Körting Mixing Systems: More than an alternative to mechanical agitators.

Bio diesel, palm oil or other mineral oils are stored in large tanks, sometimes with over 10.000 cubic meters contents. A permanent agitation of the medium can help prevent separation or sedimentation thereof. In comparison to commercial agitators, Körting mixing systems offer decisive advantages for this duty.

With the increased demands for bio fuels, market demands for optimal transport and storage of this liquid are also heightened. For example, bio diesel, palm oil or also mineral oils must be collected and stored in large storage tanks with sometimes over 10.000 cubic meters storage capacity. This storage demands a permanent agitation in order to prevent separation or sedimentation. This is where Körting mixing systems come into operation. “The essential advantages in comparison to mechanical mixing systems are the low investment costs and the nearly wear-free operation”, as Peter Drögemeier, a graduate engineer employed by Körting Hannover AG, explained.

Körting mixing systems consist of several liquid jet mixing nozzles. These are made up of a motive nozzle and a mixing zone and operate as follows: the liquid motive medium is delivered to the mixing nozzles by means of a mechanical pump mounted on the outside of the tank. In the motive nozzle the static pressure of the motive medium is converted into speed. This generates a corresponding low pressure at the nozzle outlet and is utilised in order to suction in the so-called suction flow. “Suction and motive flow are intermixed intensively in this turbulent area at the motive nozzle outlet as well as in the downstream mixing zone and then delivered as a mixed flow into the tank volume”, reported Mr. Drögemeier. The geometrical ratios of the tank as well as the arrangement and alignment of the liquid jet mixing nozzles play a decisive role thereby.

“The efficiency of the mixing effect can be increased considerably by means of a suitable arrangement of the liquid jet mixing nozzles”, as the specialist explained. The computational fluid dynamics simulation (CFD) is used to optimise this arrangement. “With this, nearly all flow conditions in the tanks equipped with the respective liquid jet mixing nozzles can be simulated”, said Mr. Drögemeier.

All relevant demands on the mixing duties can so be fulfilled – from the aspired flow velocity in order to counter-balance inhomogeneity over the prevention of sedimentations on the floor up to avoidance of so-called dead zones in the tank. In order to achieve the preferred large-scale eddy structure the size and number of the exact positions and alignments of the liquid jet mixing nozzles must be adapted to the respective tank geometry:

Liquid jet mixing nozzles in a crude oil tank.

In the case of CFD the geometry information is imported in digitised form directly from the CAD systems applied in the production process. Number, position and alignment of the simulated liquid jet mixing nozzles in the tank are determined so that the complete tank configuration can be emulated digitally.

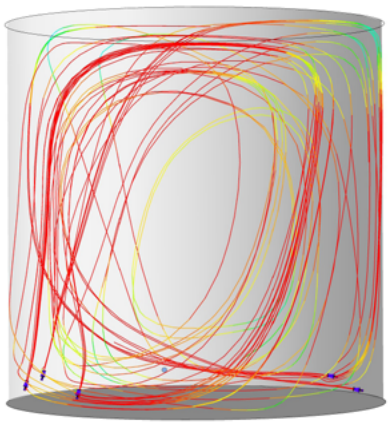
Water throughput through liquid jet mixing nozzles of different sizes

Size in inches	3/8		3/4		1 1/2		2		3	
Motive pressure drops in bar	2	4	2	4	2	4	2	4	2	4
Motive flow in m^3/h	3	4,3	6,2	8,7	12,1	17,1	23,7	33,5	48,4	68,4
Performance in W	168	475	342	966	672	1900	1300	3700	2700	7600

The simulated geometry is converted from the so-called grid generator to a calculating grid which serves as a basis for the CFD. The flow-mechanical basic equations for mass, impulse and where applicable, energy maintenance, are solved for each of the cells generated in the grid. Turbulence behaviour is also suitably simulated. Important basic principles are the geometrical boundary conditions of the tank such as filling height and diameter as well as number, position and size of the liquid jet mixing nozzles. The operational boundary conditions are determined by the motive pressure at the liquid jet mixing nozzles as well as the physical material properties of the motive medium concerned. “The whole system is innovative and, adapted to the operational demands, is applied with great efficiency at the customer’s works”, added Mr. Drögemeier. Numerous well-known companies have recognised this fact already and have utilised it successfully.

At a glance

- Low investment costs
- Complete intermixing
- Wear and maintenance-free operation
- No sealing problems
- No dead zones
- Low power input
- Installation optimisation by means of CFD



Numerically calculated flow paths.

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