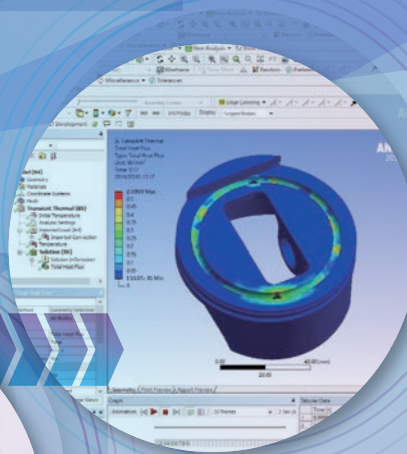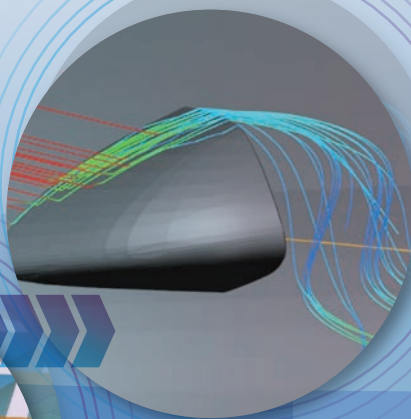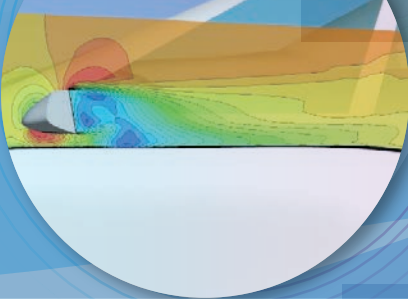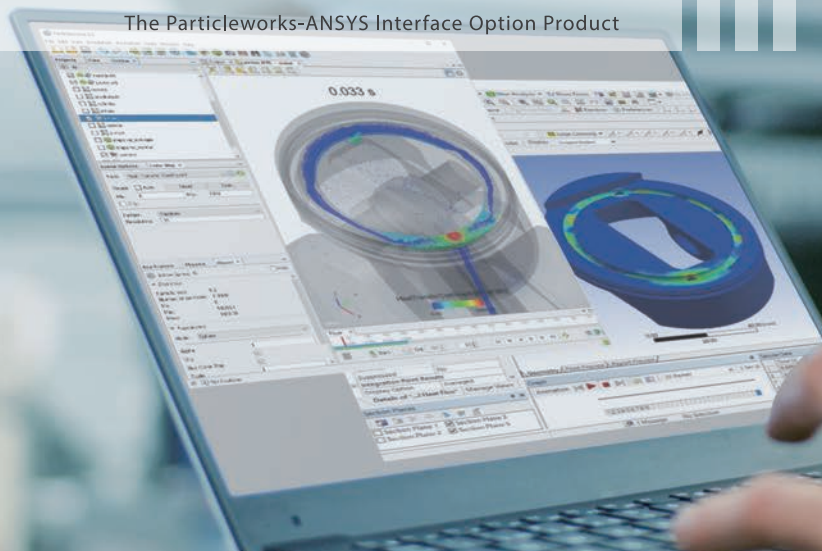# Particleworks™ for ANSYS

The Particleworks-ANSYS Interface Option Product

Particleworks™ for ANSYS

The Particleworks-ANSYS Interface Option Product

Particleworks is a meshfree CFD software for simulating liquid flow such as oil and water behaviors. It can simulate variety of physical phenomena from engine oil sloshing, lubrication, motor cooling, water splashing around car, mixing and kneading of medicine, materials and foods, debris flow, flood and Tsunami, and has been introduced in wide range of industries around the world.

Particleworks for ANSYS is an interface option for coupling simulations between such liquid simulation with large deformation of free surface and the existing simulation fields in ANSYS. By using this option, Particleworks is embedded in ANSYS® Workbench™ and this makes it possible to simulate complicated multiphysics behaviors including liquid-structure, liquid-thermal, and gas-liquid flow which had been difficult to analyze, by coupling with ANSYS simulation capabilities. Particleworks for ANSYS is a new tool for encouraging to understand realistic phenomena in design problems.
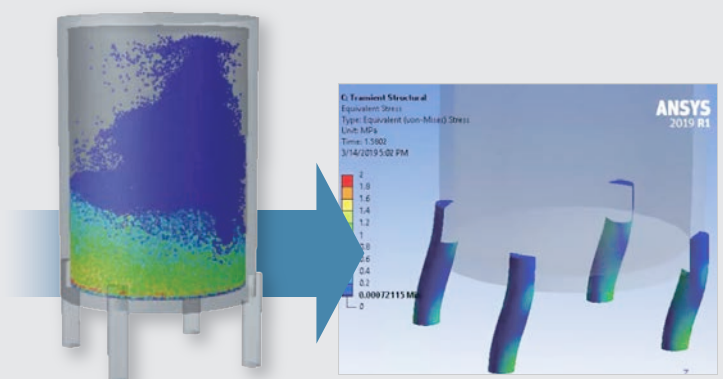
Liquid-Structure Coupling

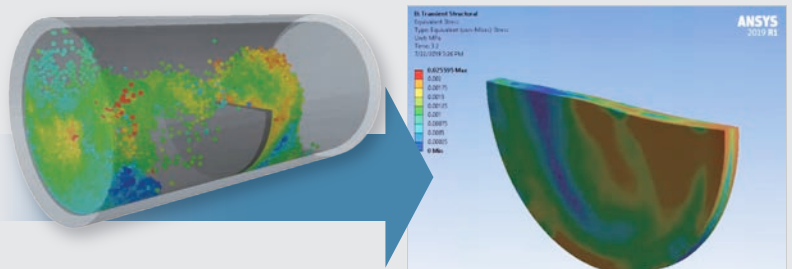**Particleworks™** Particle-based simulation software for CAE → **Pressure** → **ANSYS**
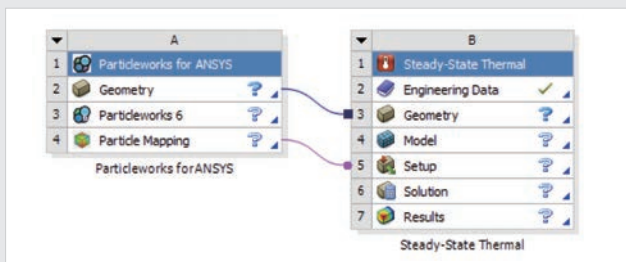
Stress analysis of foot by tank sloshing

Analyze oil behavior with Particleworks to determine the pressure on the tank. Perform stress analysis with ANSYS® Mechanical™ based on the pressure.

Stress analysis of baffle by tank sloshing

Analyze oil behavior with Particleworks to determine the pressure on the baffle. Perform stress analysis with ANSYS Mechanical based on the pressure.

Coupling Simulation Flow

Particleworks™ Particle-based simulation software for CAE | **Heat Transfer Coefficient** ▶ **ANSYS**
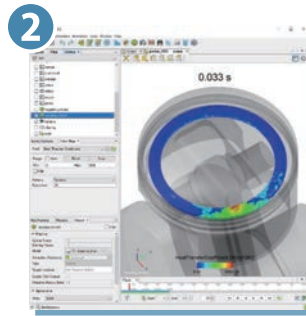
▌Cooling analysis of piston by oil jet

Analyze the oil behavior with Particleworks and calculate the temperature and heat transfer coefficient in the oil flow path. The temperature of the cylinder head is obtained by ANSYS Mechanical based on the obtained heat transfer coefficient.
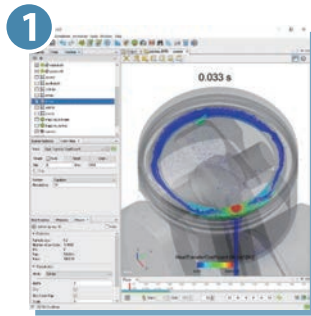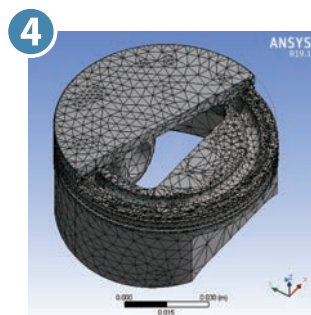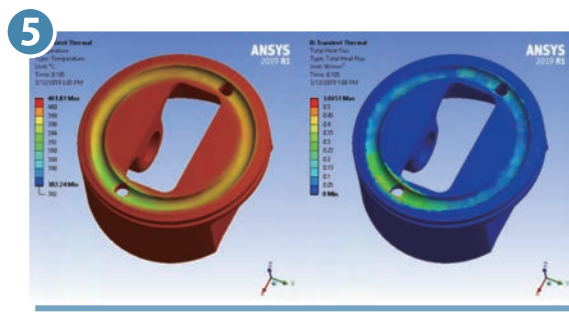
①
CFD calculation by Particleworks

▶

②
HTC mapping in Particleworks

▶

③
Imported HTC in ANSYS Mechanical

▶

④
Mesh generation

▶

⑤
Total heat flux and temperature

Operation environment / requirement
1) OS: Windows 10 64bit
2) Both Particleworks and ANSYS (including ANSYS Workbench) should run on the same machine.
   - Available version of ANSYS Workbench and Mechanical: ANSYS 19.1, ANSYS 19.2, ANSYS 2019 R1, ANSYS 2019 R2
   - Available version of Particleworks: Particleworks 6.2
3) Licenses: floating · node lock
4) For more information about price for 1 user: kaidai@prometech.co.jp

Gas-Liquid Coupling

ANSYS Velocity ▶ **Particleworks™** Particle-based simulation software for CAE
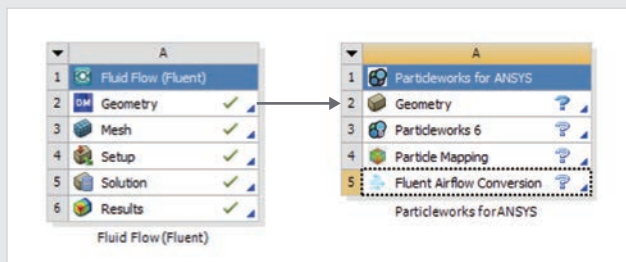

▌Behavior analysis of raindrops around side mirrors

ANSYS® Fluent® analyzes the airflow around the car body (mirror). In consideration of the airflow, the behavior of raindrops is analyzed with Particleworks.

Considering airflow
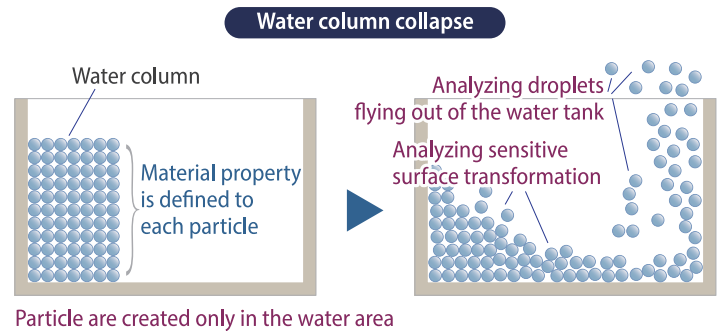
Without considering airflow
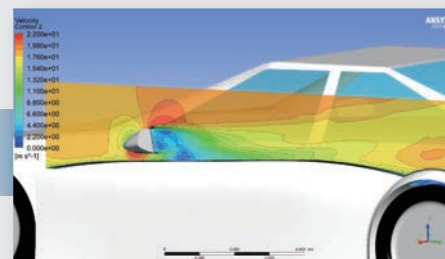
▌Oil lubrication analysis when gear is idle

ANSYS Fluent analyzes the airflow around the gear and analyzes the oil behavior with Particleworks based on the airflow information.
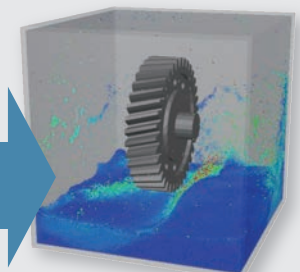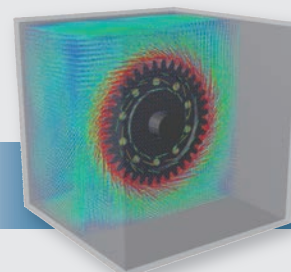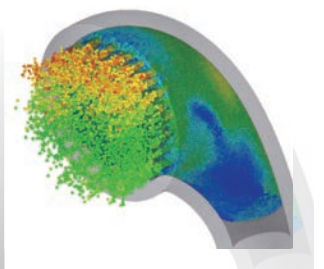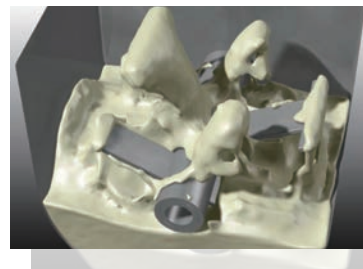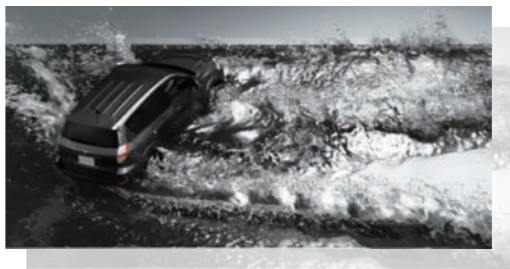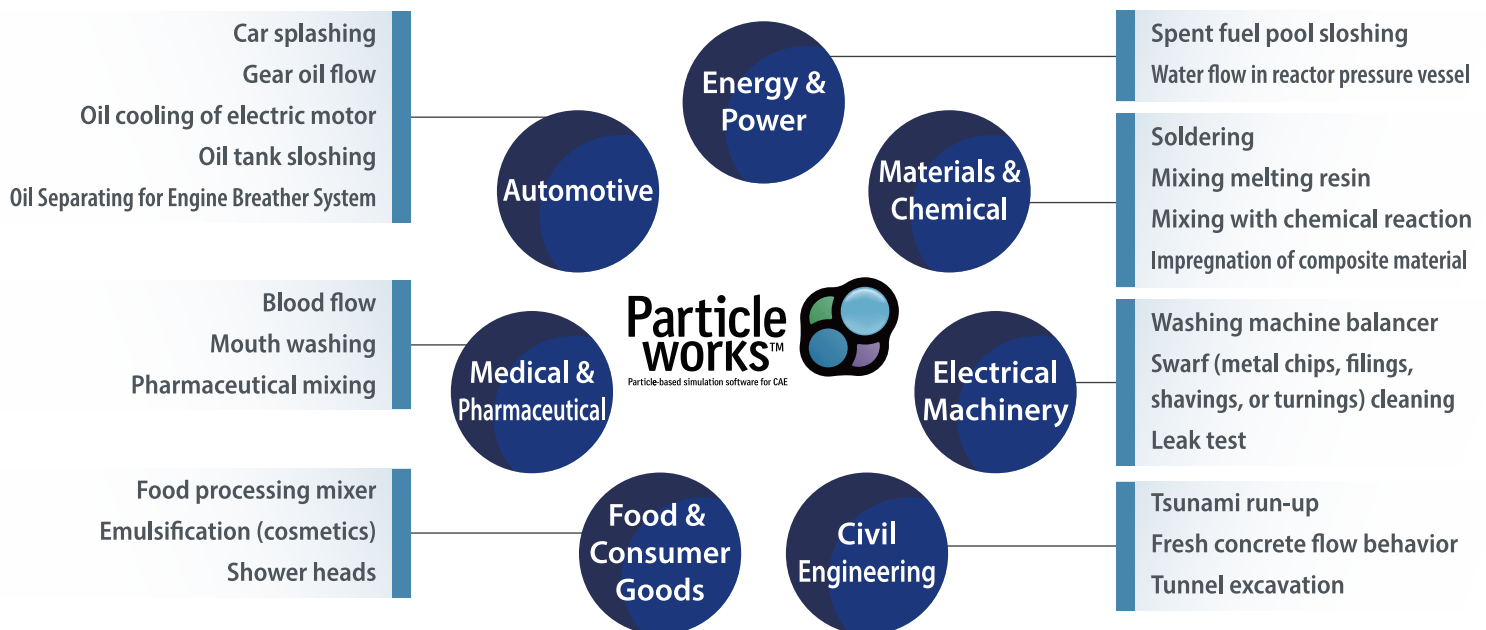
Benefits of MPS (Moving Particle Simulation Method) used in Particleworks

- No need to set the analysis region in advance. The particles themselves represent the flow of fluid. This is optimal for tracking conditions where fluid droplets are widely scattered.

- Easily modeling of the fluid parts with CAD data of the walls, even for containers and piping of complex shapes. Only the initial particle spacing needs to be specified. Particles are evenly distributed according to the specified spacing.

- No abnormal termination and mesh collapsing issues.

Water column collapse

Water column

Material property is defined to each particle

Analyzing droplets flying out of the water tank

Analyzing sensitive surface transformation

Particle are created only in the water area

Particleworks Applications * Some images are with CG rendering

Automotive
- Car splashing
- Gear oil flow
- Oil cooling of electric motor
- Oil tank sloshing
- Oil Separating for Engine Breather System

Energy & Power
- Spent fuel pool sloshing
- Water flow in reactor pressure vessel

Materials & Chemical
- Soldering
- Mixing melting resin
- Mixing with chemical reaction
- Impregnation of composite material

Medical & Pharmaceutical
- Blood flow
- Mouth washing
- Pharmaceutical mixing

Electrical Machinery
- Washing machine balancer
- Swarf (metal chips, filings, shavings, or turnings) cleaning
- Leak test

Food & Consumer Goods
- Food processing mixer
- Emulsification (cosmetics)
- Shower heads

Civil Engineering
- Tsunami run-up
- Fresh concrete flow behavior
- Tunnel excavation

Particle works™
Particle-based simulation software for CAE