SFB 561 - Thermally Highly Loaded, Porous and Cooled Multi-Layer Systems for Combined Cycle Power Plants

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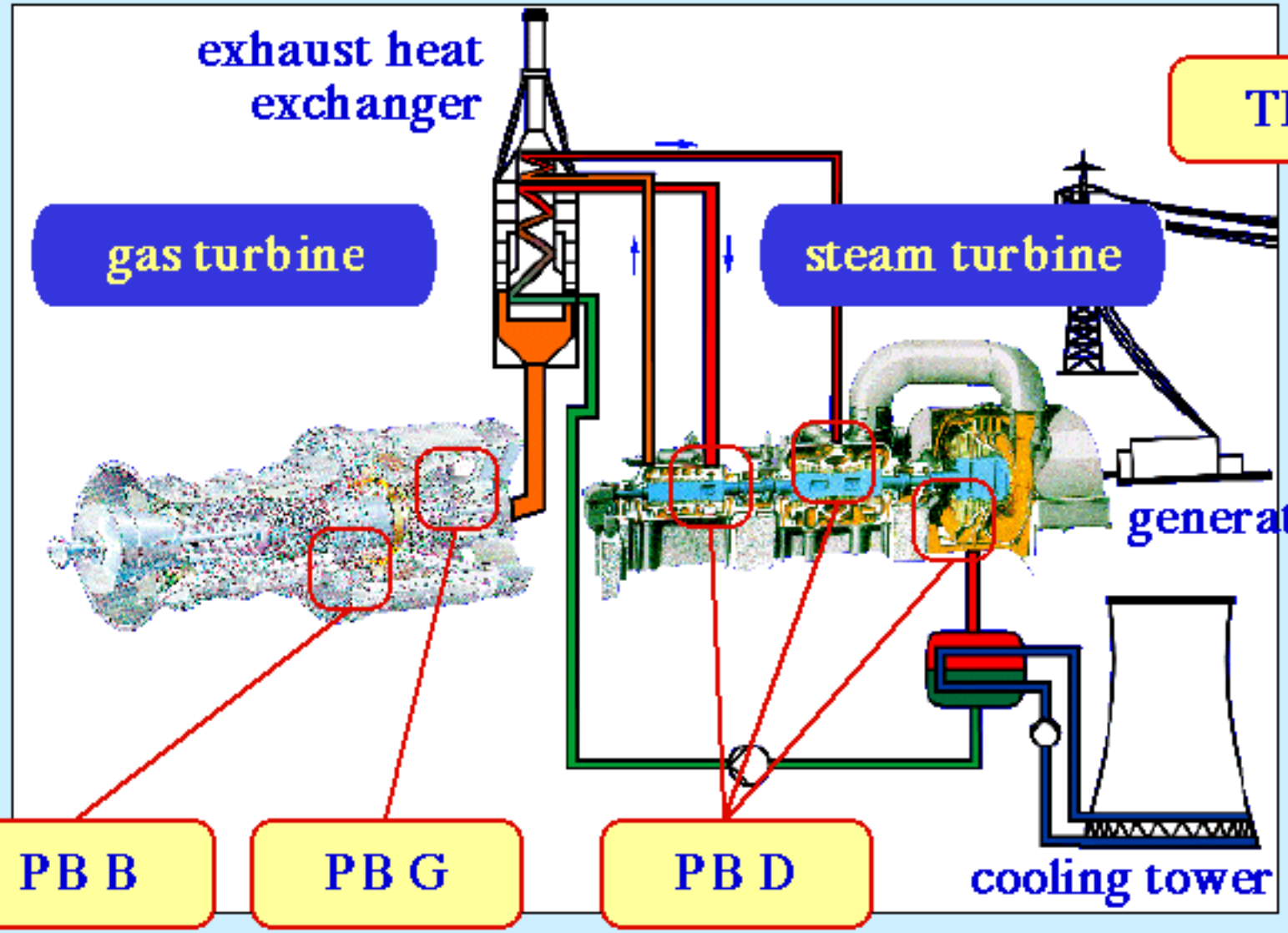
Scientific Objective for the Future Combined Cycle Power Plant

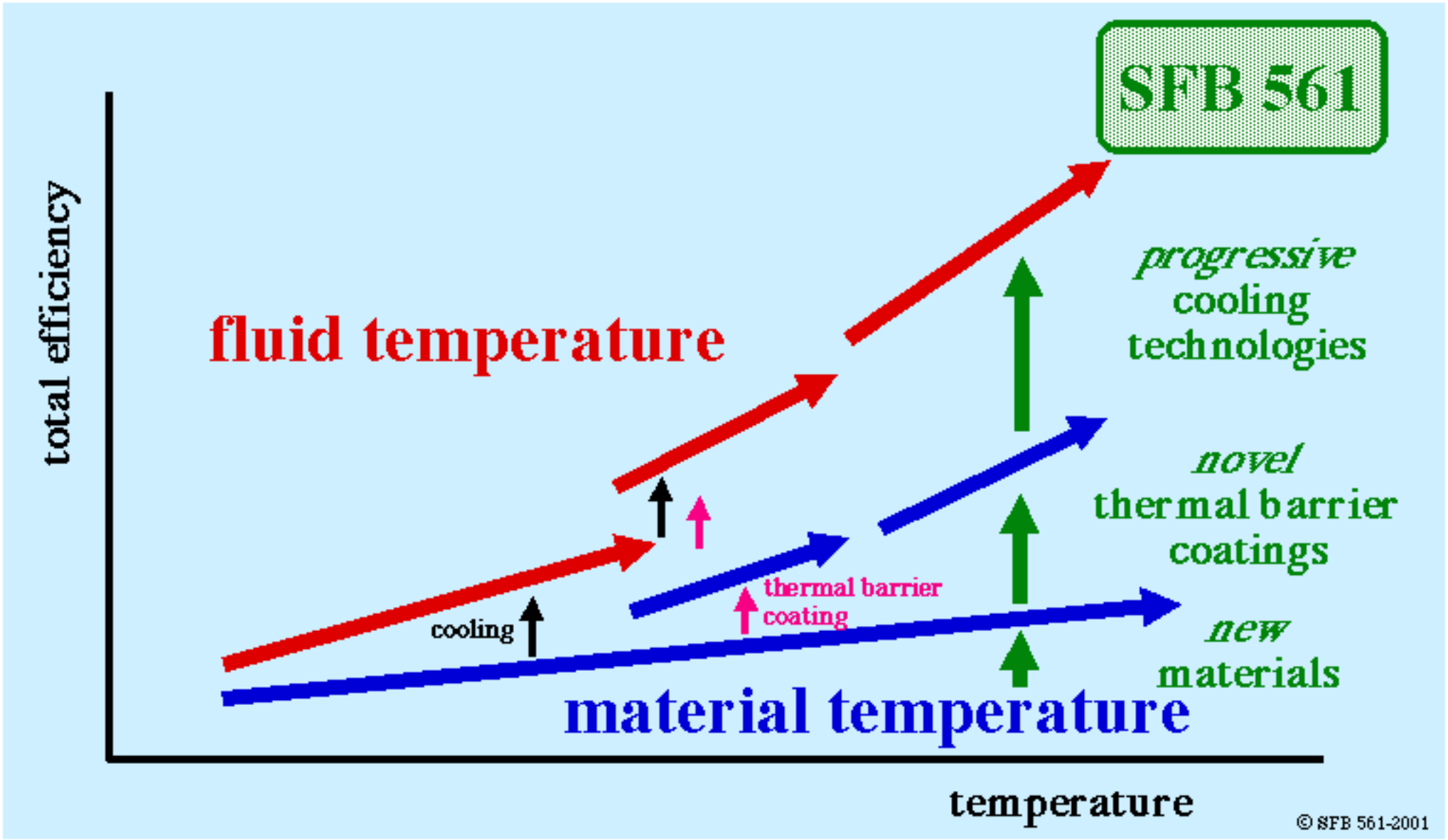
total efficiency	with natural gas	roughly 65%	(current 58 %)
	with coal gas	roughly 55%	(current 45 %)

turbine inlet temperature	gas turbine	1350 °C-ISO	(current 1230 °C-ISO)
	steam turbine	650 to 720 °C	(current < 600 °C)

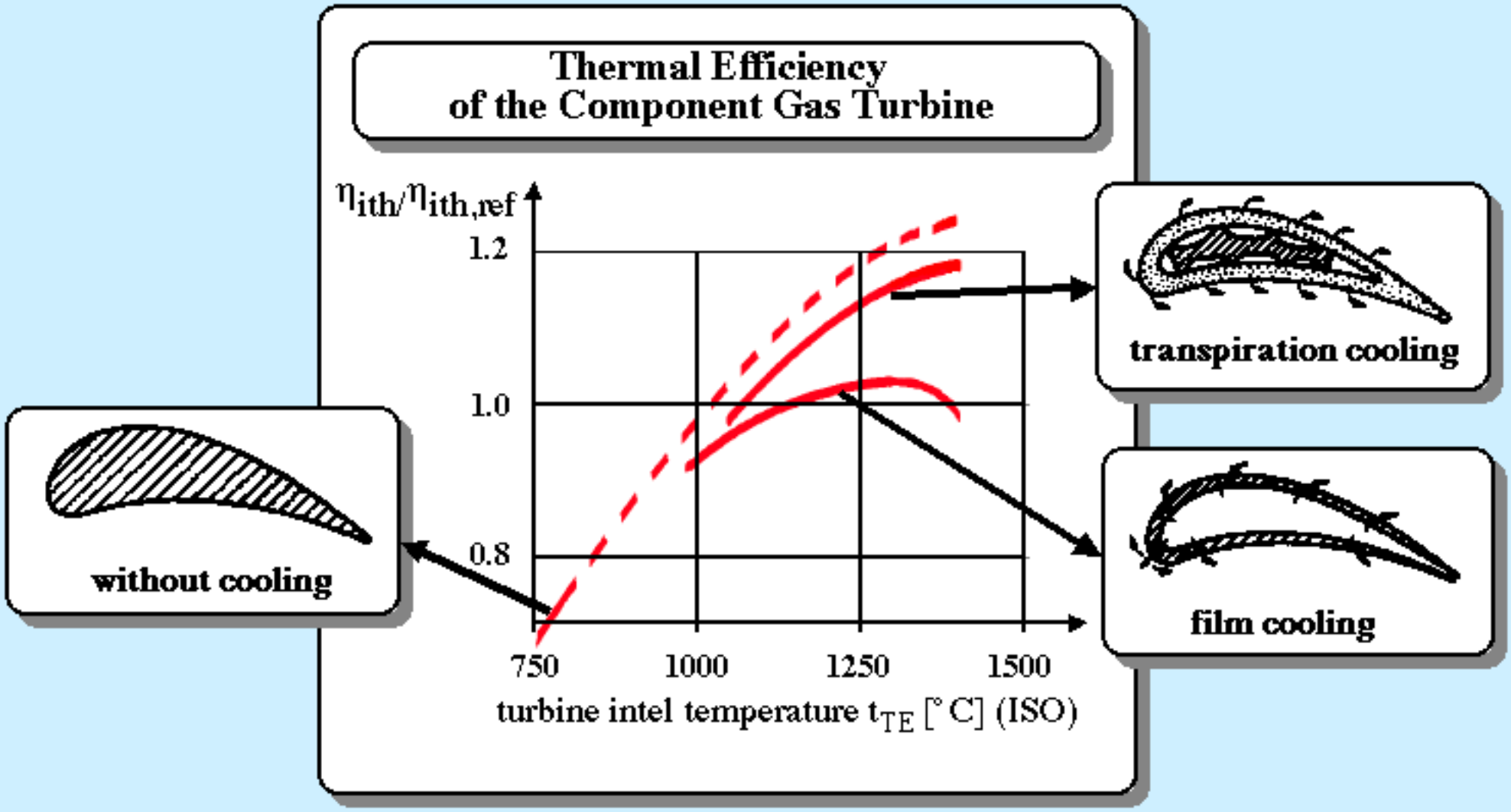
Combined Cycle Power Plant



Increase of Efficiency

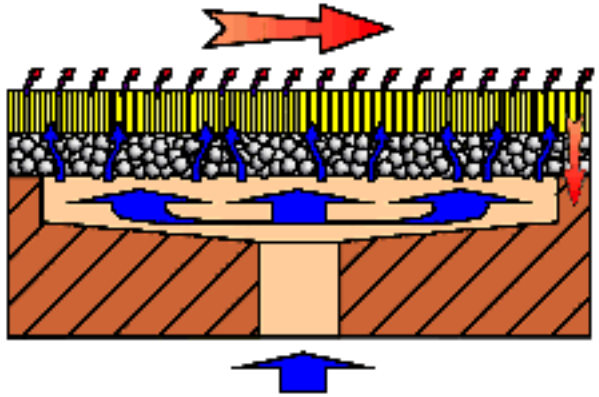


Cooling Technologies for Gas Turbine Blades: Effect on Thermal Efficiency

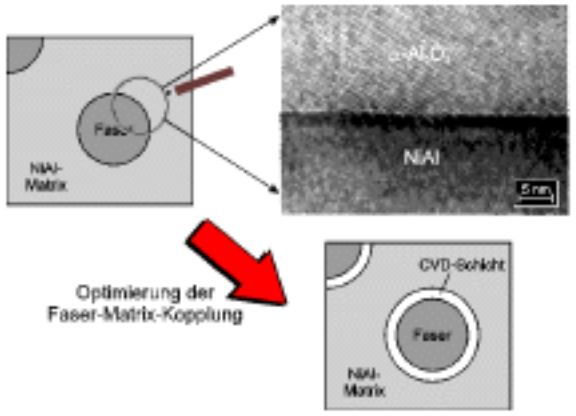


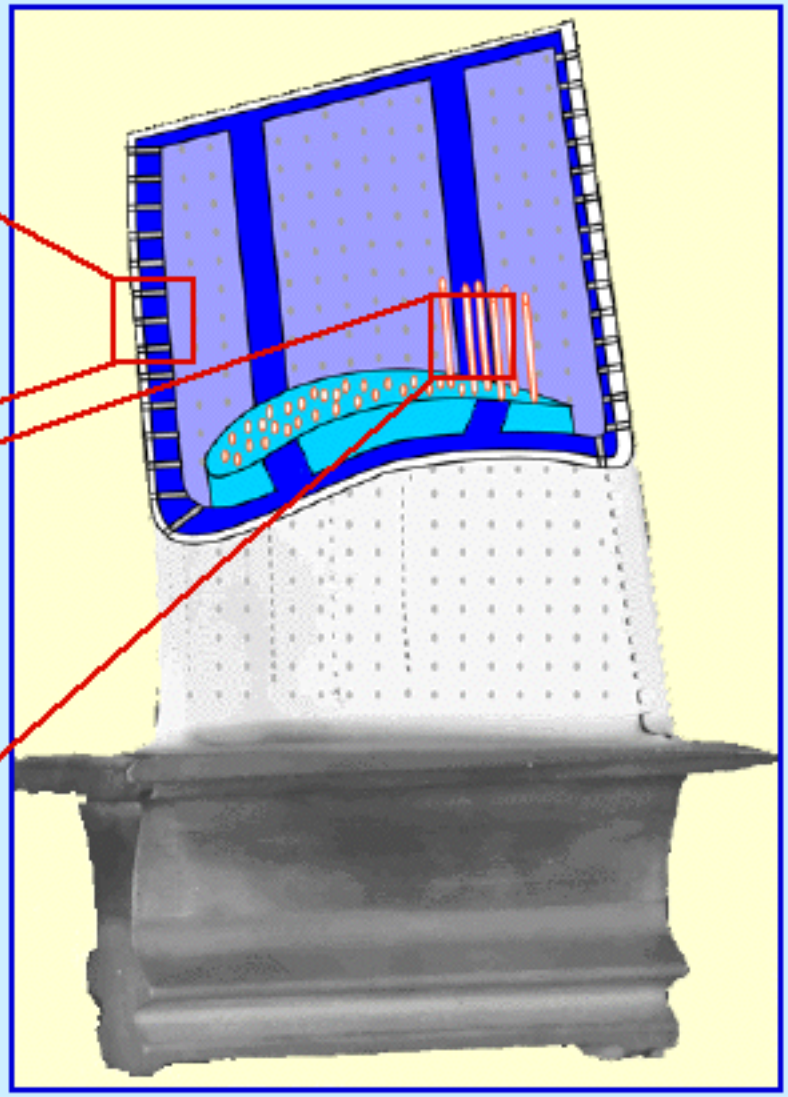
Schematic Set-Up of a Future Gas Turbine Blade

transpiration cooling

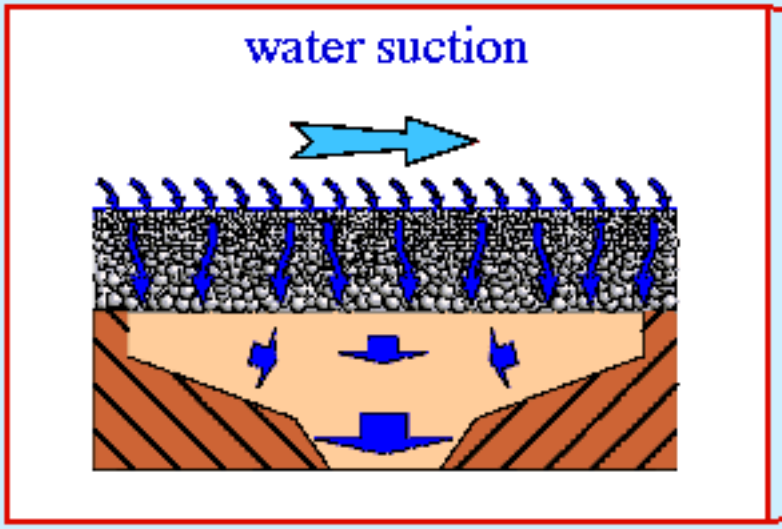


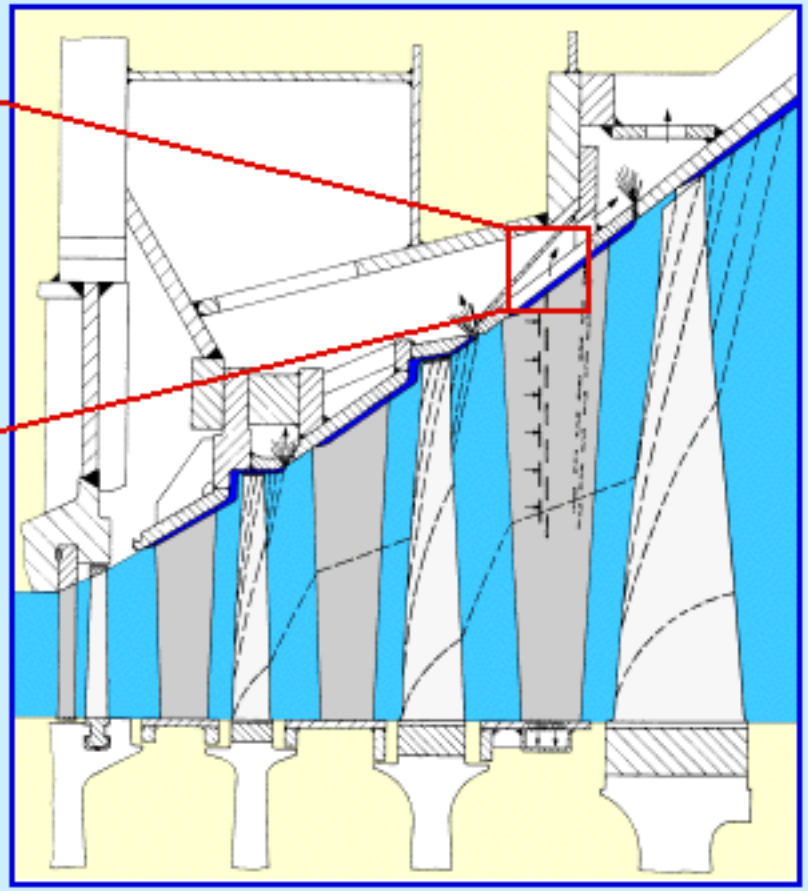
fibre reenforcement



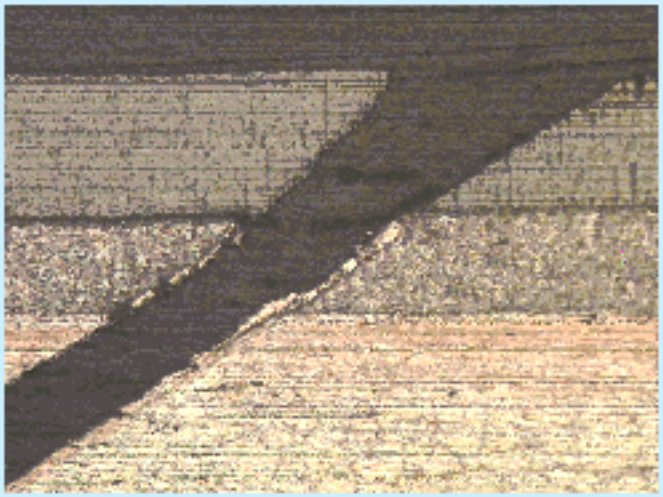


Low Pressure Steam Turbine:
Water Suction by Porous Structures

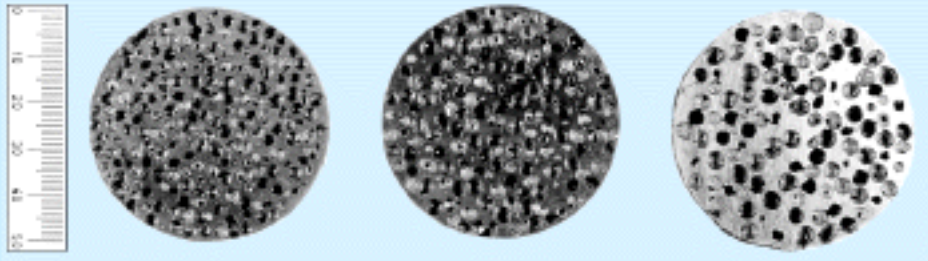




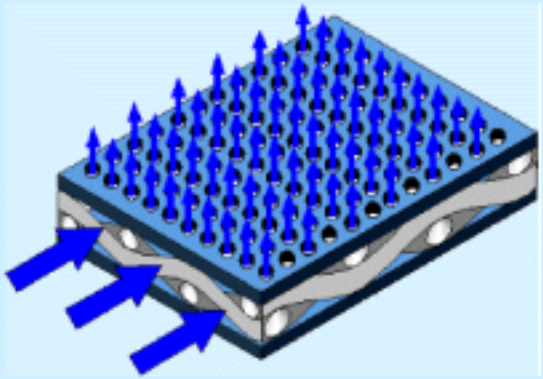
Manufacturing of Porous Materials



laser drilled cooling hole in multi-layer system

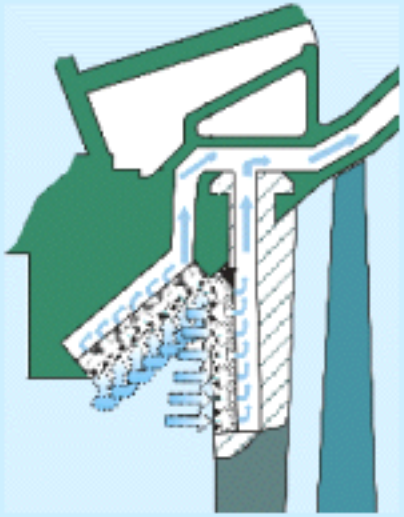


casted structure with open porosity on basis of cast irons

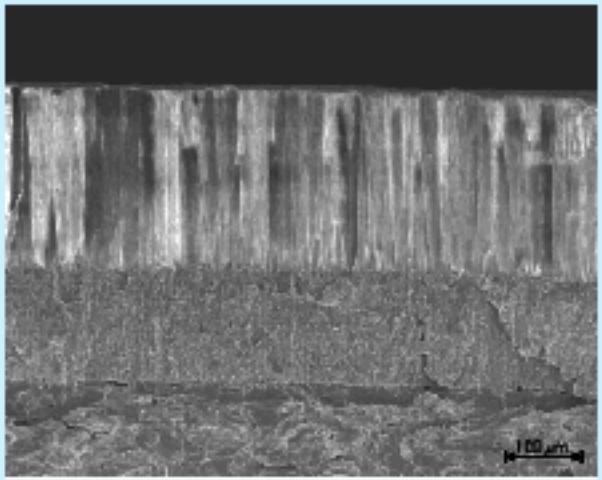


porous hollow structure build up with grid sheets

porous, powder metalurgically manufactured in-situ composite material

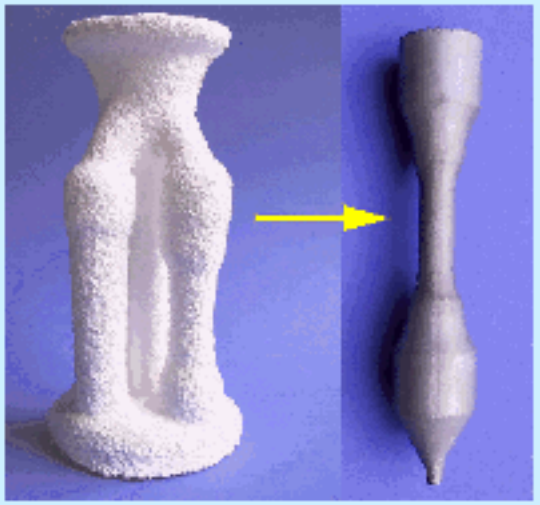


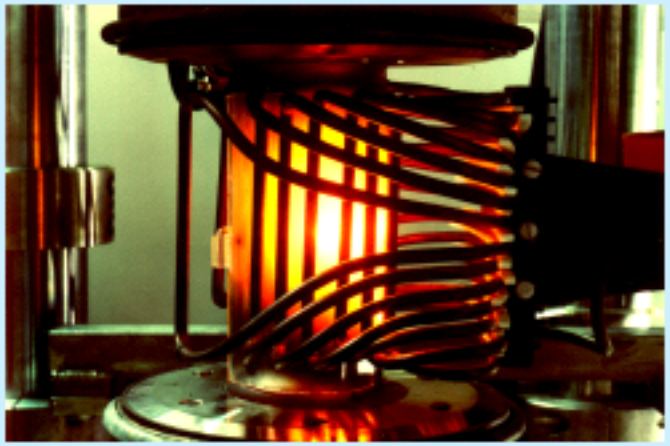
Manufacturing Processes and Investigation of New Materials



structure of thermal barrier coating

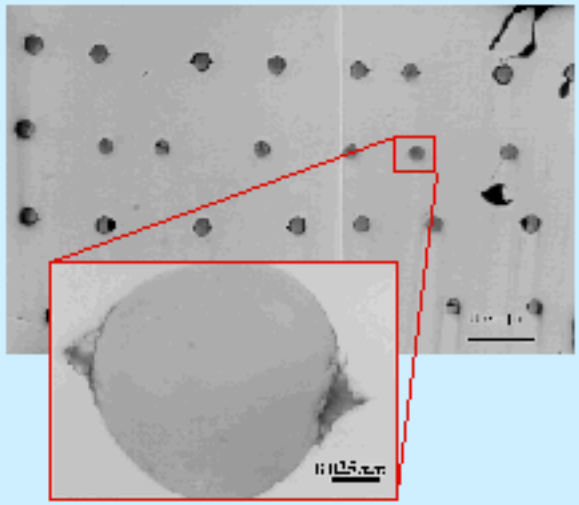
manufacturing of LCF specimens of NiAl alloys

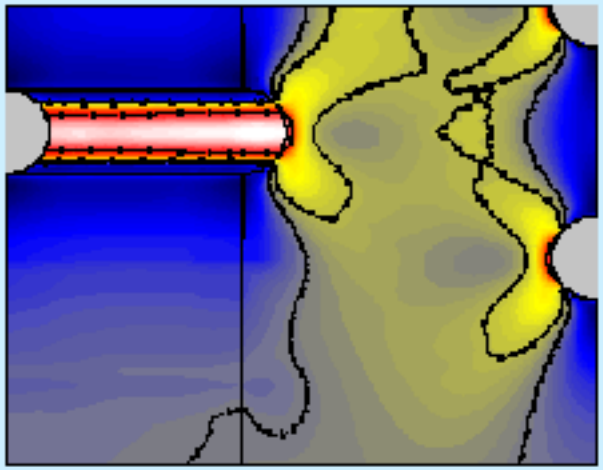




investigation of thermo-mechanical behaviour

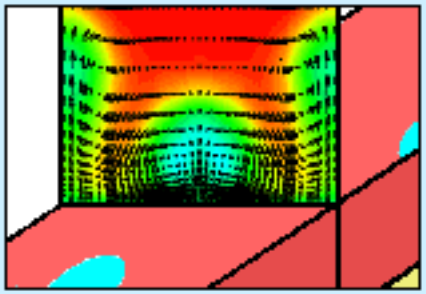
bonding of Al_2O_3 fibres in NiAl alloy

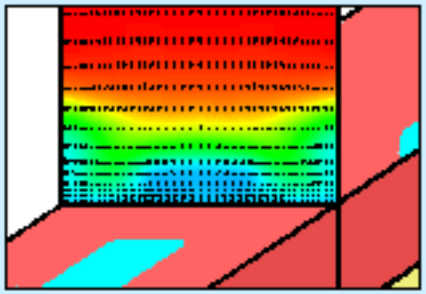


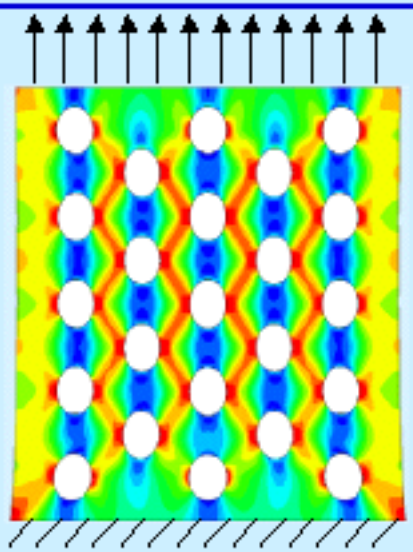


finite-element calculation of stress distribution in a cylindrical hollow specimen with drill-holes

development of homogeneous cooling film by application of hole shaping

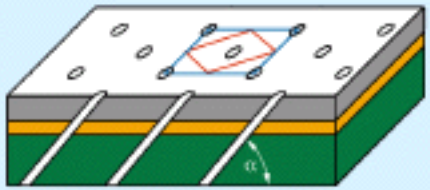


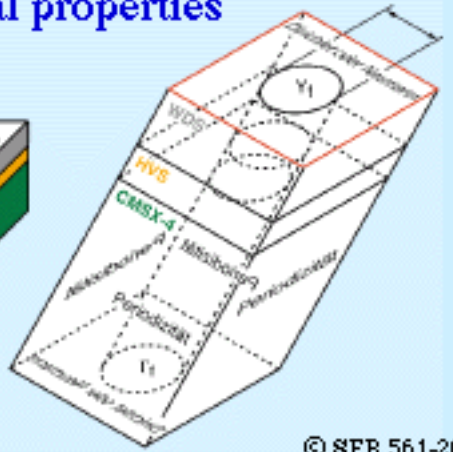




finite-element analysis of v. Mises stresses in a perforated sheet

definition of unit cell for calculation of homogenized material properties





Increase of Total Efficiency