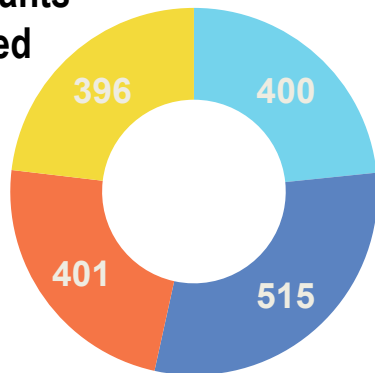




## ADVANCED INDUSTRIAL TECHNOLOGIES: SKOLKOVO CAPABILITIES FOR BUSINESS DEVELOPMENT

**ALEXEI BELYAKOV,**  
VICE-PRESIDENT,  
EXECUTIVE DIRECTOR OF ADVANCED INDUSTRIAL TECHNOLOGIES CLUSTER

The total number of Participants has reached **1,712**



Every **6th** applicant obtained the Skolkovo Project Participant Status

Over **40%** of Participants collected proceeds in 2015 – 1H 2016,

Every **25th** Participant received over **RUB 100** mln

Over **140** Participants sell in the international markets

Every **5th** Participant submitted an IP application,

every **9th** obtained a patent or a certificate

Acceleration programme, including participation of foreign accelerators

Establishment of Skolkovo Mentors' Panel

Cooperation with industrial partners, including creation of demand for innovations

**Quality Improvement of Skolkovo Participants' projects**

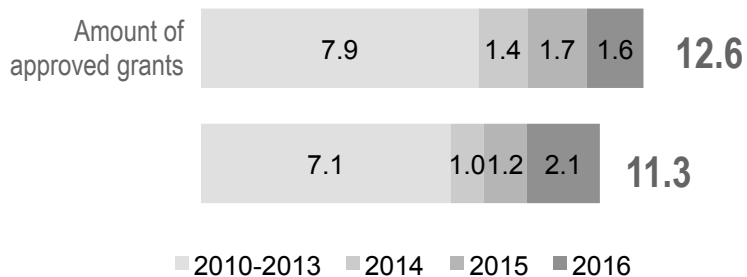
Deprivation of Project Participant Status based on the results of analysis of regular reports on scientific research activities. From the beginning of the project, **390** companies have been deprived of the Status

Format development of grantees' regular in-house audit

Updating and continuous improvement of the technological and business expertise level of Skolkovo Experts Panel

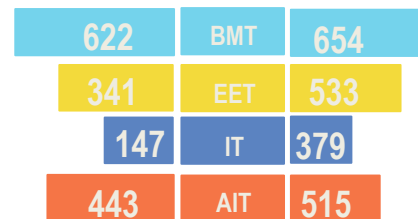
In total, from the beginning of the project 982 grants for the amount of RUB 12.6 bln have been approved, RUB 11.3 bln have been transferred

## General information about grants (2010-2016)



## Grant information for 2016

RUB 1.6 bln – total amount of the grants approved in 2016



Total number of grants is **982** including

**211** grants

**267** mini-grants

**504** micro-grants

Average share of the private co-funding for the whole period of the

Skolkovo Project amounted to **65%**,

for 2015 – **84%**

for 2014 – **80%**

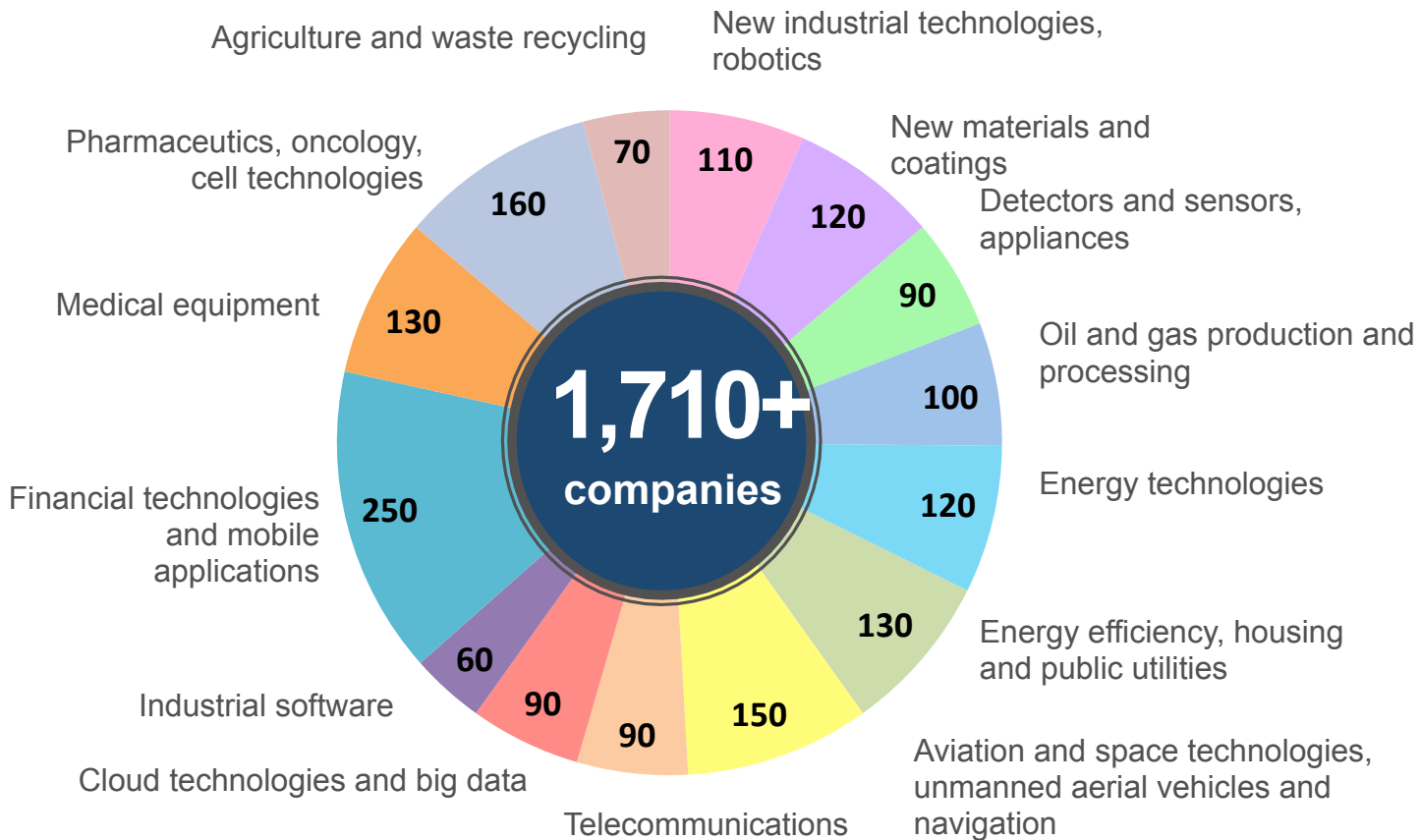
for 2013 – **62%**

Total number of the grants approved during 2016 is **453** (including **37** grants and **416** mini- and micro-grants)

Since 2015, the system of participants financing is in force to solve the problems within the research activities – **the micro-grants**:


1. Protection of Intellectual Property.
2. Prototyping.
3. Testing.
4. Participation in Exhibitions and Conferences.

# THE SKOLKOVO FOUNDATION MANAGED TO BRING TOGETHER THE BEST RUSSIAN TECHNOLOGICAL START-UPS IN THE MOST PROGRESSIVE SPHERES



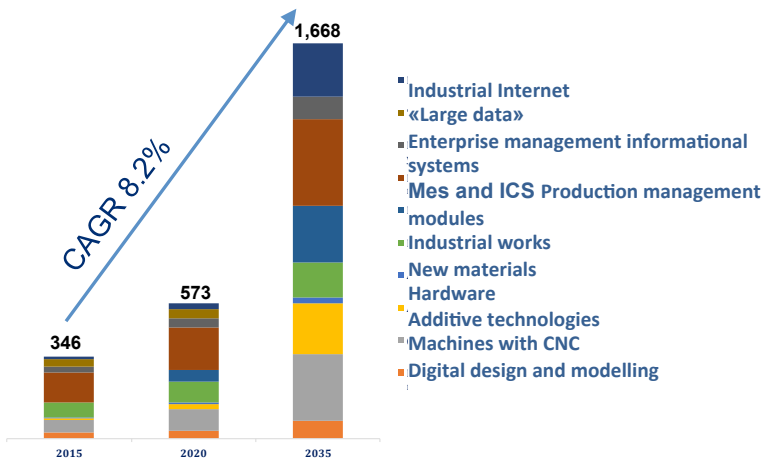


## THE WORLD IS EXPERIENCING THE 4TH INDUSTRIAL REVOLUTION WHICH IS CHANGING THE GLOBAL ECONOMIC LANDSCAPE AND THE LABOUR MARKET

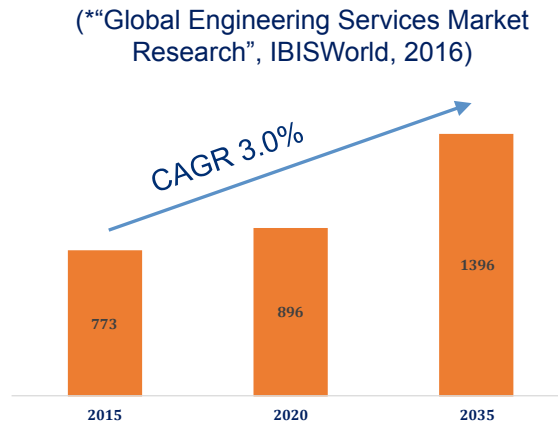
- ☑ Wealth of the accumulated data with simultaneous enhancement of the computational technologies and the **Big Data technologies** (including due to evolution of the artificial intelligence technologies);
  - ☑ **Ubiquitous sensing** and evolution of the **IoT technologies**;
  - ☑ Advent of the **new computer interfaces** (and enhancement of the **AR/VR technologies**);
  - ☑ Advent of the **brand new materials** and evolution of the **additive technologies**;
  - ☑ **Robotics** gradual intellectualization
- 
- ☑ **Fundamental change of many business processes** well-established over decades;
  - ☑ **Enhancement of the flow processes** and many-fold increase of capacity;
  - ☑ Advent of the **new social and economic challenges** etc.

# DYNAMICS OF THE GLOBAL MARKET OF ADVANCED INDUSTRIAL TECHNOLOGIES

Global market of Smart Factory components, USD bln\*



Global market of Smart Factory design and engineering services, USD bln\*



## 2016 Global Industry 4.0 Survey (PWC): 2,000+ technology companies from 26 countries

### USD 907 bln

Annual investment in digital technologies (till 2020)

### USD 412 bln

Expectations of the aggregate annual profit from cost optimization and efficiency raise (till 2020)

### Expected ROI

Within 2 years – 55% of the companies;  
 Within 2-5 years – 37% of the companies;  
 Over 5 years – 8% of the company

The companies' refusal of strategic investment in the advanced industrial technologies ⇔ Definite loss of a technology company global competitiveness in the mid/ long term

# SIGNIFICANCE ASSESSMENT OF THE ADVANCED INDUSTRIAL TECHNOLOGIES

ADVANCED INDUSTRIAL TECHNOLOGIES	the USA	CHINA	EUROPE
PREDICTIVE ANALYTICS	1	1	4
SMART NETWORKED PRODUCTS (IoT)	2	7	2
NEW ADVANCED MATERIALS	3	4	5
SMART FACTORIES (IoT)	4	2	1
DIGITAL DESIGN, MODELLING, AND ENGINEERING	5	5	3
HIGH PERFORMANCE COMPUTATIONS	6	3	7
ADVANCED ROBOTICS	7	8	6
ADDITIVE MANUFACTURING (3D PRINTING)	8	11	9
DESIGN WITH OPEN SOURCE CODE / DIRECT CLIENT INPUT	9	10	10
AUGMENTED REALITY (TO IMPROVE QUALITY; TRAINING, EXPERT KNOWLEDGE)	10	6	8
AUGMENTED REALITY (TO EXPAND CUSTOMER SERVICING AND EXPERIENCE)	11	9	11

SOURCE: 2016 Global Manufacturing Competitiveness Index, Deloitte and Council of Competitiveness.

# ADVANCED INDUSTRIAL TECHNOLOGIES IN THE SKOLKOVO



ADVANCED INDUSTRIAL TECHNOLOGIES	SKOLKOVO START-UPS
PREDICTIVE ANALYTICS SMART NETWORKED PRODUCTS (IoT) SMART FACTORIES (IoT)	<p>&gt; <b>10 companies</b> – the Industrial Internet technologies;</p> <p>&gt; <b>90 companies</b> – the Industrial Internet components (transmitters, sensors).</p>
ADVANCED ROBOTICS	<p>&gt; <b>20 companies</b> – industrial, utility, and educational robotics</p>
ADDITIVE MANUFACTURING (3D PRINTING)	<p>&gt; <b>10 companies</b></p>
NEW ADVANCED MATERIALS	<p>&gt; <b>100 companies</b></p>
HIGH PERFORMANCE COMPUTATIONS  DIGITAL DESIGN, MODELLING, AND ENGINEERING DESIGN WITH OPEN SOURCE CODE / DIRECT CLIENT INPUT	<p>&gt; <b>40 companies</b></p>
AUGMENTED REALITY (TO IMPROVE QUALITY; TRAINING, EXPERT KNOWLEDGE)  AUGMENTED REALITY (TO EXPAND CUSTOMER SERVICING AND EXPERIENCE)	<p>&gt; <b>20 companies</b></p>



# THE INDUSTRIAL INTERNET, IIoT, IN THE SKOLKOVO: 10+ COMPANIES PARTICIPATING IN THIS SEGMENT



DATADVANCE



- Remote monitoring and unmanned diagnostics of the production equipment
- Monitoring of the production facilities
- Analysis of the acquired data, and predictive simulation
- Control of the production facilities lighting
- Monitoring of the human motion at the territory of an enterprise.
- Prevention, containment of accidents, emergencies
- Adaptive control of the motive-power unit

## Winnum – the software platform for the Industrial Internet of Things

- 7 ready-for-use industry-specific solutions with implementation time of 1 week
- High capacity when dealing with Big Data (5-6 billion records in several seconds)
- Creation and launching of the independent diagnostic algorithms
- Virtual reality (creation of 3D stages in the web browser with due account for kinematics of physical objects), augmented reality (3D objects)
- Data protection (more than 35 encryption algorithms, monitoring of data fraudulent corruption, keys and security labels, server work on UNIX)

## Solely Russian development

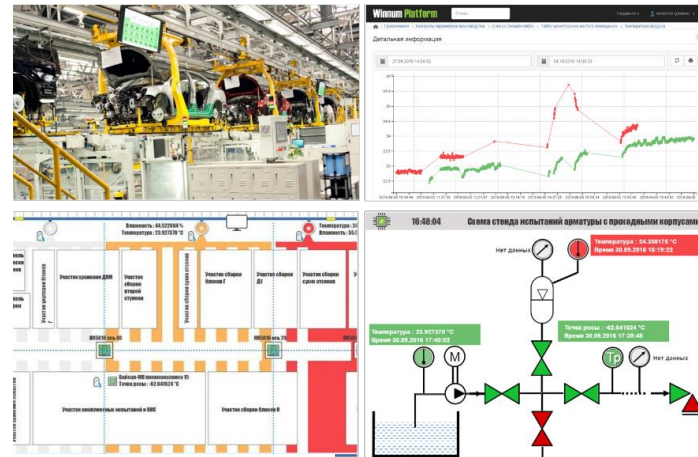
- Headquarters at the Skolkovo IC territory
- Market player since 2015, 300 installations accomplished during 2016
- Major customers: the concern included in Roskosmos the enterprises included in Rostec
- Representative offices: Chelyabinsk, Voronezh, Minsk
- The process of the patent obtaining has started
- Members of the Association of manufacturers of machines and tools

## Partners:

- Stankoprom (Rostec), JV Bi Pitron, STAN Group, Chergos, Are Term, IT Solutions, Grosver

## Competence centres

- Voronezh State Technical University, Izhevsk State Technical University



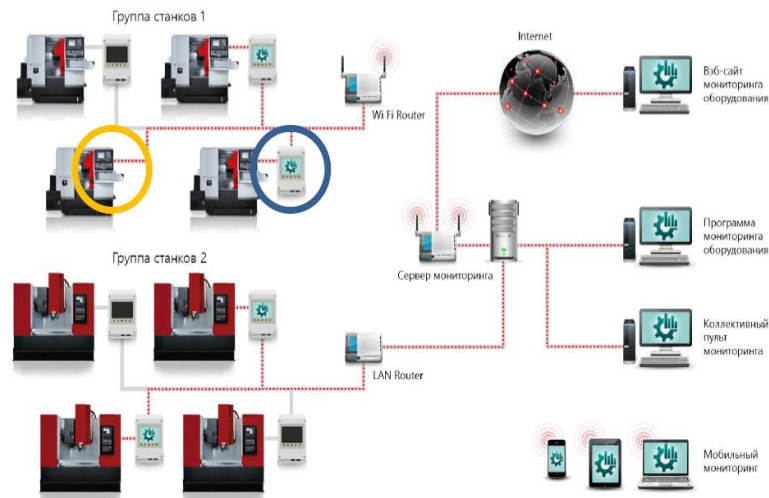
## AIS Dispatcher - monitoring of the industrial equipment performance and the production personnel operation at the enterprise

The AIS Dispatcher system is intended to improve efficiency of the process equipment and to increase the labour productivity at the enterprise with equipment of any generation, and allows accomplishment of the following:

- Automatic monitoring of the machine condition (the machine is on, production, emergency etc.)
- Monitoring of the downtime reasons, and call for the enterprise service teams
- Monitoring of the process discipline, and detection of violations of the enterprise flow processes.
- Direct connection via the standard NC interfaces; Connection using the input/output terminals; connection using the recording terminal
- On-line control of the production tasks, data displaying on a pad or a smartphone.
- The product is intended for the enterprises of metal-working industry, machine building, manufacturing of end products.

The system application allows increasing of the equipment loading to the maximum possible indicators and reducing of the machine-hour cost (reduction up to 40%)

## Arrangement for the system of industrial equipment performance monitoring at the enterprise





### Innovation:

Insertion of the continuous reinforcing yarn into the plastic in the course of printing allows 3D printing of the components of the material which:

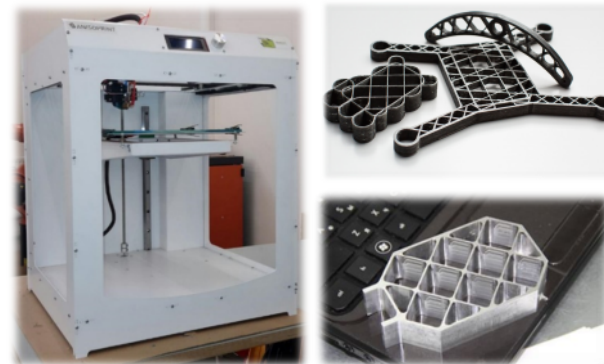
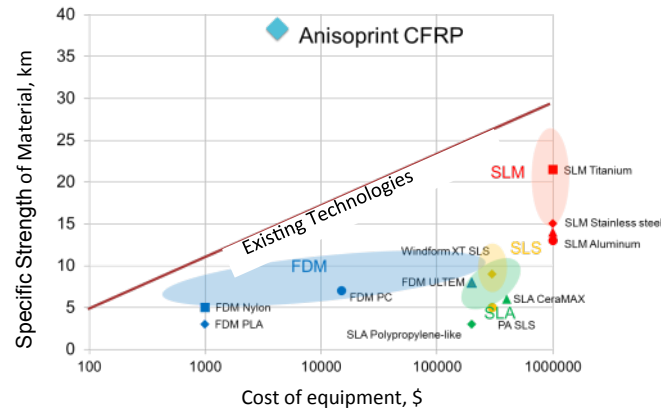
- is 20 times stronger than the conventional plastic,
- 1.5 times stronger than aluminium,
- is comparable by strength with titanium alloys,
- and with all this, weighs 4 times less!

### Competitive advantages:

- average cost of labour hour (material not included) on an NC machine is \$30-50.
- planned cost of labour hour (material included) on the Anisoprint 3D printer is \$25
- the components manufactured according to the Anisoprint technology posses higher specific stress-strain properties.

### What is done by now:

- the functional prototype is developed
- the applications for registration of the IP are filed
- the material is tested
- the first sales are accomplished
- the work on the product industrial design is on



The Anisoprint printer, and the composite components manufactured on the printer

# TERRITORY OF THE SKOLKOVO INNOVATION CENTER: 386 HA, AREA 2,6 MLN. SQ.METERS, 20 MINUTES FROM THE CENTER OF MOSCOW



**Zone Z2 (Landscape)**

Objects of engineering, logistics, transport and city improvement

**Zone Z1 (Central)**

Transport hub, Hypercube, Matryoshka, Kvadrat, City Hall, the creative quarter, Student residences for Skoltech and the teaching district

**District D2 (Technopark)**

Technopark Skolkovo Centers of key partners (TMX, CISCO) and IT cluster  
Apartments, offices and social facilities

**District D1 (Southern)**

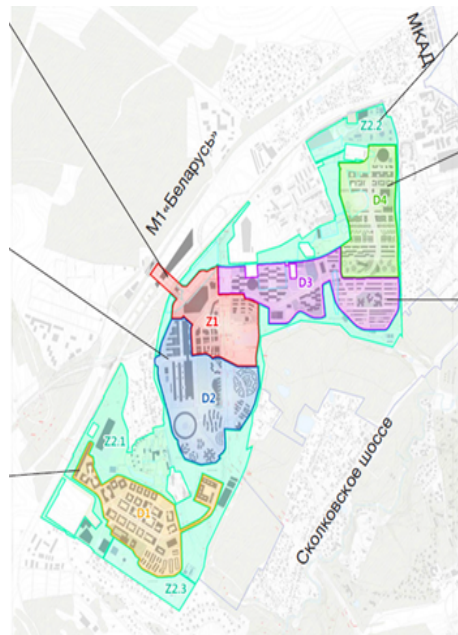
Centers of key partners (Sberbank, Renova, Tatneft, Boeing), Apartments, offices, social facilities

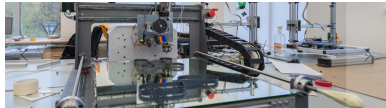
**District D4 (Northern)**

The centers of key partners (TMK, FANUC, etc.)  
Apartments, offices, social facilities

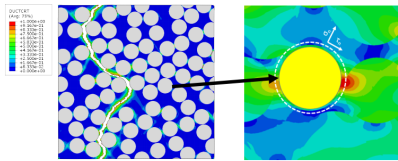
**District D3 (University)**

SkolTech International Gymnasium Skolkovo  
Apartments, offices, social facilities

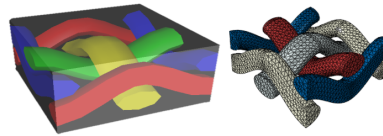




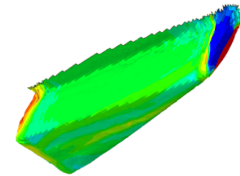
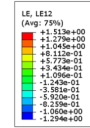
## LABORATORY OF COMPOSITE MATERIALS AND CONSTRUCTIONS SKOLTECH Predictive modeling for determining optimal parameters of technological processes



Modeling the initiation of damage at the microstructural level

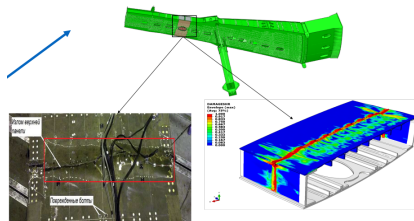


Modeling of effective properties taking into account the structure of the material

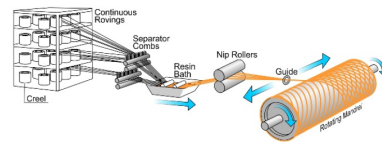


$$\begin{aligned} \epsilon_x &= \frac{\sigma_x}{E_1} - \nu \frac{\sigma_y}{E_1}, \\ \epsilon_y &= -\nu \frac{\sigma_x}{E_1} + \frac{\sigma_y}{E_2}, \\ \gamma_{xy} &= \frac{\tau_{xy}}{G(q)} \end{aligned} \quad + \quad \text{ABAQUS}$$

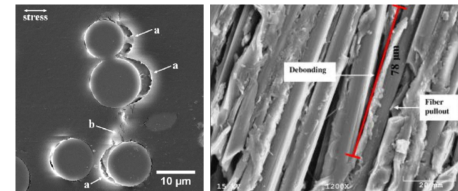
Development and verification of modeling techniques for the thermoforming process



Modeling of full-scale static tests of the wing caisson MC 21



Composite Technology implementation



Investigation of the fracture toughness of a fiber / matrix interface



- ❑ **The utility model ensures the following:**
  - basic routing by the state support measures;
  - provision of the on-request services including provision of on-line access to the services;
  - control and management of the quality of services being provided;
- ❑ **Main services to be provided by the Skolkovo ecosystem:**

Protection of intellectual property	Lease of office and laboratory premises	Mentor program	Scientific and technological expert review
Legal services and transaction support	Access to common use centres	Access to public events	Provision of grant funding
Services of the customs agent	Personnel selection	Marketing support and PR support	Assistance in venture investment raising
Standardization and certification of the products	Services of commercial operators	Acceleration services	Urban services



# ADVANCED INDUSTRIAL TECHNOLOGIES: SKOLKOVO CAPABILITIES FOR BUSINESS DEVELOPMENT

**ALEXEI BELYAKOV,**  
VICE-PRESIDENT,  
EXECUTIVE DIRECTOR OF ADVANCED INDUSTRIAL TECHNOLOGIES CLUSTER

