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Design and Fabrication of Beach Cleaning Equipment

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ABSTRACT: Main objective of our project is to clean beaches. Abstract-Beaches are one of the main tourist attractions in the coastal parts of India. They are also the most polluted. Most government neglected cleaning of beaches. The main reason being the difficult nature of cleaning it. It takes up lot of resources and time. The workers need to manually pick the waste. The waste when thrown in the sand gets covered with the sand by the heavy coastal winds. This makes the spotting of waste difficult. It is difficult for the workers to clean as they have to dig each cubic feet to collect the waste. The heat and humid climate of the beaches makes the working conditions worse. Many organizations and government bodies are taking several steps to get rid of the waste accumulated in beaches more effectively. India has a long stretch of coastline of about 7517 Km with nearly 170 famous beaches both on eastern and western coasts. Our aim of work is to design and fabricate the beach cleaning machine. We have created a simple economical design so that it will be easy for maintenance and use The machine is environment friendly and can run in any conditions offered by the beach. We have designed and manufactured a beach cleaning machine which is both cheap and easy to use. It does not have a huge learning curve.

I. INTRODUCTION

1.1: WHY IS BEACH CLEANING NECESSARY.

The large volume of marine debris is one of the main threats to aquatic ecosystems worldwide. Marine life is now exposed to adverse effects like the injection of polymers, consumption of debris as food, entangling into ropes, plastic can holders, nets, and other debris. In addition to the pollution of land as well as water, plastic deposition is another major problem because its decomposition takes a much longer time as compared to other materials. As a consequence, the fertility of the sand on the coast is reduced. The pollution of the coastal environment limits our ability to use beaches for economic, recreational, and aesthetic purposes. It further degrades and destroys the unique beach habitat required for animals and plants to thrive. A polluted beach is a threat to public health which leads to a reduction in the property value and hence gets in the way of the economic growth of the community. Every year approximately eight million tons of plastic waste including fragments and bits of constant polluting plastics gets deposited on the beaches and is swept away by the waves into the ocean. Despite the efforts of people participating in the beach cleaning drives, the magnitude of the beach debris is such that it is difficult to be able to collect . The Beach cleaning equipment is specifically designed to pickup the waste on sand like Plastic cans, waste bottles, papers and other plastic wastes.



Fig.1.1 : Plastic cans, covers and other waste deposited on the 2022-23

1.2: DIFFERENT METHODS OF BEACH CLEANING

Manual picking up of trash.

Manual cleaning involves individuals picking up trash exclusively by hand. This way of picking of trash is effective but hard, a person should walk around the shore in search of trash And Pick the trash manually with his hands. It's hard to walk on beach normally due to climatic conditions of coastal areas, which effects the health of a person. A person should bend each time to pick the trash from the Sand which affects the back bone of human. Its hard to carry the trash in sacs and walk around the beach .Since there are many kinds of species settled in sand which inturn can be present on trash and it can harm the Person cleaning the beach so keeping all these in mind even though this method of cleaning beach is effective It is not preferred due to its effects.

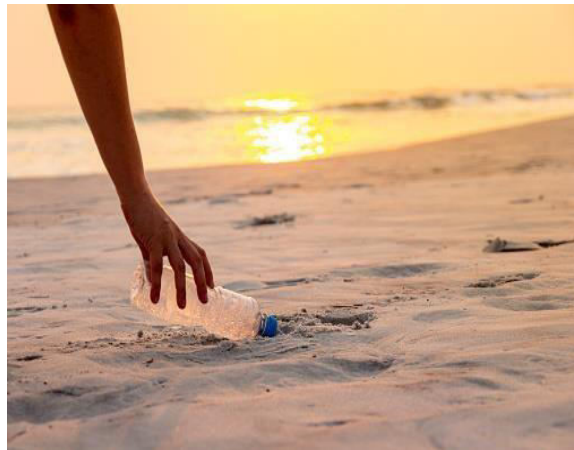


Fig.1.2 : Human picking up bottle manually with hand.



Fig.1.3 : Human carrying trash sac along with him on

Surf rake beach cleaning machines are effective in removing beach pollution such as seaweed, dead fish, glass, syringes, plastic, cans, cigarettes, shells, stone, wood and virtually any unwanted debris. Surf rake beach cleaning machines are even used to effectively remove oil and tar balls from beach sand after oil spill disasters.

- The beach cleaner's moldboard levels uneven areas in the sand to ensure an even surface for cleaning and controls the cleaning depth. It also guides the machine over large submerged objects, which protects the conveyor system and promises low-maintenance operation for the duration of the beach cleaner's life.
- Offset, individually replaceable stainless steel tines mounted on a belt-covered bar flight conveyor then rake debris from the sand toward the adjustable moldboard deflector plate, removing surface and submerged debris with ease.
- Refuse bounces off the beach cleaner's deflector moldboard and is deposited on the elevating portion of the conveyor, which transports the refuse to the hopper, while residual sand falls through the perforation in the conveyor.
- Finally, the hopper/bucket of the beach cleaner can be hydraulically raised and tripped to dispose of its contents into a truck or container up to 9 feet high.



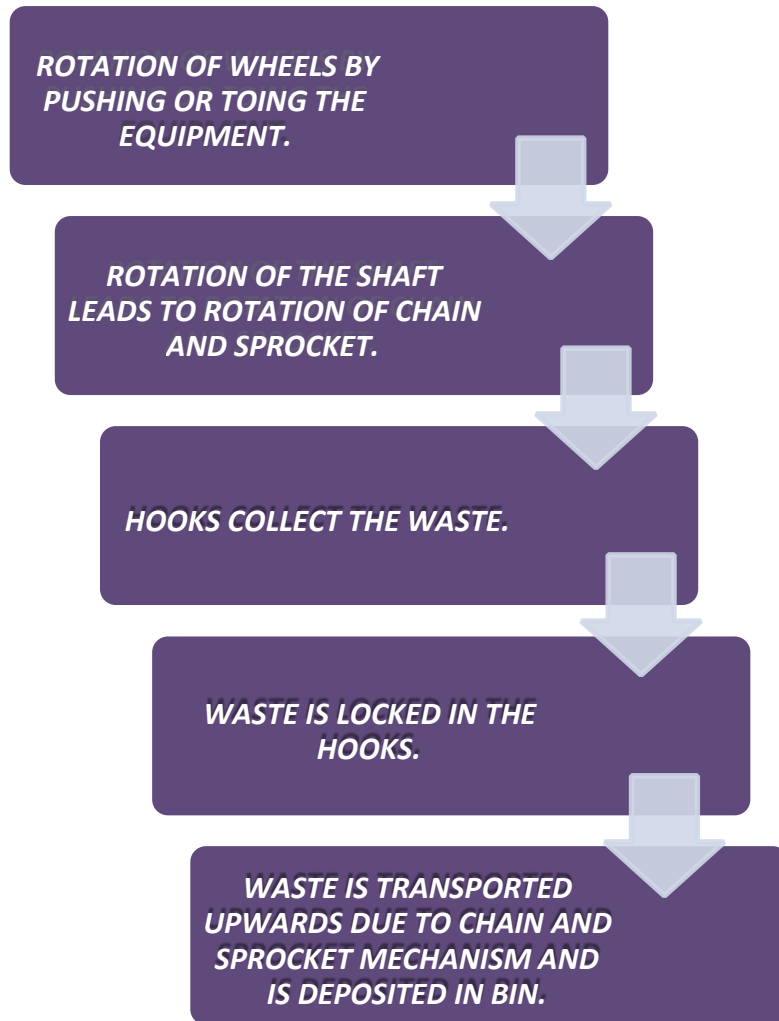
Fig.1.4: Surf Rake : Tractor towed beach cleaner machine.

II. LITERATURE REVIEW

1. Design and analysis of sustainable beach cleaner [2022] **H. Ebrahim, W. Sheikh, A. Saeed**. This paper analyzes various beach cleaner projects with the motive of eradicating the limitations they consist of. It also presents a detailed study of the functionality of these beach cleaners along with the motion and stress graphs of the same. The designed machine is a combination of different features adapted from their research. The mechanism of the machine is a simple chain sprocket arrangement wherein the sprocket turns the chain and the rakes attached to the chain lift the trash.[1] This prototype is operated by pushing the machine which might be hard in order to avoid this we used a motor so it can easily move.
2. Manufacturing of Beach cleaning Machine at UMS prototype design and analysis [2021] **N. Bolong, I. Saad, M. Amran Madlan**. In this paper, the team has assembled a beach cleaner by integrating both raking sifting mechanisms. It consists of a sprocket chain arrangement with components like a collector, conveyor, motor, and gears which requires manual handling of the machine. The main objective was to fabricate a simple and budget-friendly beach cleaning machine feasible for one person to handle. The paper also includes a detailed examination of the operation of the prototype, on-site testing, and user survey.[2] This prototype is operated manually. Keeping in mind the detailed examination and results of the survey presented in this paper we have improved upon the fabrication and used more strong material and have tried to reduce the weight of it to make it easily portable.
3. Design and Fabrication of Beach Sand Cleaning Machine [February 2020] **V. Mepani, H. Patel, Vataliya Mohil, Prof. R. Sahu**. This paper describes the fabrication of an inexpensive manually operated sand cleaning machine along with the analysis and comparison of various methods employed for cleaning beaches. When the machine is pushed forward the motion of the machine leads to the movement of the conveyor. The rotation of the shaft indirectly rotates the conveyor belt and further the spokes mounted on the belt locks in the debris which is then transferred up the conveyor belt and is deposited in a container it can efficiently remove debris, it cannot be used for smaller areas and beaches with sensitive habitats.
4. Design and fabrication of beach cleaning machine [2019] **V. Dhole, O. Doke, A. Kakade, S. Teradale, Prof. R. Patil**. This paper presents design and construction of a mechanical beach cleaner and it discusses the various techniques and technologies applied for cleaning beach debris. The proposed system consists of motor chain drive system wherein the motor drives the chain which is connected to the lifters that collect the debris and deposits it in a container. The sand is sieved through the lifter teeth back to the sand bed and is levelled with the help of a bend plate. The main objective of this system is to provide a semi-automatic and a better alternative for beach cleaning as compared to the time consuming and labour-intensive process of picking debris and sifting the beach manually. [5] Beaches with fine grained sand and low gradient have high moisture content. The machine will collect and aerate the sand and dry it out causing the erosion of finer sand. The mesh in our proposed system will sieve the finer sand keeping the sand bed intact.
5. Prevalence of marine litter along the Indian beaches: A preliminary account on its status and composition[2017] **P. Kaladharan et al**. This paper sheds light on the condition and composition of beach litter along certain coasts of India. It presents a detailed study which discusses the results of a survey that assessed the quantity and quality of beach litter from 254 selected beaches along the coast of India as well as the Union Territories of Andaman and Lakshadweep Islands. The paper suggests colour coding the beaches to identify critically polluted

beaches and assist the planners and policymakers to adopt stringent measures. It also suggests that the origin of all plastic waste being land, control measures need to start from land by tackling the issue at production as well as disposal level. This paper showcases the need for beach cleaning for preservation of our natural treasures.

III. METHODOLOGY



IV. FABRICATION

4.1 : Components

➤ K2 CHAIN:

The chain used here is specialized K2 chain. These chains are provided with attachments to which the claw plates can be bolted. These are bolted on to the shaft in order to give chain and sprocket mechanism.



➤ **TIRES:**

A tire or tyre is a ring-shaped component that surrounds a wheel's rim to transfer a vehicle's load from the axle through the wheel to the ground and to provide traction on the surface over which the wheel travels.

➤ **BEARING:**

A bearing is a machine element that constrains relative motion to only the desired motion, and reduces friction between moving parts. The design of the bearing may, for example, provide for free linear movement of the moving part or for free rotation around a fixed axis; or, it may prevent a motion by controlling the vectors of normal forces that bear on the moving parts.



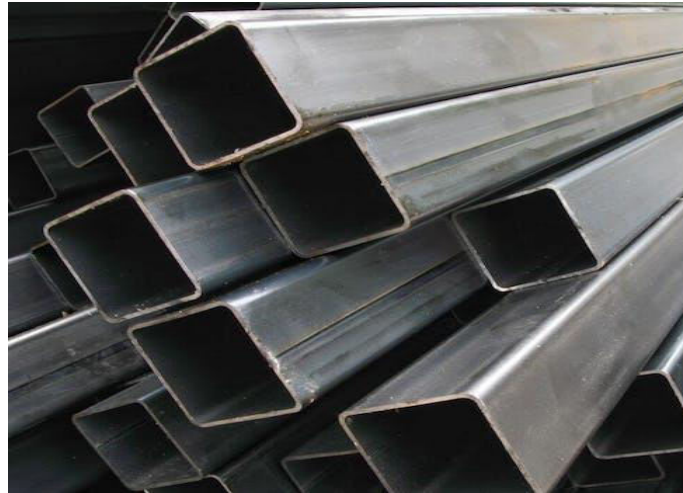
➤ **SPROCKET:**

A sprocket, sprocket-wheel or chainwheel is a profiled wheel with teeth that mesh with a chain, track or other perforated or indented material. The name 'sprocket' applies generally to any wheel upon which radial projections engage a chain passing over it. Sprockets are used in bicycles, motorcycles, tracked vehicles, and other machinery either to transmit rotary motion between two shafts where gears are unsuitable or to impart linear motion to a track, tape etc. Perhaps the most common form of sprocket may be found in the bicycle, in which the pedal shaft carries a large sprocket-wheel, which drives a chain, which, in turn, drives a small sprocket on the axle of the rear wheel.



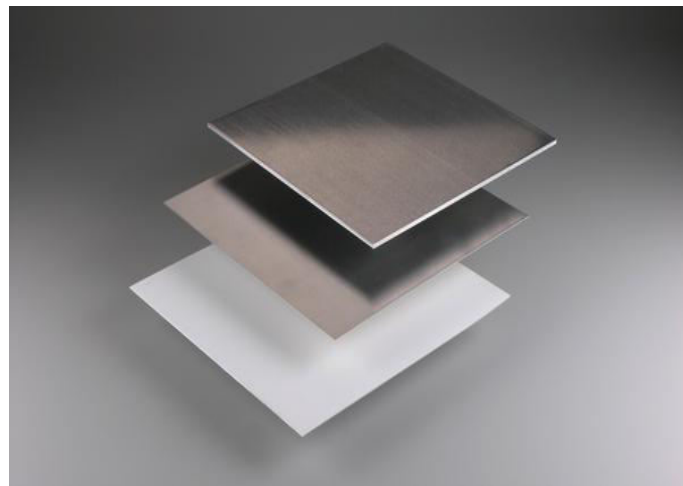
➤ **ALLOY STEEL:**

The material used for the fabrication of the primary frame is ASTM 106 Grade B MS pipes. ASTM A106 Grade B is a mild steel pipe material commonly used in industrial plants, power plants, refineries and chemical plants which is typically seamless and comes in three grades A, B, and C with grade B being the most commonly used grade.



➤ **SHEET METAL:**

Sheet metal is metal formed into thin, flat pieces, usually by an industrial process. Sheet metal is one of the fundamental forms used in metalworking, and it can be cut and bent into a variety of shapes.



V. CAD MODEL

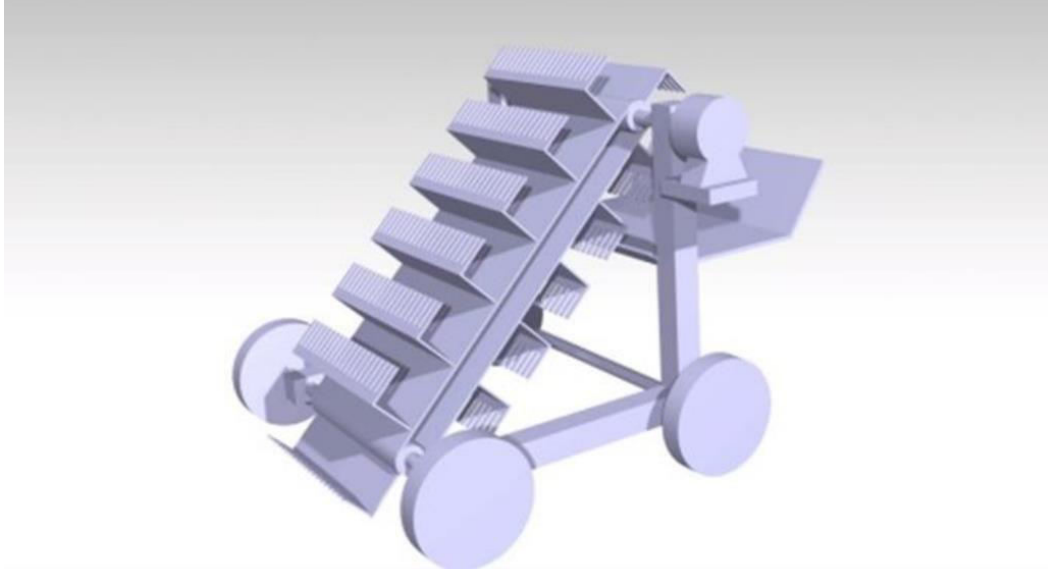


FIG 5.1 : 3D CAD MODEL

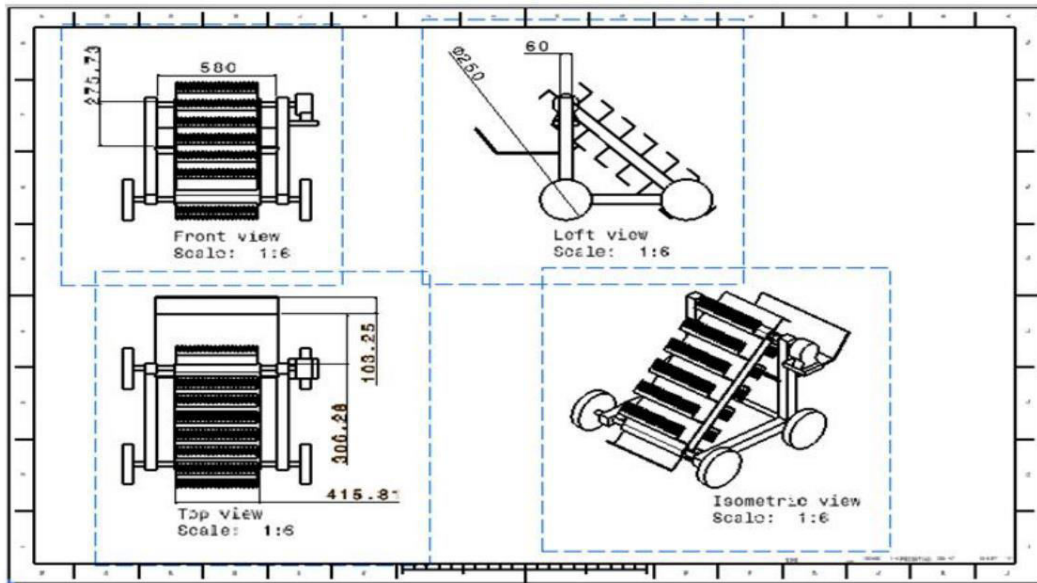


FIG 5.2 : 2D CAD MODEL

VI. CONCLUSION

The beach cleaning equipment is successfully designed and fabricated. This unit has been manufactured by employing fabrication techniques like welding ,drilling , lathe operation. Upon testing , It is observed that with further modification like automation and sensory usage, This system can be made self operated in future.

REFERENCES

1. **H. Ebrahim, W. Sheikh, A. Saeed**, “Design and analysis of sustainable beach cleaner”, 3C Technology. Glosses of innovation applied to SMEs, Special Edition, ISSN: 2254-4143, <https://doi.org/10.17993/3ctecno.2022.specialissue9.167-179>, 14 Feb 2022.
2. **N. Bolong, I. Saad, M. Amran Madlan**, “Manufacturing of Beach Cleaning Machine at University Malaysia Sabah (UMS) Prototype Design and Analysis”, Transactions on Science and Technology, Volume: 08, No. 3-2, 281 - 289, 02 Nov 2021.
3. **Prof. J. Shelke, B. Bhakare, K. Lute, A. Pateshwari, H. Khodiyar**, “Beach cleaning system and surface cleaning system”, International Research Journal of Modernization in Engineering Technology and Science, Volume:02, Issue:06, e-ISSN: 2582- 5208, June 2020.
4. **V. Mepani, H. Patel, Vataliya Mohil, Prof. R. Sahu**, “Design and Fabrication of Beach Sand Cleaning Machine”, International Research Journal of Engineering and Technology, Volume: 07, Issue: 02, e-ISSN: 2395-0056, p-ISSN: 2395-0072, Feb 2020.
5. **V. Dhole, O. Doke, A. Kakade, S. Teradale, Prof. R. Patil**, “Design and fabrication of beach cleaning machine”, International Research Journal of Engineering and Technology (IRJET), e-ISSN: 2395-0056, Volume: 06 Issue: 04, Apr 2019.
6. **C. Balasuthagar, D. Shanmugam, K. Vigneshwaran**, “Design and fabrication of beach cleaning machine”, IOP Conf. Series: Materials Science and Engineering 912 (2020) 022048 IOP Publishing doi:10.1088/1757-899X/912/2/022048, 2020.
7. **P. Kaladharan, K. Vijayakumaran, V. V. Singh, D. Prema, P. S. Asha, Bindu Sulochanan, P.**
8. **Hemasankari, L. Loveson Edward, Shelton Padua, S. Veena, A. Anasukoya H. M. Bhint**, “Prevalence of marine litter along the Indian beaches: A preliminary account on its status and composition”, Journal of Marine Biological Association of India, Volume: 59, No 1, June 30, 2017.
9. **Prathamesh Jangam, Sneha jangam, Rutuja kadu, Mubbashir Kazi, Prof. Sanobar Shaikh**, “Beach Cleaning Robot”, International Research Journal of Engineering and Technology (IRJET), ISSN: 2349-6002, Volume:6 Issue:12, May 2020.
10. **Ramamoorthi R, Ramachandran N, Nikiles PD, Jayasurya R, Natheesh MD, Nithin K Biju**, “Design and fabrication of beach cleaning machine”, International Journal of Innovative Technology and Exploring Engineering, ISSN:2278-3075, Volume: 08, Issue:12, Oct 2019.
11. **D. Vaishnavi, Sabeesh Kumar.S**, “Swachh yantramanav: A multipurpose cleaning robot”, International Journal of Innovative Science and Research Technology, ISSN:2456-2165, Volume:02, Issue:05, May 2017.
12. **M.Bhavani, S.Kalaiselvan, S.Jagan, S.Gopinath**, “Semi-Automated Wireless Beach Cleaning Robot Vehicle”, International Journal of Recent Technology and Engineering (IJRTE), ISSN: 2277- 3878, Volume:8 Issue:1S2, May 2019.
13. **Dr. F B Sayyad, Dr. Md. Imran Ansari, Dr. S F Sayyad**, “Design and Development of Beach Cleaning Machine”, International Journal for Research in Applied Science & Engineering Technology, ISSN: 2321-
14. **R Praveen, L Prabhu, P Premjith, Adarsh. K. Mohan, Ajayraj**, “Design experimental of RF controlled beach cleaner robotic vehicle”, IOP Conf. Series: Materials Science and Engineering 993 (2020) 012030 IOP Publishing doi:10.1088/1757- 899X/993/1/012030, 2020.
15. **S. Das, P. Jha, A. Chatterjee**, “Assessing Marine Plastic Pollution in India”, IEG Working Paper No. 389, Apr 2020.
16. **Zhai Yuyi, Zhou Yu, Luo Huanxin, Liu Yunjia, Liu Liang**, “Control System Design for a Surface Cleaning Robot” International Journal of Advanced Robotic Systems, Volume:10, Feb 2013.
17. **Ankita Paste, Prerna Pisal, Ameya Shinde, Tanvi Upaskar, Dr. Baban U Rindhe**,” Smart Beach Cleaner Vehicle”, ISSN: 2581- 4419, Volume:1 Issue:1
18. **Amit Kumar Yadav, Animesh Singh, M. A. Murtaza, Ajendra Kumar Singh**, “Eco Beach Cleaner”, International Journal of Engineering and Management Research, ISSN (ONLINE): 2250-0758, ISSN (PRINT): 2394-6962, Volume:08, Issue:03, June 2018.
19. **Francisco Cuellar et al.**, “IEEE Open Category: Beach cleaner”, Team PUCP – Team Description paper, LARC 2013.
20. **Kuson Prakobkarna, Banyat Saitthitib, Sakda Intaravichib**,” Design and Construction of Beach Cleaning
21. **Trailer by Finite Element Method**”, International Transaction Journal of Engineering, Management, & Applied Sciences & Technologies, ISSN:2228-9860, eISSN:1906-9642, Volume:03, No.02, 2012.



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