



# **iJRASET**

International Journal For Research in  
Applied Science and Engineering Technology



---

# **INTERNATIONAL JOURNAL FOR RESEARCH**

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

---

**Volume: 7      Issue: III      Month of publication: March 2019**

**DOI: <http://doi.org/10.22214/ijraset.2019.3070>**

**[www.ijraset.com](http://www.ijraset.com)**

**Call:  08813907089**

**E-mail ID: [ijraset@gmail.com](mailto:ijraset@gmail.com)**

# Manual Operated Dust Collecting Vehicle

Rasid MP<sup>1</sup>, Ajmal Nishad KP<sup>2</sup>, Anas PK<sup>3</sup>, Fahad MK<sup>4</sup>, Irshad TS<sup>5</sup>, Muhammed Ajwad P<sup>6</sup>

<sup>1</sup>Lecturer, Department Of Mechanical Engineering, Orphanage Polytechnic College, Edavanna, Kerala, India.

<sup>2,3,4,5,6</sup> Diploma Students, Department Of Mechanical Engineering, Orphanage Polytechnic College, Edavanna, Kerala, India.

**Abstract:** Now a days Cleaning is the main basic need for all human beings and it is necessary for daily routine process. The manual operated dust collecting vehicle is most widely used in many applications such as roads, railway stations, airports, hospitals, Bus stands, colleges etc. Also this machine uses human energy for its working operation. It is a user friendly as well as eco-friendly and economical too. The manual dust collector, we introduce through our project is mainly useful for collecting all kind of dusts from home, play grounds such as cricket ground, football ground. It consist of cleaning brush, storage tank, collecting trays and locomotive parts.

The parts and working involved in this project worked based up Karl. T. Ulrich product design and development method, so that it is very reliable low cost and user friendly. This working prototype is used for college campus for cleaning purpose

**Keywords:** Cleaning, road, floor, conventional, economic

## I. INTRODUCTION

Pure, clean air is nature's gift to mankind and every living being has a right to it. But in today's world, a deep breath of pure, clean air appears to be a luxury thanks to an alarming increase in pollution levels. If technical and industrial advancement have brought us many commercial successes and comforts, they have also brought the gigantic concerns of pollution and its effect on environment. These concerns pose a serious hazard to the health of mankind not only today, but forever. It is high time that we complement our technological advancement with great responsibility and give back to our world simple pleasures like a deep breath of pure air. As individuals we could make a big difference at our workplaces if we understand the processes and various equipment's used for pollution control. Many industries such as woodcutting, furniture building, plastic cutting, and metal working among others operate under conditions that create a lot of dust and sand. Efficient dust controlling systems control dust pollution and aid us in our objective and these dust and sand also collected in a storage tank. Dust collectors are devices that filter dust from polluted air generated by industrial processes and discharge clean air into the environment. Efficient dust collectors protect employees and society from exposure to pollution, recover product from the dust filled air and facilitate compliance with health and air emission standards.

## II. PRODUCT DEVELOPMENT PROCESS

This product "MANUAL DUST COLLECTING VEHICLE" carried based on KARL .T. ULRICH'S product development process

### Product Development Process



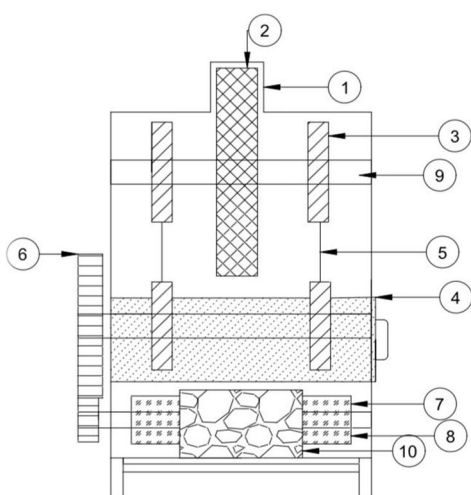
Project management is necessary throughout the development process.

Fig.1 Product development process

### III. DESIGN AND FABRICATION



Fig.2 Design of Manual Operated Dust Collecting Vehicle



1. OUTER FRAME
2. CYCLE WHEEL
3. SPROCKET
4. DUST COLLECTING TRAY
5. CHAIN
6. SPUR GEAR
7. ROTATING DUST COLLECTING BRUSH
8. SHAFTS
9. SHAFTS
10. BIG WASTE COLLECTING TRAY

Fig.3 2D view of Manual Operated Dust Collecting vehicle

#### A. Materials

In this work components used as given below,

- 1) *Wheels:* Use one wheel it having diameter of 609.6mm. As shown in the figure3(a).
- 2) *Shaft:* The shaft length 500mm long and 25mm diameter. As shown in the figure3(b).
- 3) *Chain:* Total chain length used 1219mm of 75 numbers. As shown in the figure3(c).
- 4) *Supporting wheels:* Diameter of wheel 200mm. As shown in the figure3(d).
- 5) *Handle:* For the handle we are using two rods they are usually in bending shape. One of the rod length is 1092.2mm and another small rod of size is 685.8mm . For these two rods a vertical shape of rod is connected of length 203.2mm for this vertical rod an horizontal rod is attached of size of 457.2mm and the height adjustment is made with the rods.
- 6) *Gears:* Use two gears driver and driven the smaller gear has a diameter of 50mm , and the larger gear has diameter of 130mm As shown in the figure3(e).
- 7) *Bearings:* Bearings having an outer diameter of 60mm and inner having a 50mm diameter. As shown in the figure3(f).
- 8) *Brush:* Brush having a length of 480mm long and outer diameter of 250mm and inner diameter of 20mm .As shown in the figure3(g).
- 9) *Collecting box:* The function of the collecting box is to collect the dust up to some quantity after that remove box and dump the waste. The dimensions of the collecting box measures length of 546mm and width 233mm .As shown in the figure3(a).

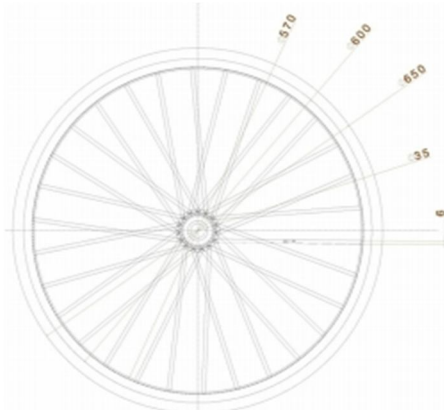


Figure 3(a).Wheel



Figure3 (b).Shaft

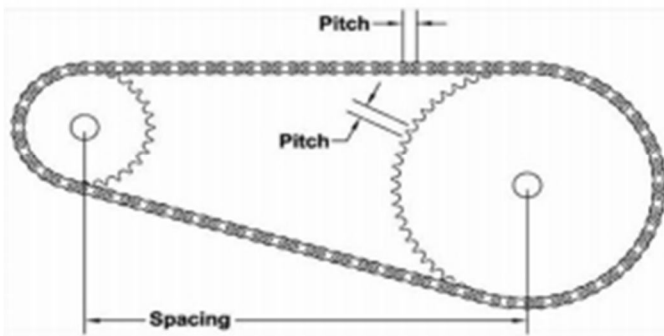


Figure3(c).Chain

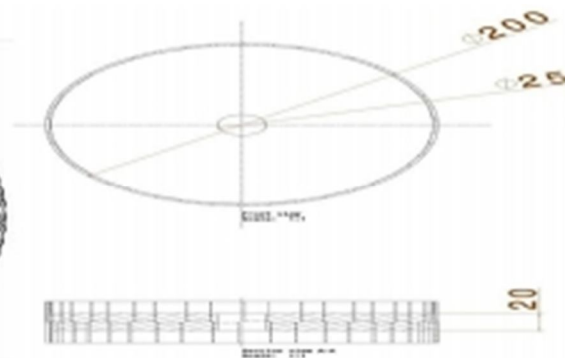


Figure3(d).Supporting wheel

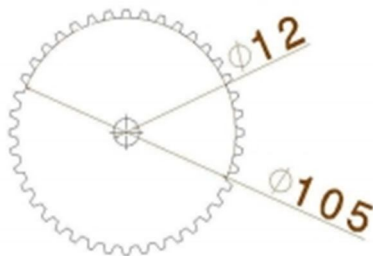


Figure3 (e).Gear

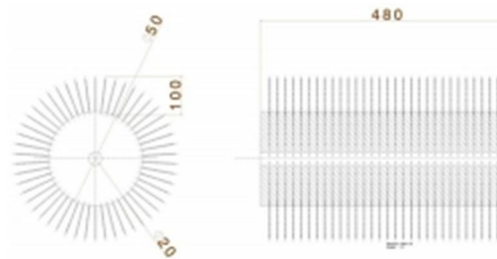


figure3 (g).Brush

#### IV. FABRICATION TECHNIQUES USED AND ASSEMBLED MODE

Fabrication process is carried out by using following operation as given below.

Welding, grinding, drilling and cutting these process are performed as shown in the following figures



Fig.4Welding



Fig.5Grinding



Fig.6Drilling



Fig.7Cutting



Fig.8Assembled model

### V. BLOCK DIAGRAM

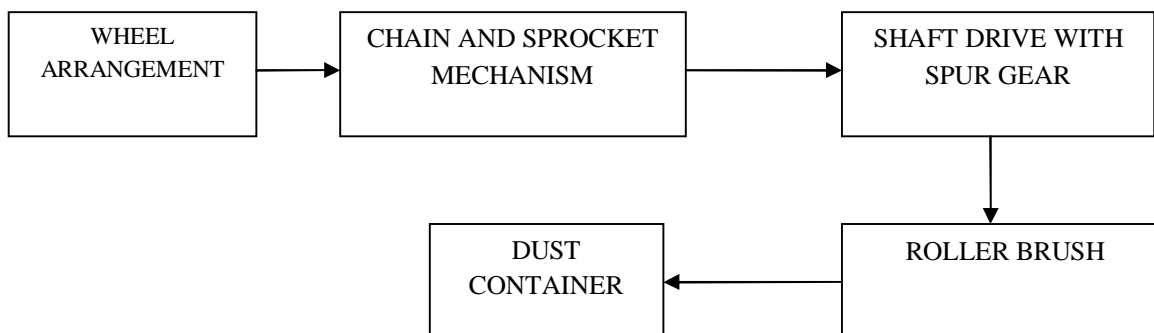


Fig.9 Block diagarm

### VI. WORKING PRINCIPLE OF ROAD CLEANING MACHINE

The manual operated dust collecting vehicle consist of frame stand, cycle wheel, sprockets, dust collecting tray, chain, spur gear, rotating brushes, shafts and the big waste collecting tray. The system is fixed with a cycle wheel, which are connected with the help of shaft and bearings, the two sprockets are also fixed at the end of the other shaft. This sprockets and freewheel are to be connected with chain. The chain is drives according to the movement of wheel and gear. The wheel are moved for a desired position with the help of manual force. The brush moving opposite direction of the wheel move and the brush brooms the dust present on the roads, also it dumps the waste into the waste collecting box. The dust collecting box is removed to dump the waste in to desired places. The big wastes like crushed bottles, pappers, etc can take from ground by human risk and dump into the big waste collecting tray.

### VII. ACKNOWLEDGEMENT

We extend our deep sense of gratitude to our project guide Mr. Rashid . MP, Assistant Professor, Department of Mechanical Engineering for providing us with valuable guidance and whole hearted encouragement throughout the project. We express our sincere thanks to Mr. Mansoor Ali PP Principal, Orphanage Polytechnic College Edavanna for the support and constant encouragement. We express our sincere gratitude to Mr. Binu. KK ,Head of Department, Department of Mechanical Engineering for the support and constant encouragement. We thank all the teaching and non-teaching staffs, our classmates and friends for sharing their knowledge and valuable suggestions.

**VIII. RESULT AND DISCUSSIONS**

The product is produced, even considering the high material cost, it is easier to construct and less consumption of energy as compared to other fabrication materials, process, assembling, drilling, cutting and painting are simple. This vehicle cleans hundred square feet area with in 6.5 minutes and large amount of dusts are to be collected.

Table 1 Comparison with conventional machine

SI NO	CRITERIA	MANUAL DUST COLLECTING VEHICLE	OTHER TYPE DUST COLLECTING MACHINE
1	COST	Low cost	High cost
2	ELECTRICITY	Not required	Required
3	OPERATION	Easy	Difficult
4	MAN POWER	Needed	Needed
5	MAINTANANCE	Low	High
6	WEIGHT	Heavy	Low weight compared to manual dust collector
7	TIME TAKEN FOR CLEANIG 100 Sq.ft AREA	6.5 minutes	10 minutes
8	LUBRICATION	Required	Not required
9	CONSTRUCTION	Simple	Difficult

Table 7.2 Financial analysis

SI NO	DESCRIPTION	COST
1	COST OF PRODUCTION 1. total recurring expenditure 2. price of product	6060 8000
2	PROFIT=Sales-cost of production =8000-6060	1940
3	PROFIT RATIO=(profit/price)*100 =(1940/8000)*100	24.2%
4	RATE OF RETURN =(PROFIT/INVESTMENT)*100 =(1940/6060)*100	32%

**IX. CONCLUSION**

This project work has provided us an excellent opportunity and experience, to use our limited knowledge. We gained a lot of practical knowledge regarding, planning, purchasing, computing and machining while doing this project work. We feel that the project work is a good solution to bridge the gates between institution and industries. We are proud that we have completed the work with the limited time successfully. The manual operated dust collecting vehicle is working with satisfactory conditions. We have done to our ability and skill making maximum use of available facilities. In conclusion remarks of our project work, let us add a few more lines about our impression project work. The chief advantage of our system is that, simple portable type low cost manual dust collecting vehicle when compared to other collectors which are available in market. Operating principle of manual dust collecting vehicle is also very easy. We can move the manual dust collecting vehicle from one place to another place very easily by providing back and front wheel arrangement and this working prototype is now use for college campus cleaning purposes.



## REFERENCES

- [1] MohsenAzadbakht,AliKiapey,AliJafari-“DesignandFabricationofatractorpoweredleavescollectorequippedwithsuctionblowersystem”-September, 2014Agric EngInt: CIGRJournalOpenaccessat<http://www.cigrjournal.org>Vol.16,No.3.
- [2] M.RanjithKumar,N.Kapilan-“DesignandAnalysisofManuallyOperatedFloorCleaningMachine”- InternationalJournalofEngineeringResearch&Technology(IJERT)ISSN:2278-0181IJERTIS040912[[www.ijert.org](http://www.ijert.org)]Vol.4Issue04, April-2015.
- [3] Sandeep.J.Meshram,Dr.G.D.Mehta-“DesignandDevelopmentofTricycleOperatedStreetCleaningMachine”- JournalofInformation,KnowledgeAndResearchInMechanicalEngineeringISSN0975-668X[Nov15ToOct16]Volume-04,Issue-01.
- [4] Karl T. Ulrich and Steven D. Eppinger (McGraw-Hill 1995, 2000, 2004, 2008
- [5] M. RANJITH KUMAR,A Technical Aanalysis Of Autonomous Floor Cleaning Robots Based On US Granted patents,European International Journals Of Science And Technology vol 2 no. 7 september 2013,199-216
- [6] Dr.M VARAPRASAD RAO, Design of Dust Collector for Rear Wheel of Four-Wheeler, International Journal of Emerging Technology and Advanced Engineering, Volume 3, Issue 7, July 2013, 199-216
- [7] Abhishek Chakraborty, Ashutosh Bansal, (2013). Analysis of design and purchase decision of central dust collection system. Global Journal of Research In Engineering.
- [8] Aman khan, Anurag Pannase, Amol Sharnagat,. (2017). Study of multipurpose road cleaning machine. International research journal of engineering and technology, 4(2), 1382-1386.
- [9] Meshram, S., & Mehta, G. (2016). Design and development of tricycle operated street cleaning machine. mechanical engineering designing, 702-706.
- [10] Kv Venugopalan,V Praburaj.engineering drawing,New age international publishers
- [11] Ghosh, R., et al. (2016). Design and fabrication of a pedaloperated floor mopping machine.[www. slideshare/fabrication of a mopping machine.com](http://www.slideshare/fabricationofamoppingmachine.com)



10.22214/IJRASET



45.98



IMPACT FACTOR:  
7.129



IMPACT FACTOR:  
7.429



# INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Call : 08813907089  (24\*7 Support on Whatsapp)