DYNAMIC POSITIONING CONFERENCE
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DESIGN AND CONTROL SESSION

Station Keeping with High Performance Rudders

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Rudder - Profiles and types

NACA

Hollow profile

Schilling

(Flap type)

(Conventional use)

(Conventional use)

(High Performance)
preferred for
slow/zero speed
maneuvering
Comparison of rudder profile

Rudder force
Hydrodynamic force
resulting from pressure
distribution around rudder blade

BLUE - suction side
RED - pressure side

After stall (flow disruption
on suction side) only
pressure component
remains.
Vector graph of a High Performance vs Conventional Rudder

Max lateral force of the conventional rudder profile

- High remaining ahead force,
- Low thrust deduction,
- Low lateral Force,
- High lateral force,
- Low thrust deduction,
- Low lateral Force,
Manoeuverability for slow speed

- High propeller coverage
- Optimum use of propeller thrust
- Time and cost efficient
- Independent ship operation - less tug boat support required
Slow speed/zero speed maneuvering

- Smallest turning circles / Turning on the spot at slow speed and zero speed at larger rudder angles

- Crabbing at zero speed
Becker Intelligent Monitoring System (BIMS)

New possibilities for Rudder operation:

- Measurement of real manoeuvring force acting on the aft ship
- Ideal rudder operation through exact determination lift maximum
- Drag measurement allows calculation of ahead thrust deduction (important for single screw)
- Monitoring of manoeuvring condition changes and adaption survey
BIMS - From Theory and ...
.... Practice
BIMS - Improved Propeller-Rudder Operation

- More reliable and more predictable Propeller-Rudder Operation,
- Recorded rudder data available for the DP/steering control system,
- Less rudder acting, no rudder flipping
- More potential for high performance rudders
- Reduced response time during maneuvering
- Much less steering gear motion
- Energy savings through improved efficiency
Becker Nozzle
nozzle angle 35°
Flow distribution at BP cond. 15 deg rudder angle/nozzle angle

Fixed nozzle/propeller and flap rudder

Becker Nozzle
Flow distribution at BP cond. 25 deg rudder angle/nozzle angle

Fixed nozzle/propeller and flap rudder

Becker Nozzle
Performance of Becker Nozzle vs fixed nozzle and flap rudder

Ahead force and side force ratio at different rudder angles.
New Becker Nozzle - Facts

• High maneuverability for conventional twin shaft line driven ships,

• Faster response of maneuvering force,

• Higher maneuvering forces than high lift rudders,

• Simple interaction of propeller, nozzle and flap,

• Compact unit, no higher weight,

• Less engine power required,