

# Influence of fin arrangement on fluid flow and heat transfer in the inlet of a plate-fin heat exchanger

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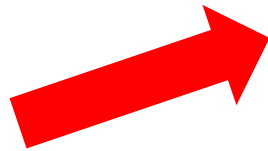
# Plate-fin Heat Exchanger

Proposed in 1930s  
in automotive and  
aviation fields

Designed the  
Plate-fin Heat  
Exchanger

Marston Excesior  
Company in 1930s

Fluid Flow and Heat  
Transfer Enhancement

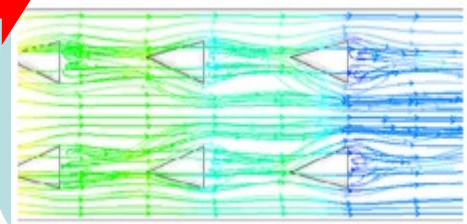


More Compact  
and Smarter  
.....

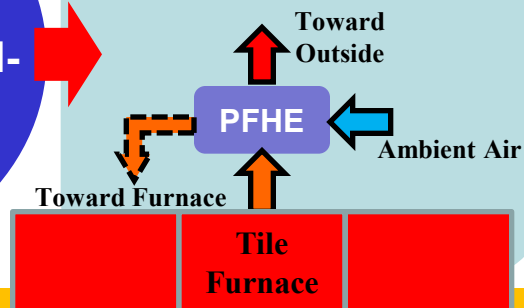
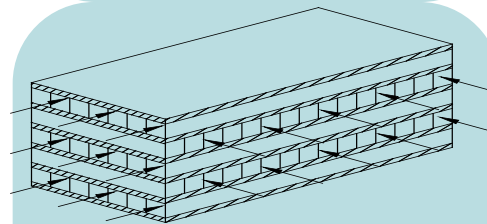


Optimizing Design

A Novel Fin  
Configuration for  
High Temperature  
Ceramic Plate-fin  
Heat Exchanger was  
Investigated

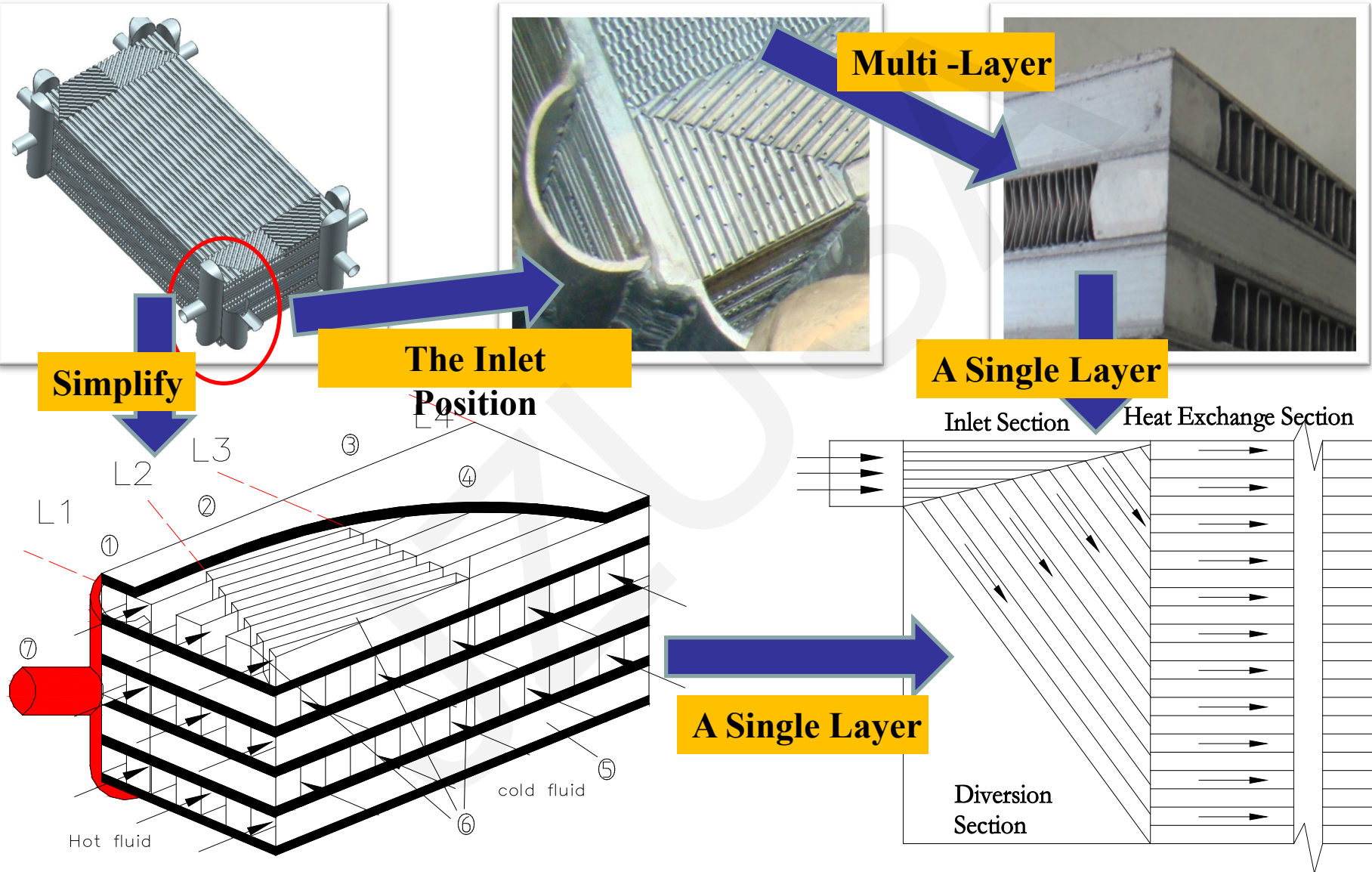


Optimizing the Plate-  
fin Heat Exchanger  
Considering Thermal-  
Economic using  
Genetic Algorithm  
...



Research on Fin Arrangement in Plate-fin Heat Exchanger has not been Reported

# Plate-fin Heat Exchanger



Simplify

Multi-Layer

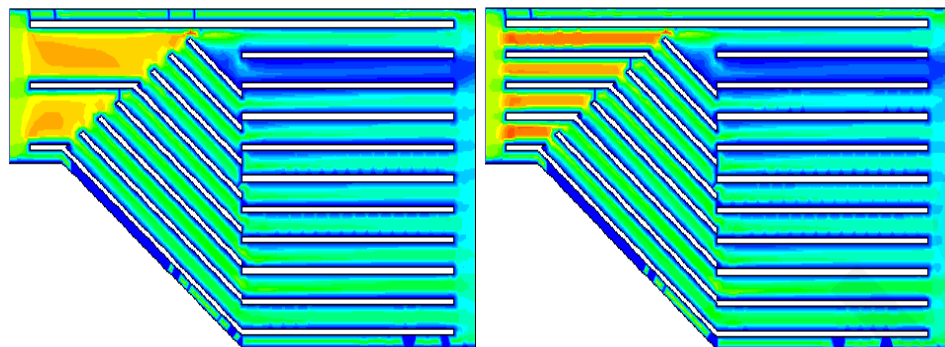
The Inlet Position

A Single Layer

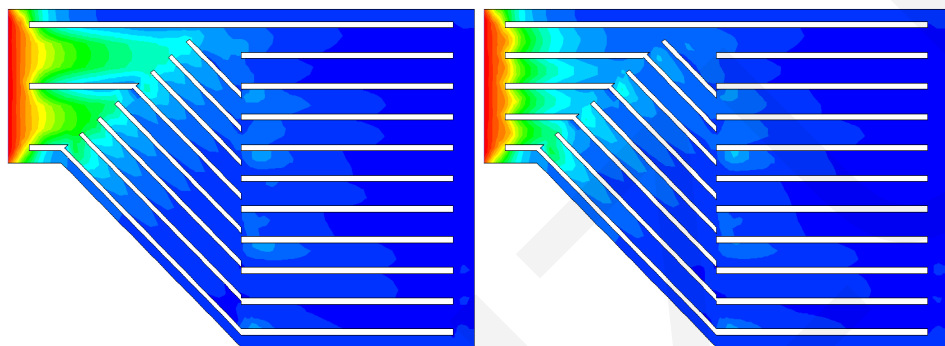
A Single Layer

# Fluid Flow and Temperature Distribution

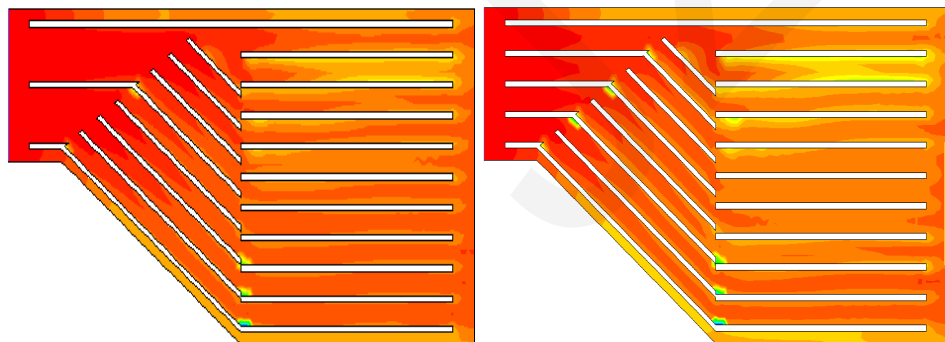
## Fluid Field in Inlet of the Plate-fin Heat Exchanger



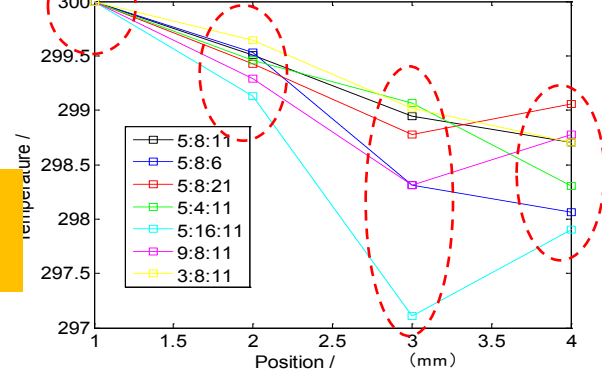
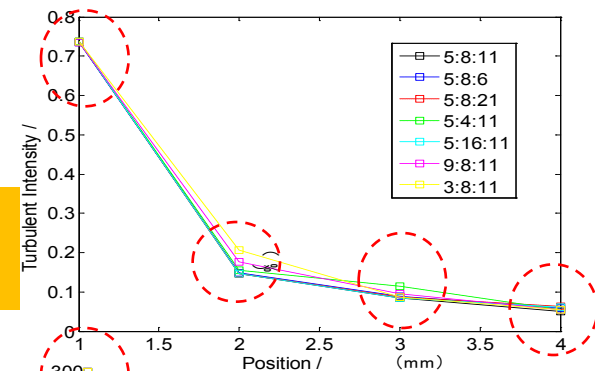
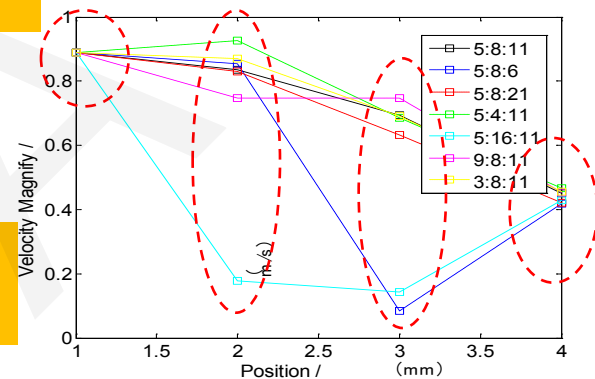
Velocity Distribution



Turbulent Intensity



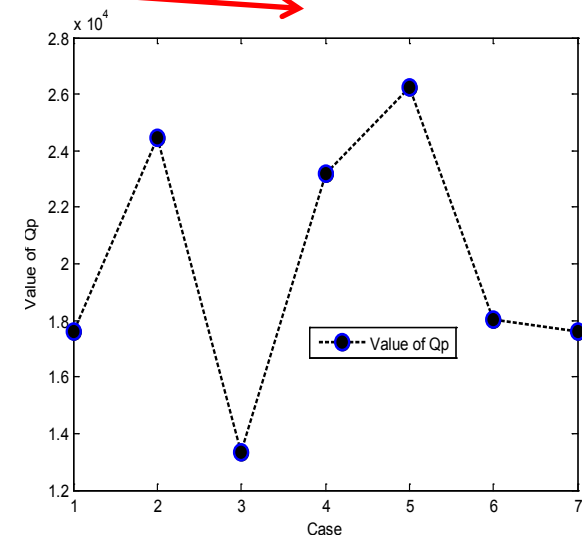
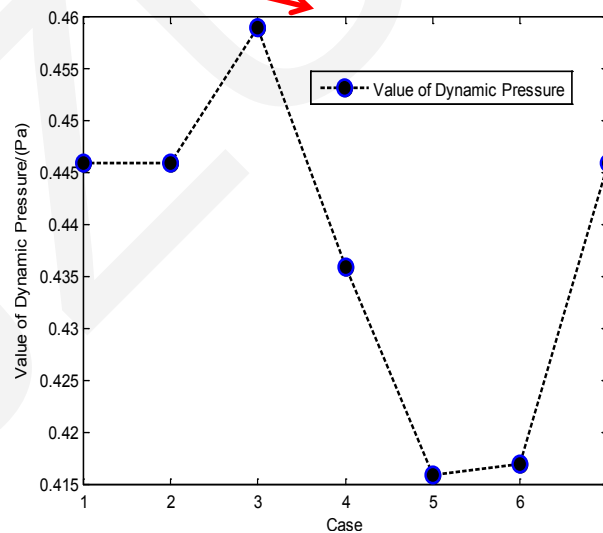
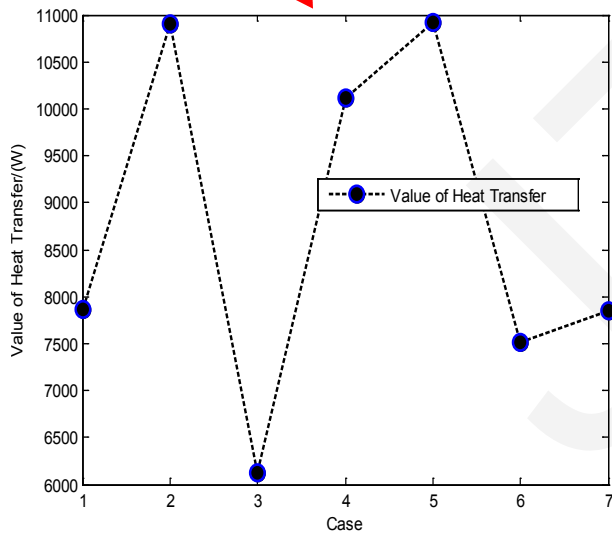
Temperature Distribution



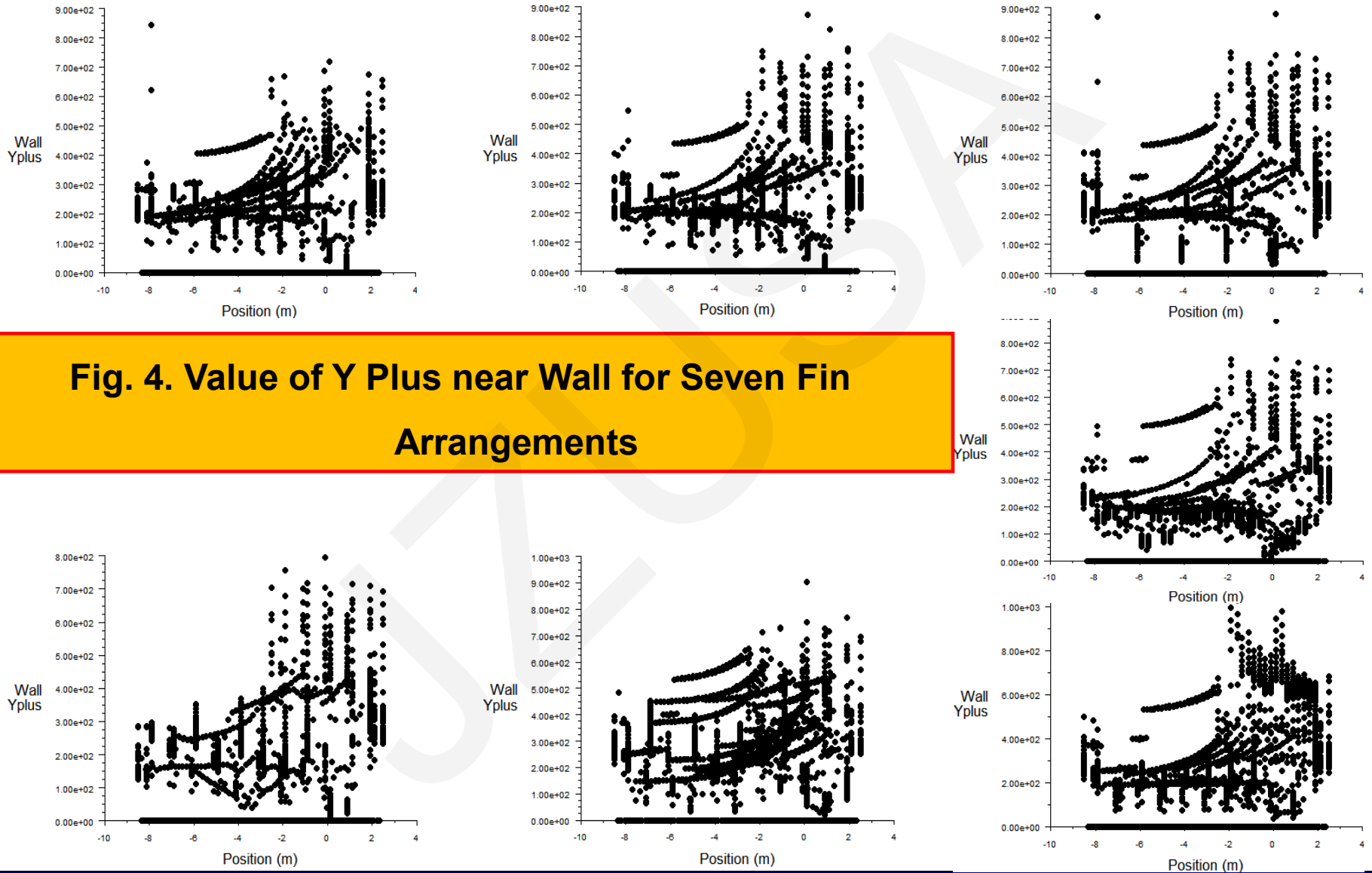
# Results Validation under Seven Cases

## Results Validation

	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6	Case 7
$Q_{avg}$	7846.43	10904.70	6117.43	10120.91	10913.94	7512.16	7859.87
$P_{avg}$	0.446	0.446	0.459	0.436	0.416	0.417	0.446
$Q_p$	17592.89	24460	13327.73	23213.1	26235.43	18014.77	17623.03



# Y+ near Wall for Seven Fin Arrangements



**Fig. 4. Value of Y Plus near Wall for Seven Fin Arrangements**

# Conclusions

- **Fin arrangements in three sections affect fluid turbulence. Simulating the fluid flow under seven fin arrangements shows that, with increase of fin number, turbulence intensity at monitoring positions decreases along the flow direction.**
- **Dense arrangement of fins can equalize fluid distribution in different channels at the same layer, reduce temperature difference, increase the heat exchange area of fins, and improve the effect of heat transfer.**
- **Compared with the inlet and heat exchange sections, fin arrangements in the diversion section have more significant effects on temperature distribution and pressure drop.**
- **The mean value of pressure drop at the outlet is consistent with temperature.**