# Scientific Activities
# of Chair of Thermal Engineering

**Ul. Piotrowo 3, 60-965 Poznań**

POZNAN UNIVERSITY OF TECHNOLOGY

# THE COMPOSITION OF
# CHAIR OF THERMAL ENGINEERING:

## • LABORATORY OF THE MASS AND HEAT TRANSFER

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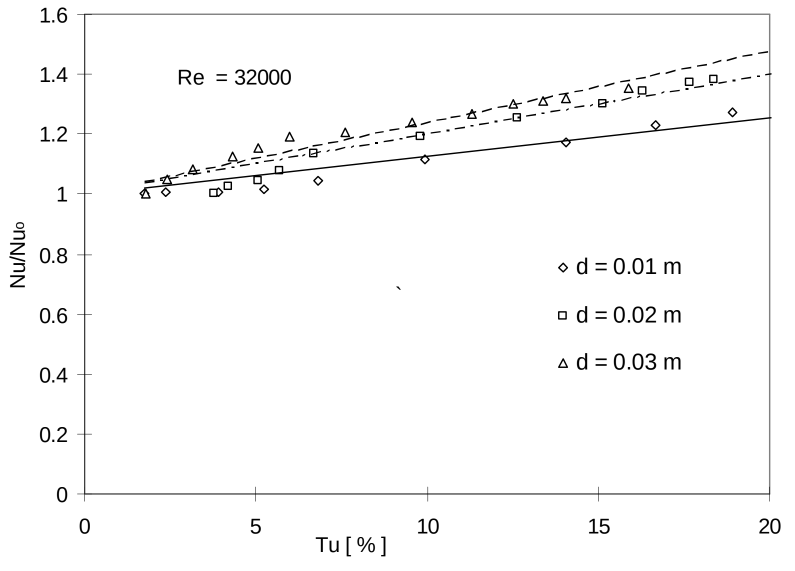
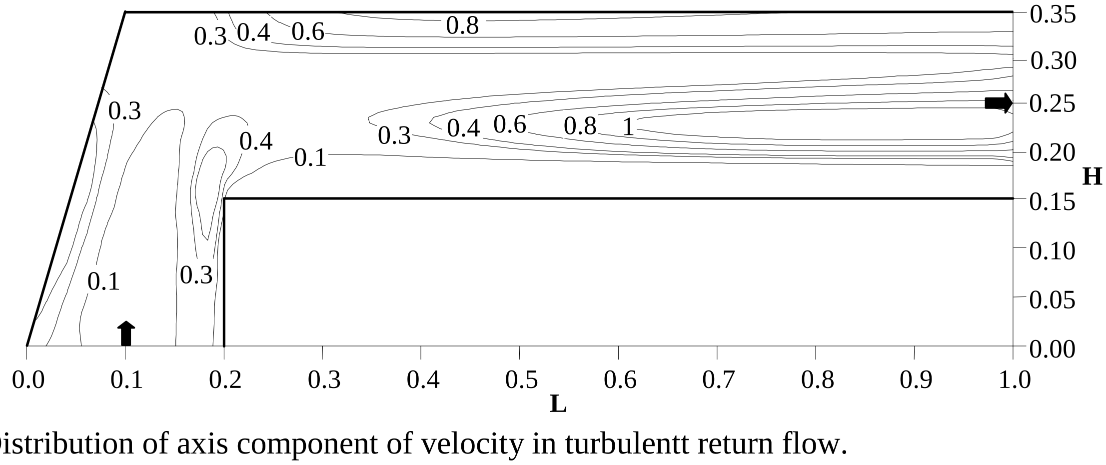
INVESTIGATIONS ON THE INFLUENCE OF FLOW TURBULENCE ON THE PROCESSES OF SURFACE HEAT AND MOMENTUM TRANSFER IN SELECTED MACHINE PARTS.

**APPARATUS:** WIND TUNNELS, ANEMOMETERS SYSTEMS TSI 1050, TSI IFA 300, DIGITAL ACQUISITION SYSTEMS IOTECH 488, MIKROMANOMETERS, DIGITAL MULTIMETERS

**PROGRAMS:** SYSTHERM, TURBOLAB, LABVIEW, CFX




Trends lines of increasing of the average heat transfer coefficient on spheres diameter of 0.01 m, 0.02 m and 0.03 m at different inflow turbulence level.




Distribution of axis component of velocity in turbulentt return flow.

## ● LABORATORY OF NUMERICAL FLUID MECHANICS

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APPLICATION OF THE INVERSE PROBLEMS TO ANALYSIS OF THE THERMAL FLOW AND THERMAL FIELDS AS WELL AS THERMAL POLYNOMIALS FOR THE PROBLEMS OF FLUID MECHANICS.

## ● LABORATORY OF GAS TECHNOLOGY

**Tomasz.dobski@put.poznan.pl**

INVESTIGATIONS ON THE GAS COMBUSTION PROCESSES, INCLUDING GASES OF THE LOW CALORIC VALUE, IN THE VARIOUS CONDITIONS, IN RELATION TO THE REDUCTION OF TOXIC EMISSIONS.

INVESTIGATIONS OF THE FUEL COMBUSTION (SOLID, LIQUID, GASEOUS, WASTE AND RENEWABLE FUELS) IN HEATING APPLIANCES AND THE LOW-POWER BOILERS FOR OPTIMIZATION OF THE DESIGN AND REDUCTION OF TOXIC EMISSIONS.

## ● LABORATORY OF TURBOMACHINERY

**Janusz.walczak@put.poznan.pl**

INVESTIGATIONS OF THE COMPRESSORS (APPLICATION OF OBTAINED RESULTS TO THE VERIFICATION OF DESIGNS). INVESTIGATIONS OF THE CENTRIFUGAL FANS.

## ● LABORATORY OF ENERGETIC SYSTEMS AND AUTOMATIZARION

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## ● LABORATORY OF VIRTUAL ENGINEERING OF THE FLUID FLOW MACHINERY

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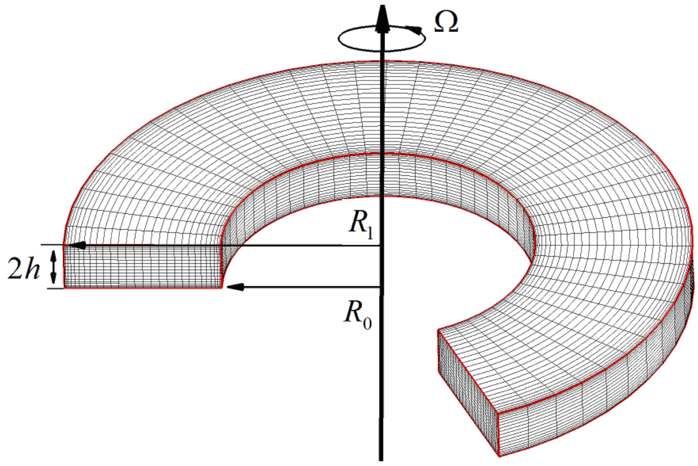
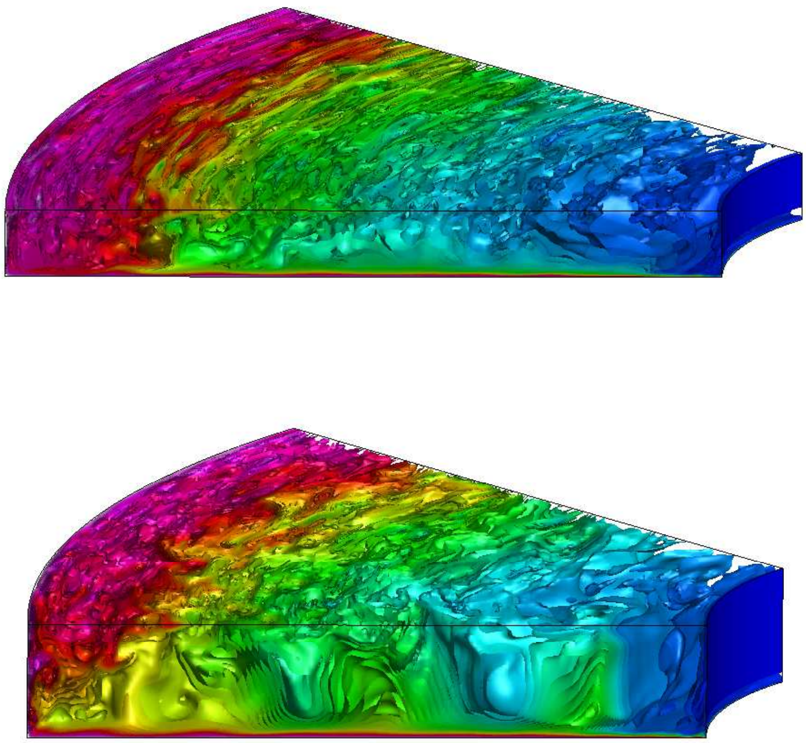
DNS AND LES OF HEAT AND MOMENTUM TRANSPORT IN ROTATING CONFIGURATIONS.
NUMERICAL APPROACH:
SPATIAL APPROXIMATION: A PSEUDOSPECTRAL COLLOCATION CHEBYSHEV-FOURIE METHOD
THE TIME DERIVATIVE:

i) THE TIME DERIVATIVE IS APPROXIMATED BY A SECOND ORDER EULER BACK-WARD SCHEME
ii) THE LINEAR TERMS ARE IMPLICITLY EVALUATED
iii) THE NON-LINEAR PART ARE EXPLICITELY EVALUATED BY MEANS OF AN ADAMS-BASHFORTH EXTRAPOLATION

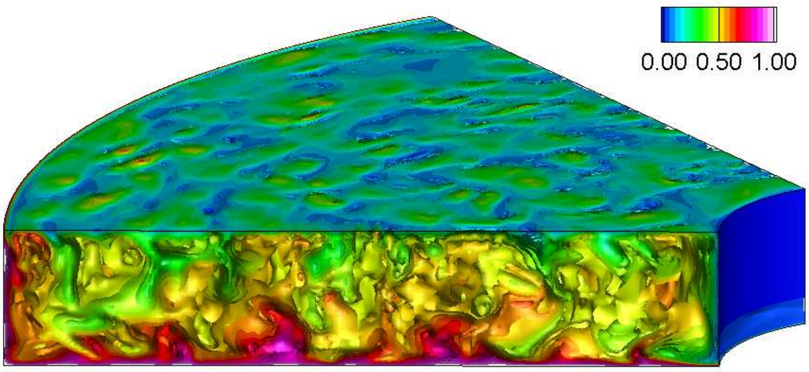
IN THE LES A VERSION OF THE DYNAMIC SMAGORINSKY EDDY VISCOSITY MODEL PROPOSED BY MENEVEAU ET AL. (1996) IS USED, IN WHICH THE REQUIRED AVERAGING IS PERFORMED OVER THE PARTICLES PATHLINES.




Schematic picture of computational domain.



Iso-surface of the temperature (L=9, Rm=1.8, Re=185000; L=5, Rm=1.8, Re=195000).
Rotor/stator cavity.




Iso-surfaces of temperature obtained for L=5, Rm=1.5, Ra=2500000 and Ro=.0.75. Rayleigh-Bénard convection.