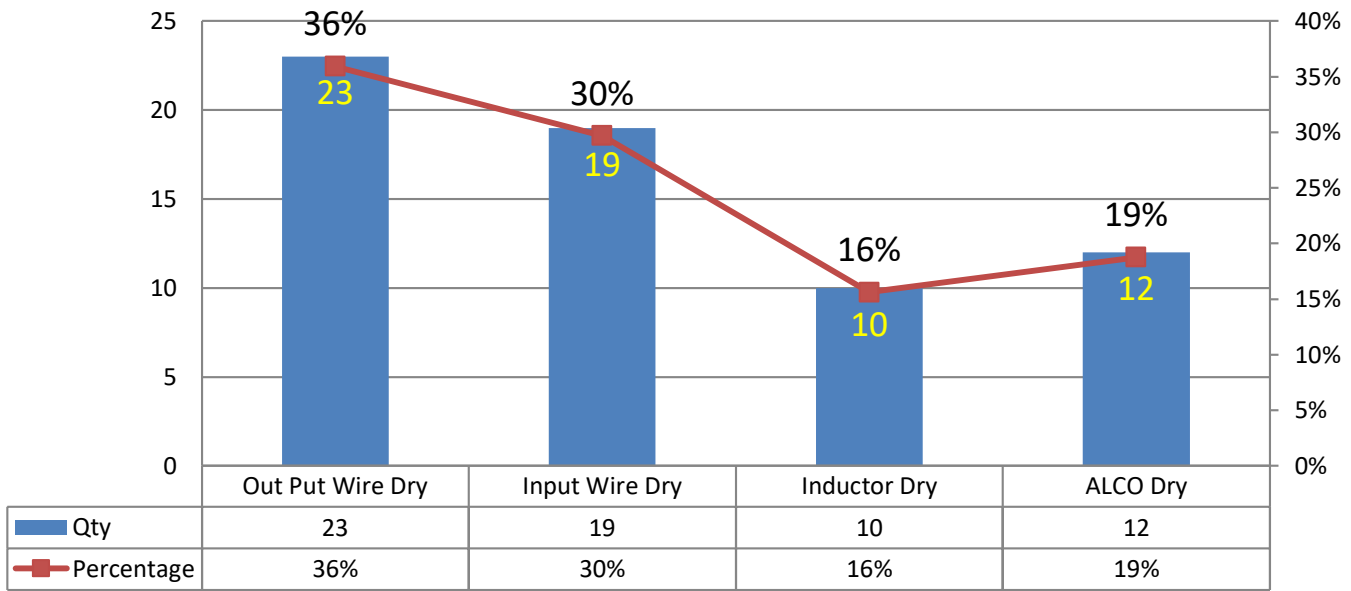
In this phase, your goal is to identify and test the underlying causes of problems to make sure that improvement takes place from deep down where the problems stem from.

- Getting a visual representation of the variations within a given process using a multi-vari chart.
- Doing failure mode and effects analysis (FMEA) to identify all possible problem areas, inefficiencies, flaws, defects, and shortcomings.

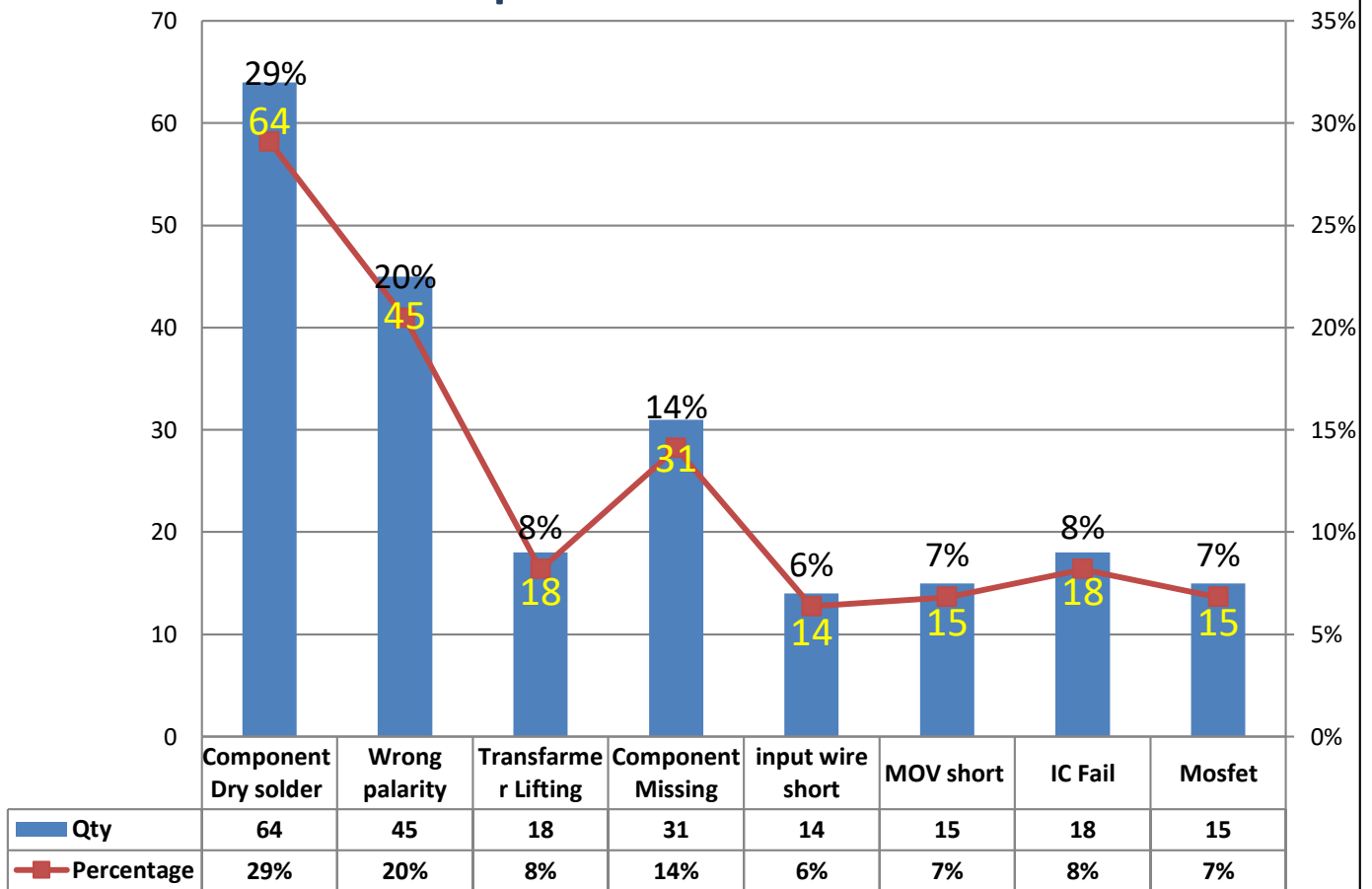
DRIVER ANALYSIS REPORT



Non Operative Driver(Component Dry solder -64 Nos.)



Non Operative Driver-220 Nos.



- Implementing process control
- Developing a plan for improvement
- After this phase, We able to capture and document all opportunities for improvement successfully, and our plan of action start taking shape.

4 . Improve

- With the analysis done and the data in front of you, now is the time to start making the improvements.
- Brainstorm and put forth solution ideas
- Develop a design of experiments (DOE) to determine the expected benefits of solution
- Revise process maps and plans according to the data collected in the previous stage
- Outline a test solution and plan
- Implement Kaizen events to improve the process
- Inform all stakeholders about the solution

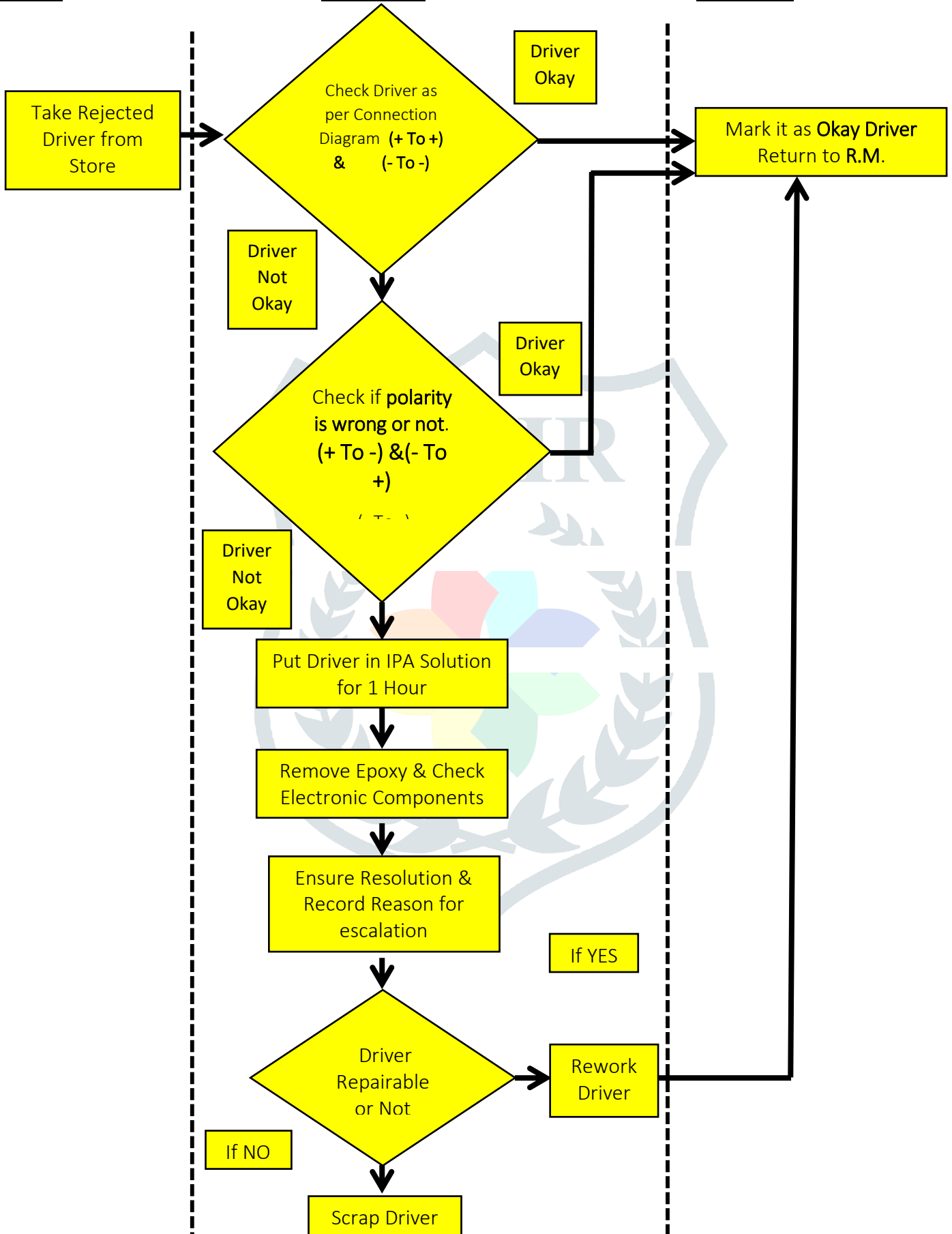


DRIVER REWORK- (Implementation Kizen Event)

INPUT

PROCESS

OUTPUT



CONCLUSION:

The synergic integration of six sigma and lean manufacturing requires defining a guide from both six sigma provides DMAIC who is a basic methodology for this integration. Also lean manufacturing provides the first step toward identifying wastes of the process. The full involvement of staff was necessary in this implementation, Lean sigma should be adapted over the circumstances of each case, so in this case tools like 5 s, visual control, production flow, work standardization and waste reduction was used, but defining DMAIC was core approach for the project and we have result in significant improvements to the process, increased efficiency, and cost savings by Recycle, Reuse and Reduce.

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