

	<p><b>I3E</b> <i>South East Europe TCP</i></p>
---	--

## Best Practice Report

**Flap type wavemaker**

**Document type** : Template  
**Document version** : Draft  
**Document Preparation Date** : November 17<sup>th</sup>, 2010  
**Classification** : Internal  
**Contact** :  
**Project co-ordination** : ISI – Industrial Systems Institute  
**Deliverable Responsible** : ISI – Industrial Systems Institute

--	--

## Good Practice Report

Rev.	Content	Resp. Partner	Date
0.1	Creation of document	ISI	17.11.2010

Everybody please state revision index and short description of what has been done + partners involved and date.

Final approval	Name	Partner
Reviewer		

## 1. Best Practice Title

Wave maker

## 2. Location of Best Practice

*Country, region, town*

**Bulgaria, Varna Region, Varna**

## 3. Best Practice Executive Summary

*Describe briefly (max 10 lines) the GP context (partnership, funding, objectives, approach followed, results)*

The “Flap type wavemaker” project was implemented in partnership with the Bulgarian Ship Hydrodynamic Centre (BSHC). The funding was provided by the Centre in the form of assigned scientific and development task to AMK Ltd. The specificity of the assignment needed innovative approach, in order to achieve the expected result and engineering effect. The involved specialists from AMK Ltd. worked in close cooperation with their colleagues from the Institute and together came to certain conclusions, which later on, laid the foundation of the innovation.

**AMK Ltd. and the Centre implemented the developed innovation successfully and managed to put it into practice in a real working environment.**

## 4. Best Practice Classification

### Best Practice Theme

- Research Transformed to Innovative Product*
- Research Transformed to Innovative Service*
- Research Transformed to Innovative Methodology*
- Research Transformed to Innovative Production Process*
- Financial Mechanism for Transformation of Research to Innovation*
- Support Mechanism for Transformation of Research to Innovation*
- Other (describe)*

### Best Practice Research / Application Areas

- Industrial / Manufacturing Systems*
  - Industrial Informatics and Communications*
  - Intelligent Devices*
  - Distributed Control Systems*
  - Flexible Manufacturing Systems*
- Embedded Systems*
  - Industrial Embedded Systems*
  - Nomadic Environments*
  - Private Spaces*
  - Public Infrastructures*

## 5. Description of Best Practice

### 5.1 Best Practice Context

*Overall background of the Best Practice. Location, socio-economic, technical & policy background of the BP (max 10 lines)*

The flap type wavemaker in the Seakeeping-maneuvering tank in the Bulgarian Ship Hydrodynamics Centre is designed for the generation of regular (harmonic) and irregular (corresponding to two dimensional spectrum) wave for conduction of experimental hydrodynamic analysis.

The innovative device is located inside the artificial testing pool for floatable vessels. During that process is being analyzed the hydro and aero dynamical conduct of the floatable vessels in real environmental conditions.

During the long standing exploitation of the wavemaker, many disadvantages of the hydraulic drive have been found concerning the control of servo-valves, such as:

- Difficult entry into a starting position of the hydraulic system;
- Necessity of calibration after a period of long stay (inactivity);
- Unreliable operation of electromagnetic system;
- Expensive maintenance.

All these problems and inconveniences cause the need for an upgrade of the wavemaker with a modern power drive system. A project of a wave generating system has been developed and realized which consists of four plates, each one of them having an independent electric drive based on AC servomotors with phase frequency management.

In results the floating vessels could be tested 2 times faster and in a very similar to the nature environment. Furthermore, the testing costs decreased with 65%.

### 5.1.1 Policy Elements

*What are the policy initiatives that have influenced the contextual environment of BP: innovation promotion policies, research funding policies, certification ect. as well as relevant tools (max 10 lines)*

Not applicable

### 5.1.2 Socio-economic & Other factors

*Other contextual factors such as customer / target market addressed, international validity, customer density, economic conditions, customer values, research area addressed (max 10 lines)*

**“Flap type wavemaker”** addressed a very specific target market – the floating vessels testing companies. However, the innovation is applicable in other types of markets, more commercially based ones, such as:

- Aqua parks;
- Indoor swimming pools;

- Training water pools.

The technology could be applied in those markets successfully as it has the international valid quality standards of AMK.

## 5.2 Objectives

*Aim of the project, specific objectives & strategies to achieve these objectives (max 10 lines)*

The overall aim of the project is to enhance and boost the capacity for producing different in types and power waves of a wave making machine, located in the **Bulgarian Ship Hydrodynamic Centre (BSHC)**.

The specific objectives are:

- To decrease 2 times the testing period of a floating vessel;
- To create more types of waves, than the existing ones;
- To create a wave water motion, very close and similar to the nature processes in the sea;
- To reduce the electricity power used during testing with at least 50%;
- To decrease the potential situations for emergency repairs;
- To secure options for electronic data base storage of the obtained testing results;

The selected strategy to achieve the above listed aims and objectives was:

- To develop specific drives and control software;
- To design and produce specific servo motors;
- To create state of an art control system and device;
- To use AMK equipment in the process

## 6. Process

*Describe the project including key concepts and the overall approach followed. Indicate project end users, target market, main project phases, problems encountered and solutions, problem resolution (max 10 lines)*

The process is as the following:

- Preliminary initial evaluation of the task;
- Drafting a design for the solution;
- Development technical documentation for the innovation;
- Development and producing the equipment for the innovation device;
- Technical consultations;
- Testing in the house of the developed device;
- On site testing of the device;
- Introducing it to exploitation

### 6.1 Project Design

*Project design based on targeted market complete understanding, project structure, policies and procedures, management and implementation actions (max 10 lines)*

The “**Flap type wavemaker**” innovation is targeted mainly for such Institutes or private entities, operating the field of floating vessels testing. But, it is also created to suit public facilities, such as water parks and pools, thus serving as many people as possible.

The innovative project is lead by a project coordinator, in our case, an engineering, who is responsible for the entire project implementation. He has a team, mostly constructed by engineers in different fields, who has individual assignments to conduct. The entire team follows a preliminary developed plan.

### 6.2 Project Management

*Activities relevant to project coordination and management, project documentation and reporting, quality control,*

*validation and verification (max 10 lines)*

The innovative project' management consists of:

- Project coordinator, in our case, an engineer, who is responsible for the entire project's implementation.
- R&D team - mostly constructed by engineers in different fields, who has individual assignments to conduct. The entire team follows a preliminary developed plan.
- Quality assessment specialists – responsible for testing the quality of the produced product.

The “**Flap type wavemaker**” as an innovation, is part of the R&D work of AMK Ltd. each individual R&D project has a strict regime of recording and bookkeeping. The entire project documentation is being recorded in electronic form, and each team member could see the engineering changes done at every stage of the development process. The innovation follows also the introduced in the company quality system – for quality control and reliability of the produced product.

Since every R&D task and project goes through a pattern for implementation, which also includes validation and verification for the product, the “Wave maker” also went through it.

### 6.3 Project Implementation

*Main elements associated with the project implementation. Realization of new idea, or new technological realization or improvement / novelty to known technology and means to achieve this. Innovation associated with the project realization in terms of new products, services, methodologies. Marketing, advertising and customer service. (max 10 lines)*

The project (innovation) implementation consists of:

- Having a reliable client;
- Having secured funding;
- Evaluation of the existing conditions;
- Drafting the proper measures and device for the client's requirements;
- Engineering and assembling activities;
- Testing activities;
- Full industrial exploitation activities.

### 6.4 Project Evaluation

*Project feedback mechanisms and evaluation mechanisms. (max 10 lines)*

The “Wave maker” evaluation consists of:

- Evaluation of the developed technical documents;
- Evaluation of the preliminary in the house testing;
- Evaluation of the onsite testing;
- Evaluation of the device performance, once it is being industrially exploited;
- Keeping constant feed back with the client.
- Cost evaluation;
- Management performance evaluation;

### 7. Description of Research team/Institution

*Short description of R&D team and institution (max. 10 lines)*

AMK “Drives and controls” Ltd., is established in 1998. It is the biggest and only production branch of the German holding AMK Arnold Müller GmbH & Co.KG, owned by Arnold Muller.

CEO of the AMK in Bulgaria, Gabrovo is Eng. Stefan Deevski, Ph. D.

AMK develops and produces servo drives, induct and synchronous servo motors, PL

## Good Practice Report

controllers, CNC, visualization panels, gear motors, frequency invertors, develops and produces systems for drives and control of technological processes, industrial networks. Also develops and produces custom made stators, rotors and electro motors, including ones for automotive industry and electro mobiles. It produces machines and technological lines, does retrofit for old machines and equipment. The company has a specifically designated R&D department, where all innovative technologies and projects are being conducted.

At the moment there are 50 employees in the company. 90% of them is engineering personnel and 5 are Ph. D. specialists.

## 8. Applied Financial Mechanism

*Describe financial mechanisms applied in transformation of research into innovation within BP, as well as means of connecting scientific research team and financiers (max. 1000 char.)*

The “Wave maker” innovation was funded by the Institute for Hydro and Aero dynamics in Varna as a scientific assignment to AMK Ltd. the funding is public, by its origin, since the Institute is a public body, part of the structure of National Academy of Science.

## 9. Impact and benefits

*Describe achieved benefits of R&D team and/or enterprise implemented innovation, as well as impacts on institutional and policy levels. (max. 1000 char.)*

The impacts for the beneficiary – the Institute for Hydro and aero dynamics are:

- Developed system for creating new types of waves;
- Achieved better similarity with the nature conditions in the sea;
- Achieved 2 times faster testing of floating vessels in the testing pool;
- Achieved decreasing the electrical consumption of the entire testing facility with 65%;
- Secured option for electronic data base;

## 10. Sustainability

*Provide information on sustainability of innovation after financial aid within implemented financial mechanisms, and some multiplier effects as replication and extension of the action performed in BP. Expected use of Best Practice and lifecycle considerations. (max. 1000 char.)*

The funding origin was a non grant once, so this is not applicable.

The “**Flap type wavemaker**” innovation is proven to work efficiently and effectively in a real working environment. It will be part of the AMK Ltd. marketing portfolio and will be sold to other potential clients.

## 11. Repeatability and transferability

*Lessons learned from the project implementation team. Repeatability and transferability of the project. (max. 1000 char.)*

The “Wave maker” innovation has a huge repeatable potential. It can be embedded in other similar testing pools all over the world, or could be slightly alternated to serve more commercialized purposes.

It can be repeated in:

- Testing pools
- Swimming pools;
- Training pools;

AMK Ltd. believes that the technology could be implemented in many different environments, when

Good Practice Report

taken into consideration are the specific requirements of the particular assignment.

## 12. Evaluation

*Describe reasons and evaluation criteria why the described example is a best practice. (max. 1000 char.)*

AMK Ltd. has more than 50 different R&D projects. Each one of them is unique and could be used in a certain branch of industry.

The “**Flap type wavemaker**” is considered “Best practice”, because it combines high technologies for a maximum positive effect, for a reasonable price.

## 13. Contact of research team/institution

*Name, address, tel., fax, e-mail, URL*

Eng. Petko Stoyanov  
Gabrovo, 5300  
1 General Nikolov str.  
Tel.: 066 819 121  
Fax: 066 819 101

## 14. Contact of financial mechanism facilitator

*Name, address, tel., fax, e-mail, URL*

Hristofor Stoyanov  
Gabrovo, 5300  
1 General Nikolov str.  
Tel.: 066 819 108  
Fax: 066 819 101