

### Numerical Simulation on Flow-induced Vibration of Square-pitched $4 \times 4$ Cylinder Arrays in Cross Flow

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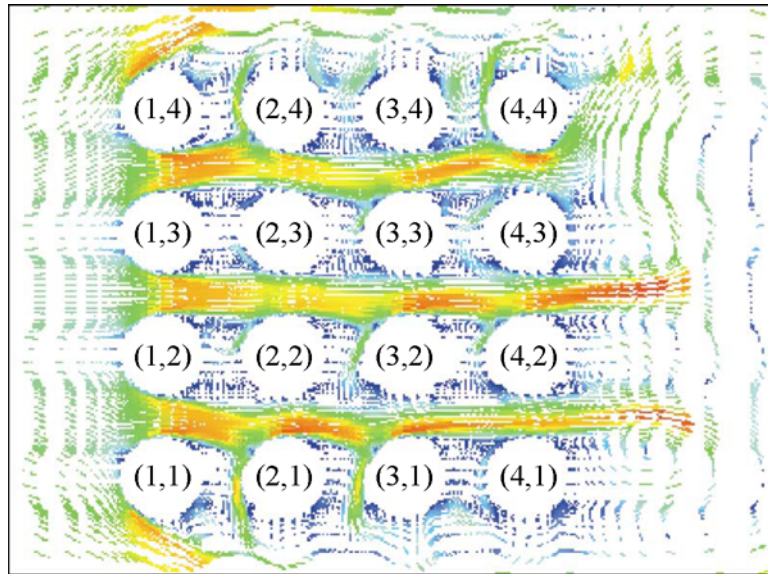


Fig. 1. Flow vector field in the vicinity of a  $4 \times 4$  square-pitched cylinder array with  $P/D=1.5$  and  $Re=1000$  at  $t^*=100.0$

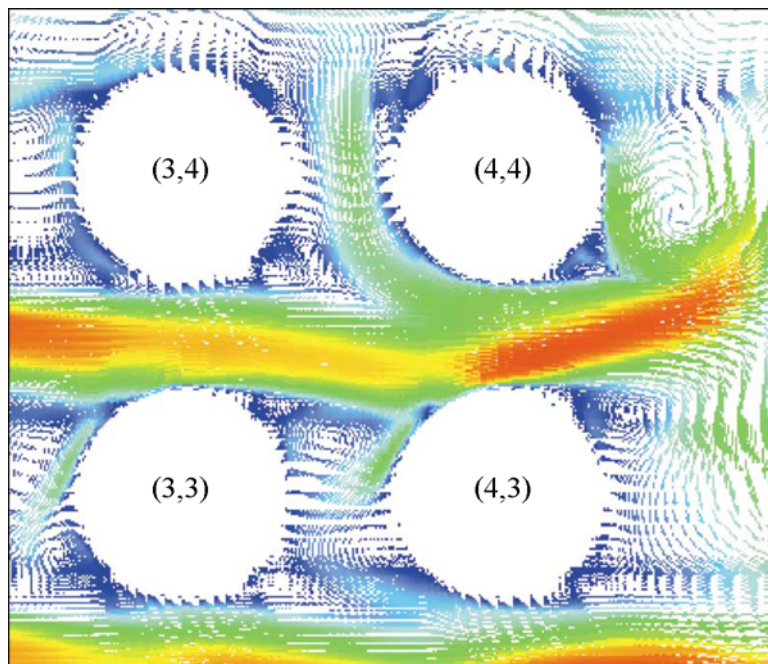


Fig. 2. Flow vector field in the vicinity of cylinders (3,3), (3,4), (4,3) and (4,4) with  $P/D=1.5$  and  $Re=1000$  at  $t^*=102.0$

The transient characteristics of the lift and the drag on cylinders were numerically evaluated for  $4 \times 4$  square-pitched circular cylinder arrays elastically supported inline to the cross fluid flow. Figures 1 and 2 show the flow vector fields inside the array at the non-dimensional time  $t^*=100.0$  and  $102.0$ , where  $t^*$  is related to the time  $t$  in terms of the cylinder diameter  $D$  and the uniform incoming cross flow velocity  $U$  such that  $t^*=U t / D$ .  $Re$  and  $P$  in figure captions are the Reynolds number and the pitch of the cylinder assembly, respectively.