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Department of Mechanical Engineering
RVR & JC College of Engineering, GUNTUR - 522 019

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Robotic Crawler Inspects Concrete Structures

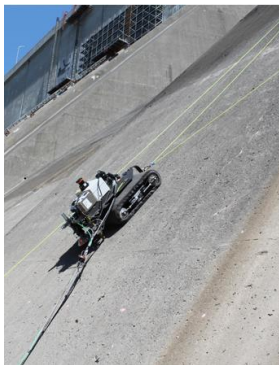
Properly maintained concrete cooling, containment, and impoundment structures are essential for the long-term safety and operation of steam-electric power plants, hydropower facilities, and other industrial sites. However, many of these concrete structures are at least 40 years old and beginning to deteriorate. This includes critical structures such as cooling towers, nuclear containment buildings, reactor cavities, spent fuel pools, hydroelectric dams, and wind turbine foundations. Much of the degradation is caused by poor construction practices, but design deficiencies and outdated operational and maintenance practices also can damage the concrete.

Proper accessibility to the key areas of the structure is often challenging; manual inspections are also labor-intensive, costly, and sometimes dangerous. Conducting these tests is easier and less expensive with automated, robotic sensing devices, which also allow more frequent inspections. Although some of these devices are on the market today, their capabilities and accuracy tend to be limited.

To address these deficiencies, the Electric Power Research Institute (EPRI), Charlotte, NC, has developed a “robotic concrete crawler” for inspecting hard-to-reach concrete surfaces. The device is designed to:

- Reduce the challenges and costs of inspecting large concrete structures
- Improve worker safety
- Deliver more comprehensive data on concrete degradation and aging
- Support long-term operations of nuclear, renewable, and fossil generating assets.

Making the Grade



About the size of a lawnmower, the concrete crawler robot can climb the surfaces of large power industry structures and assess structural integrity, using on-board instrumentation and nondestructive evaluation technologies to measure concrete properties. It can negotiate concave, convex, or overhanging vertical structures, carrying a payload of equipment that weighs more than 40 pounds. A vacuum chamber generates more than 225 pounds of adhesive force and is surrounded by a rolling foam seal that guards against leakage and facilitates propulsion. The adhesion is so strong that it would require more than 50 pounds of force to dislodge the robot from a smooth concrete surface.

“The concrete crawler employs a commercially available robotic platform, which is flexible and can accommodate several different types of sensing systems, depending on the type of degradation that affects the structure,” says Maria Guimaraes, project manager for EPRI’s nuclear sector. Onboard systems include simultaneous localization and mapping (SLAM) technology and advanced non-destructive evaluation (NDE) instrumentation developed for concrete applications.

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Research Papers Published in Journals :

- J.P.Karthik , K.L.Chaitanya , C.Tarasasanka , " *Fatigue life prediction of a parabolic spring under non – constant amplitude proportion loading using finite element method*", International Journal of Advanced Science and Technology , Vol 46 , September 2012. Pp:143-156.
- J.P.Karthik , K.L.Chaitanya , C.Tarasasanka, " *Life assessment of a parabolic spring under cyclic stress & cyclic strain loading using finite element method*", International Journal of Mechanical and Industrial Engineering(IJMIE), Vol -2 , Issue-1, 2012. Pp:36-43. ISSN: 2231-6477.
- Reddy Srinivasulu , Ch. Srinivasa Rao , " Application of grey relational analysis for surface roughness and roundness error in drilling of Al 6061 alloy", international journal of lean thinking , Vol 3 Issue 2 (December 2012) pp:67-78. ISSN : 2146-0337.
- Reddy Srinivasulu, " Simulation of Desired end point trajectory for a 2dof planar manipulator", International journal of advanced scientific and technical research, Issue 2 volume 5 October 2012 page 688-696. ISSN : 2249-9954.
- Reddy Srinivasulu , Ch. Srinivasa Rao , " Determination of optimal combination of drilling parameters to minimize the burr height and thickness for Al6061 alloy using grey relational analysis", international journal of advances in Sciences and technology , Vol 5 Issue 4 2012 October issue pp:09-16. ISSN : 2229-5216
- Dr. Goteti chaitanya , Dr. Kolla Srinivas , " Multi objective evolutionary optimization techniques based on non domination principle - A Review" , International journal of advanced scientific and technical research , Issue 2 , Vol 5 , October 2012 pp:563-572 ISSN : 2249-9954.
- C.Tara Sasanka ,V.Rama Koteswara Rao, K.Ravindra,Ch. Tirumala rao " *Prediction of transient response of isotropic and laminated cylindrical shells using ANN* ", International Journal of Technological synthesis and Analysis, Vol 1 Issue 1 December 2012. Pp:1-6. ISSN: 2320-2386.
- Bhuvanagiri Ravi Sankar, DameraNageswaraRao, ChalamalasettiSrinivasaRao " *Experimental investigation on stability of Al₂O₃- Water Nanofluid using response surface methodology*", International Journal of NanoScience and Nanotechnology, Volume 3, Number 3 (2012), pp. 149-160. ISSN : 0974-3081.
- Ravi Sankar.B, NageswaraRao .D ,Srinivasa Rao.Ch, " *Nanofluid Thermal conductivity-A Review*" International Journal of Advances in Science and Technology, Volume 3, Number 3 (2012). ISSN : 2231-1963.
- N.Surekha , Dr. K. Srinivas , Ch. Devaraj , K. Sreekanth , "Optimization of Principal dimensions of radial flow gas turbines using GA" , International Journal of Scientific and Engineering Research (IJSER) , Vol 3 Issue 12 December 2012 ISSN:2229-5518 pp:1-6.
- Srinivasarao,G. and Neelakanteswararao, A., ‘ Comparison of central composite and orthogonal array designs for cutting force and surface roughness prediction modeling in turning’, International Journal of Materials and Production Technology,Vol. 43, No.1-4, July, 2012, pp.144-164.**
- Venkata Siva S. B, G. Srinivasarao, Mahesh Kumar M," Study of phase transformations in EN8 steel material using acoustic emission technique " – International Journal of Applied Sciences and Engineering Research, Vol. 3, No.3,2012, pp.541-550.
- M. Gopi Krishna, K.K.Kishore, K. Praveen Kumar, J. Babu Rao & N.R.M.R. Bhargava, 'Studies on Deformation Behaviour of A356/Al-20Cu-10Mg Particulate Composite Metallic Materials' International Journal of Engineering Research & Technology (IJERT), Vol. 1 Issue 10, December- 2012. ISSN: 2278-0181. PP:1-6.

Research Papers Published in Seminars/Conferences/Workshops(with ISBN no):

- V.Suresh Babu , C.Tara Sasanka , K.Ravindra, " *Failure and stress analysis of GFR Laminated Composite pinned joints*", published in the proceedings of International Conference on Mechanical and Industrial Engineering(ICMIE), pune on 15th July, 2012. Pp:149-155. ISBN: 978-93-81693-74-2.
- J.P.Karthik , K.L.Chaitanya , C.Tarasasanka, " *Life assessment of a parabolic spring under cyclic stress & cyclic strain loading using finite element method*", published in the proceedings of International Conference on Mechanical and Industrial Engineering(ICMIE), Bangalore on 22nd July, 2012. Pp:44-50. ISBN: 978-93-81693-70-4.
- Reddy Sreenivasulu, Dr. Ch.Srinivasa Rao, Ch.Devaraj , " *Optimization of operating parameters to minimize burr size in drilling using taguchi method & grey relational analysis for A1 6061*" , International Conference on Challenges and Opportunities in Mechanical Engineering and Management Studies (ICCOMIM) at M.S.Ramaiah Institute of Technology, Bengaluru during 11th – 13th July 2012 Vol 3 pp: 829-833 ISBN no : 978-93-82338-05-5

Papers Published in Seminars/Conferences/Workshops :

- ✚ N.V.V.S. Sudheer , K.V.J. Rao , N. Rajesh , " Effect of Carburizing flame and oxidizing flame on surface roughness in turning of Aluminium Metal matrix composites" , Proceedings of 4th International AIMTDR Conference , organized by Jadavpur University, Kolkata, Dec 14th- 16th 2012PP:266-271.
- ✚ C. Srinivas , K.Ramji, B.Satyananarayana,R.Naveen " A Comparative study of GA and ACO Applied to Large size FMS " , Proceedings of 4th International AIMTDR Conference , organized by Jadavpur University, Kolkata, Dec 14th- 16th 2012 PP:854-860.
- ✚ Ramgopal Reddy. B , Siva K , Vinay Kumar M, Abbas Shareef Sk , " Investigation of mechanical properties of rice straw fiber reinforced polymers" , Proceedings of 4th International AIMTDR Conference , organized by Jadavpur University, Kolkata, Dec 14th- 16th 2012, PP:205-209.
- ✚ Srinivasarao,G. and Neelakanteswararao,A., "Effect of Nano cutting fluid on surface roughness in hard turning", Proceedings of 4th International & 25th AIMTDR conference, organized by Jadavpur University, Kolkata, Dec 14th- 16th 2012pp.281-286.
- ✚ Venkata Siva S B, Dr. K. L. Sahoo, Dr. S. K. Singh , Dr. R. R. Dash, Dr. R. I. Ganguly and Dr. G. Srinivasarao, "Development of Aluminium Metal Matrix Composite Using Colliery Shale: A Waste Product from Indian Coal Mines", Proceedings of International Conference on Powder Metallurgy & Particulate Materials, Nashville, Tennessee, USA, 10th-13th June. 2012, pp.9-01 to 9-13.

Seminars/Workshops/Conferences attended by the Faculty :

- ✚ J.Rangaraya Chowdary ,V. Ramakoteswara Rao, Asst. Prof , attended Two week staff development program on "Machine Condition Monitoring And Fault Diagnostics", organized by Department of Mechanical Engineering,V.R Siddhartha Engineering College, Kanuru, Vijayawada during 25th June – 7th July,2012.
- ✚ Dr. G. Chaitanya ,Assoc.Prof ,R. Sreenivasulu, Asst. Prof , attended One week faculty development program on "Optimization And Reliability In Engineering Design", organized by Department of Mechanical Engineering,V.R Siddhartha Engineering College, Kanuru, Vijayawada during 26th – 30th November,2012.
- ✚ Dr. G. Srinivasa Rao , Professor, C.Srinivas , B.Ramgopal Reddy , N.V.V. S. Sudheer ,Assoc.Prof ,attended and presented a paper in 4th International AIMTDR Conference , organized by Jadavpur University, Kolkata, Dec 14th- 16th 2012.
- ✚ K. Hanumanta Rao, G.R.N. Chowdary , attended "One day workshop on PLC", organized by Shri Vishnu Engineering College, Bhimavaram , on 22nd December,2012.

Department Activities

Seminars/workshops organized by the department :

- ✚ Department of Mechanical Engineering has organized a Two Day Robotics Workshop 'ROBOFEST-2012' during 23rd – 24th August, 2012 in association with MICROBOTX. Seventy Six students from different branches have participated in this Workshop.

Guest Lectures Delivered by the Faculty :

- ✚ Dr. G. Srinivasa Rao, Professor has delivered a guest lecture on " Design of Experiments and Taguchi Techniques" at Lakkireddy Balireddy College of Engineering , Mylavaram on 28-9-2012.

Guest Lectures organized by the Department :

- ✚ " Fits Operation and maintenance of Thermal Power Stations " by Sri. P.Sathya Narayana , Divisional Engineer, NTT Power station, Vijayawada on 21st November 2012.

Research Degree Conferred on the Faculty :



N. Govind , Asst. Professor, has been awarded Ph.D by Andhra University in Nov 2012 for his thesis entitled "Investigations On Friction Stir Welded And Friction Stir Processed Nano Sic Reinforced 6061aluminum Alloy". He was guided by Dr. D. Nageswara Rao and Dr. N. Ramanaiah of Department of Mechanical Engineering in Andhra University, Vizag.

Promotions to the Faculty :



Dr. G. Chaitanya , Asst. Professor in the Department of Mechanical Engineering has been promoted as Associate Professor w.e.f 01-07-2012.

Book Published :

- J. Purushotham Karthik , C. Tara Sasanka , K. Lakshmi Chaitanya published a book entitled, " Fatigue life prediction of a parabolic spring" with Lambert publishers in Nov 2012. ISBN: 978-3-659-29707-6.

Student Corner

Results Analysis :

	Total Appeared	Total Passed	Pass percentage
IV/IV II sem	137	135	98.54
III/IV II sem	125	93	74.40
II/IV II sem	139	89	64.03
I/IV B.Tech	171	133	77.78

SAE Colligate Club Started:

- SAE Colligate club in collaboration with SAE India started on 8th Aug 2012. Mr. Seshadri Sr. Asst. Director , Marketing SAEINDIA is the chief guest for the inauguration. and explained various activities and benefits for being the member of SAE Club all over the INDIA.



The RAJMEA like to know what is happening in your professional life. Visit the following website to update your information or let us know about your accomplishments: www.rvrjce.ac.in/mech