

6. Implementation of the Results

In this project, as it was mentioned before, a novel method for zeolite modification and a WWTT based on the application of modified zeolite was developed.

Implementation of the results described as “Criteria for Success” in the revised Project Plan and the achievements at the end of the project are the following:

Criteria for Success	Achievements
1. If before the end of the 2nd project year, the R&D work on zeolite modification is successfully completed	Three methods for zeolite modification (modification in suspension, modification with low water content, “dry” modification) were developed between 1999 and 2002
2. If before the end of the 2nd project year, a competitive industrial-scale technology for zeolite modification is developed	The development work on a low-cost industrial-scale technology for zeolite modification was completed in 2003, and a semi-industrial equipment for zeolite modification was constructed in 2003
3. If before the end of the project, patent applications describing the zeolite modification method and the ZeoRap technology to be developed are on the file with the US and the Hungarian Patent Offices	The Hungarian and the international patent applications were submitted to the Hungarian Patent Office and the PCT Office of Germany in 2000 and 2001 respectively. Hungarian patent was given for the zeolite modification method and the WWTT based on modified zeolite additive in 2004
4. If before the end of the 3 rd project at least 2 industrial partners representing actual wastewater treatment facilities regularly use the ZeoRap technology to treat wastewater	Four WTPs in Hungary regularly employ the ZeoRap [®] WWTT (WWTP of Szob, Dunakeszi, Dombóvár, Kiser)
5. If before the end of the 3 rd project the ZeoRap WWTT is authorized in Hungary by the National Water Authority	The ZeoRap [®] WWTT trade-marked in 2002 was authorized by the National Water Authority in Hungary in 2003. Authorization No. is F- 173.
6. If before the end of the project, the number of the articles published in peer reviewed paper is at least 3	<p>Three scientific papers have been submitted to the editorial board of the following scientific journals: (1) Measurement, (2) Hydrological News, (3) Water Environmental Science. The estimated year of publishing is 2005.</p> <p>Scientific and technical results of the project have been presented at three international and five national conferences. The presented papers have been published in the conference proceedings.</p>
7. If before the end of the project, industrial partner representing zeolite distributors regularly disposes of modified zeolites for wastewater treatment	Two companies (Unichem Ltd. and Bioteam Corp.) have regularly produced and disposed modified zeolite for WTPs since 2003.
8. If before the end of the project, the industrial partners representing academia are consistently teaching the ZeoRap technology to future wastewater scientists and engineers	<p>The Institute of General and Analytical Chemistry of the Technical University of Budapest and the Civil Engineering Department of University Florida have taught the analytical aspects of zeolite modification, as well as the ZeoRap[®] WWTT since 2003.</p> <p>The project had a PhD student at the Szent István University and a MSc student at the Ybl Miklós Technical High School.</p>

9. If at the end of the project, industrial partner representing the zeolite processing industry regularly produces zeolites modified with CAP for wastewater treatment	Two companies (Unichem Ltd. and Bioteam Corp.) have regularly produced modified zeolite since 2003. The total amount of modified zeolite produced within the lifetime of the project was 85,000 kg.
10. If at the end of the project, industrial partners representing consultants in the wastewater industry have included the ZeoRap technology in a new project	The Chematech Trading, Ltd. and the Uwatech International Consultant, Ltd. included the ZeoRap [®] WWTT in a Romanian (WWTP of Beszterce) and a Hungarian (WWTP of Debrecen) projects in 2004.
11. If two years after completion of the project, at least 30 wastewater is treated plants regularly use the ZeoRap technology in Hungary	<p>A more stringent effluent water penalty system was planned to introduce in Hungary on 1 January 2003. Standard values and penalties for COD, BOD₅, NH₄-N, total-N, total phosphorous and suspended solids, according to the new regulation (9/2002. (III.22.) KöM-KöViM decree) are summarized in Table A. Although the new standard values and penalties should have been introduced gradually over the next 15 years, introduction of the decree was postponed until 1 January 2005. It means that the economy of the ZeoRap[®] WWTT that is directly proportional with the environmental penalty will increase during 15-year transient period.</p> <p>In order that the production cost of ZeoRap[®] could be decreased the National Bureau for Research and Development in Hungary offered a financial support of 64,000 EUR for the development of a more effective industrial-scale equipment in 2004.</p> <p>Taking into consideration the increasing economy of the ZeoRap[®] WWTT, the estimated value of the ZeoRap[®] demand is 250,000 – 300,000 kg for the following two years. The estimated number of WTPs employing the ZeoRap[®] WWTT is 35- 40.</p>
12. If two years after completion of the project, the ZeoRap technology is used in the USA and third world countries, as well	<p>There is a number of potential end-users for the zeolite modification technology and ZeoRap[®] WWTT. The American and Hungarian project management have already started negotiations in the subject of technology transfer with Uwatech, Ltd., GeoExplorer, Inc., Boulder, Inc., Zeochem, Inc., CMH₂HILL, Inc. and International Council of Cruise Lines.</p> <p>The ZeoRap[®] WWTT will be tested in Romania at the WTPs of Temesvar and Beszterce in 2005.</p>
13. If two years after completion of the project, wastewater consultants, beyond those included in the project, are recommending and including the zeolite process in treatment plant design and operation	This criteria for success has already been achieved. Besides the legal entities a number of private experts have been dealing with the marketing and recommendation of the zeolite modification and the ZeoRap [®] WWTT.