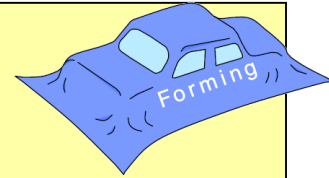
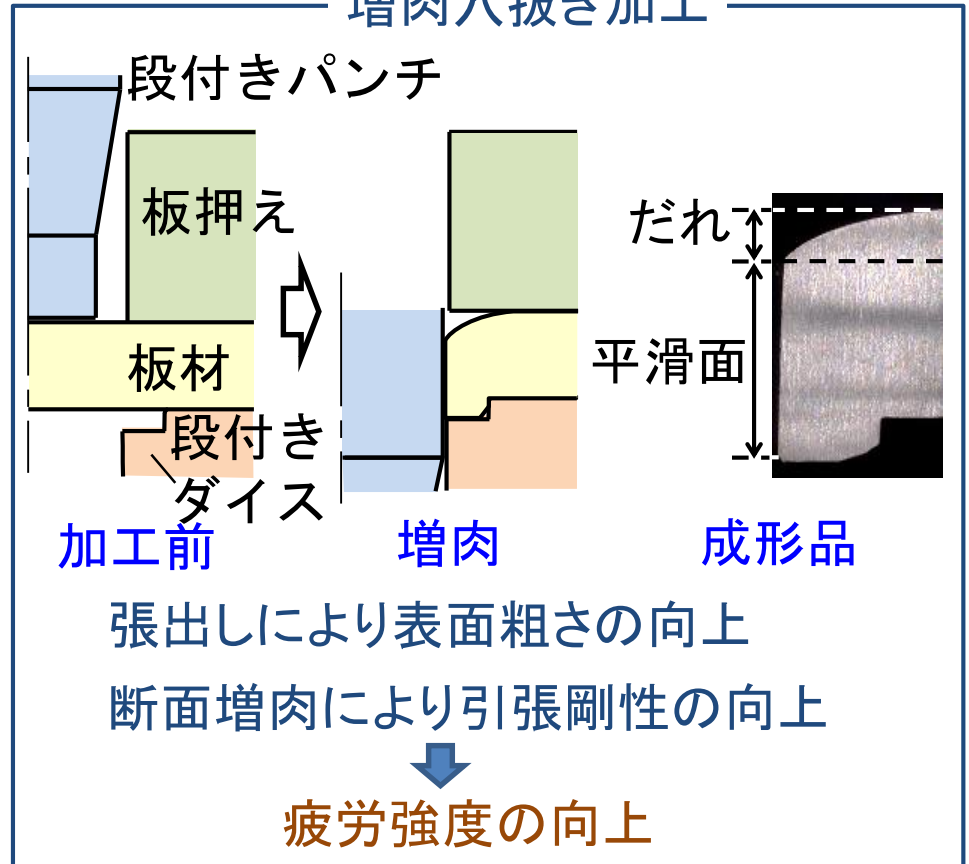
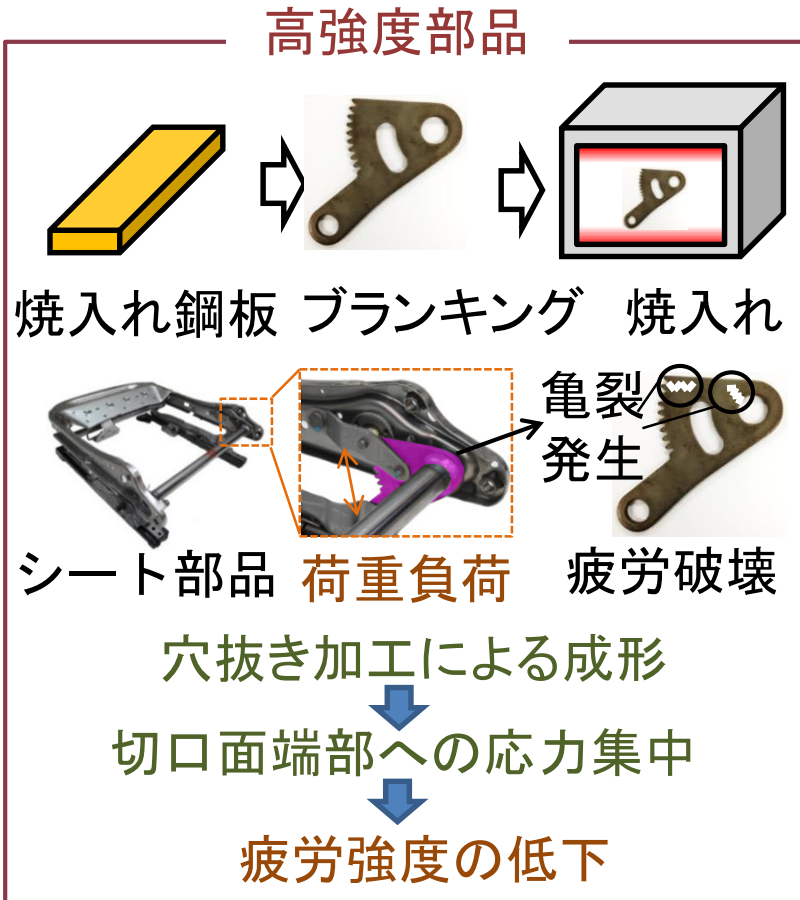


穴抜き増肉加工された焼入れ鋼板の 熱処理後の機械的特性



極限成形システム研究室 中川 直哉

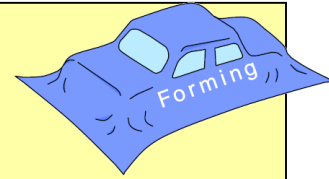
増肉穴抜き加工



研究目的

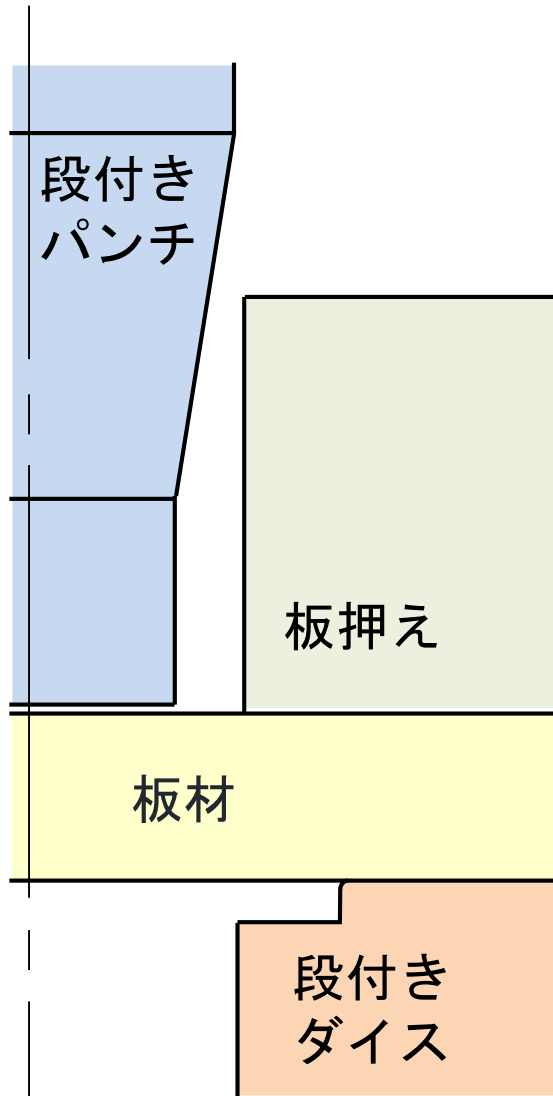
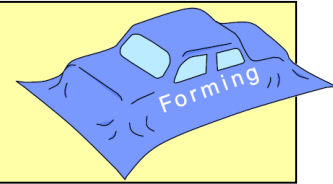
焼入れ鋼板の増肉穴抜き加工による疲労強度の向上とだれ低減

穴抜き増肉加工された焼入れ鋼板の 熱処理後の機械的特性

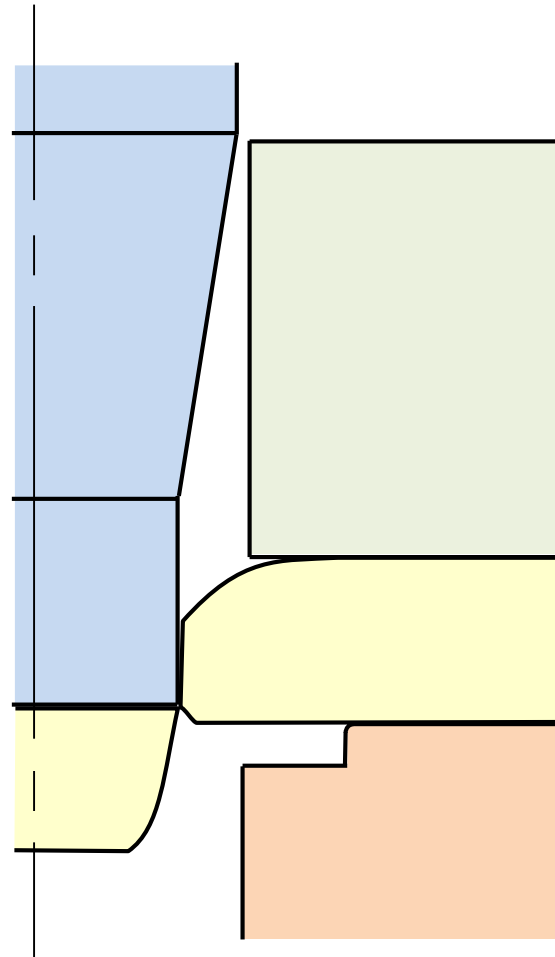


- 1) 増肉穴抜き加工による疲労強度の向上
- 2) だれ低減増肉穴抜き加工による疲労強度の向上

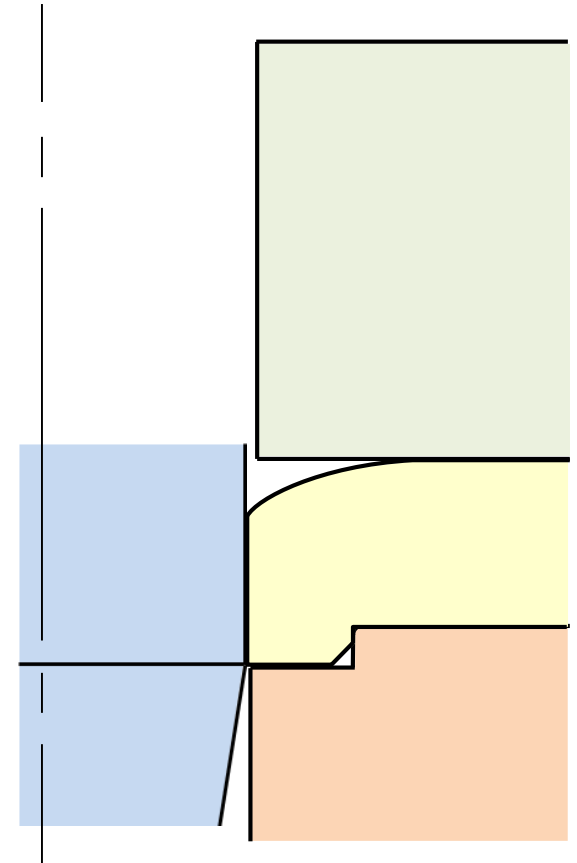
段付き金型を用いた 増肉穴抜き加工方法



(1) 加工前

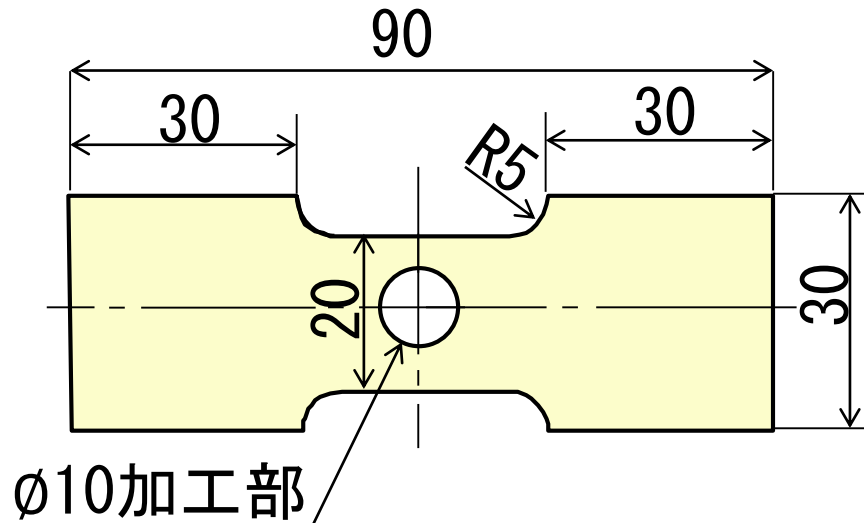
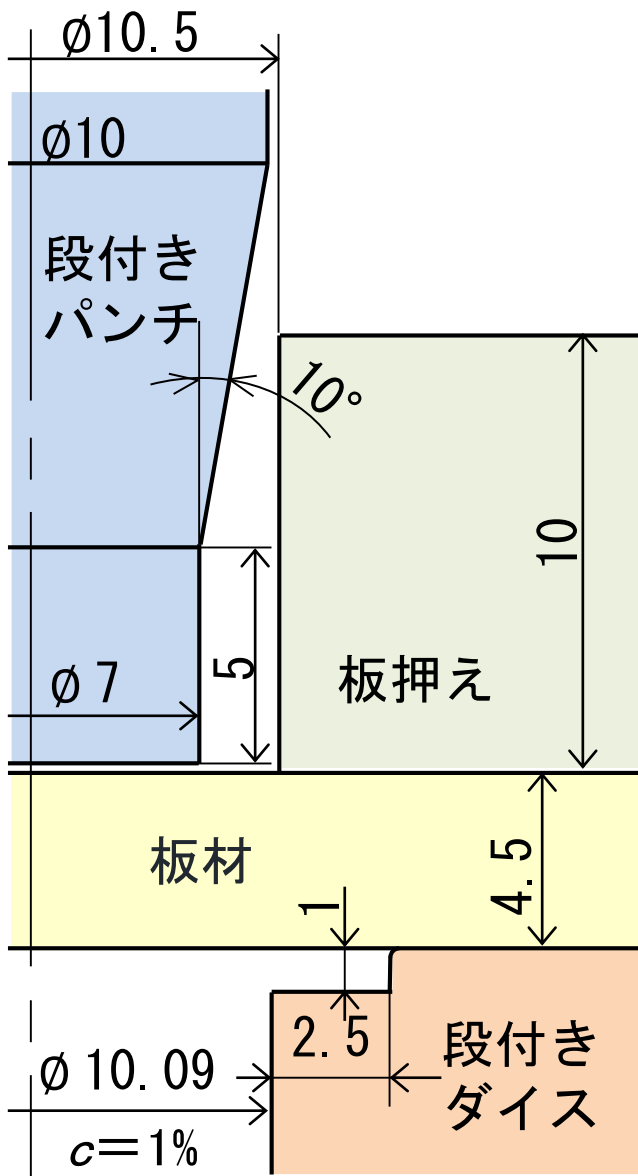
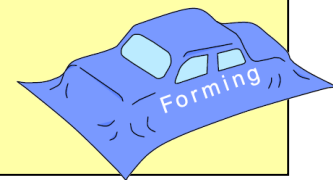


(2) 穴抜き



(3) 増肉

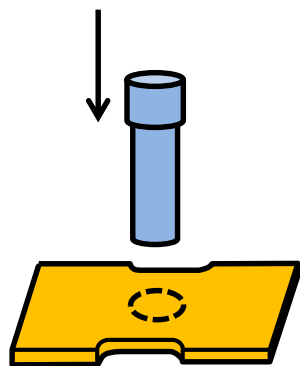
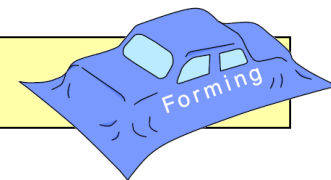
増肉穴抜き加工条件と 鋼板の機械的特性



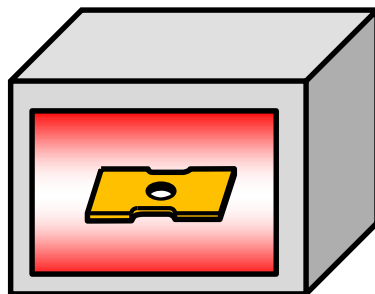
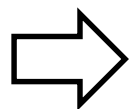
機械的特性

S35C 相当材	焼入れ前		焼入れ後	
	引張強さ [MPa]	絞り [%]	引張強さ [MPa]	絞り [%]
国内材	471	64.1	1559	37.6
台湾材	489	76.5	1515	47.3
中国材	469	72.5	1555	48.4

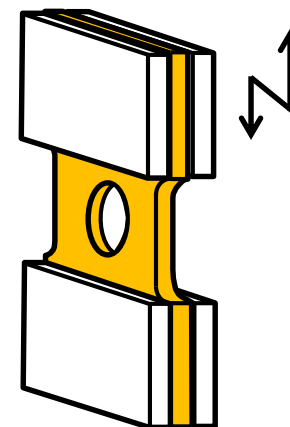
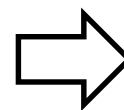
熱処理・疲労試験条件



穴抜き



焼入れ・焼戻し



疲労試験

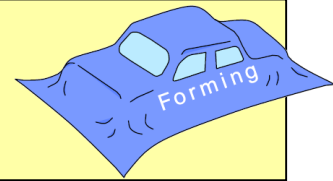
熱処理条件

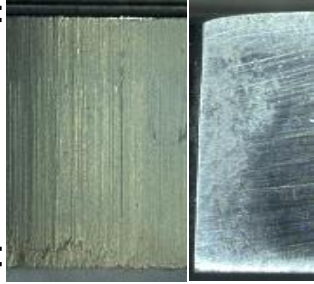
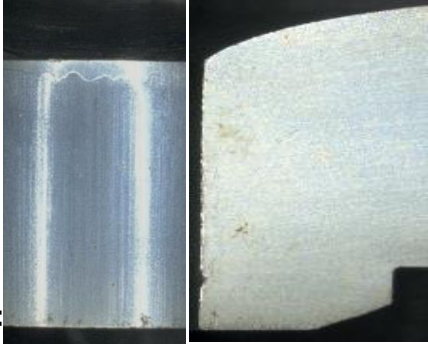
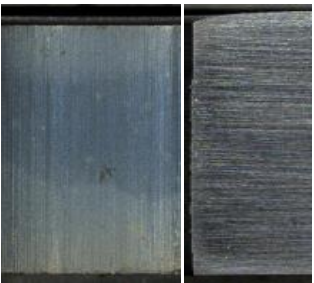
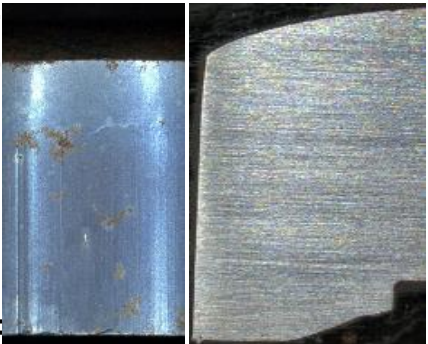
	温度 [°C]	時間 [min]	冷却方法
焼入れ	870	40	油冷
焼戻し	300	60	空冷

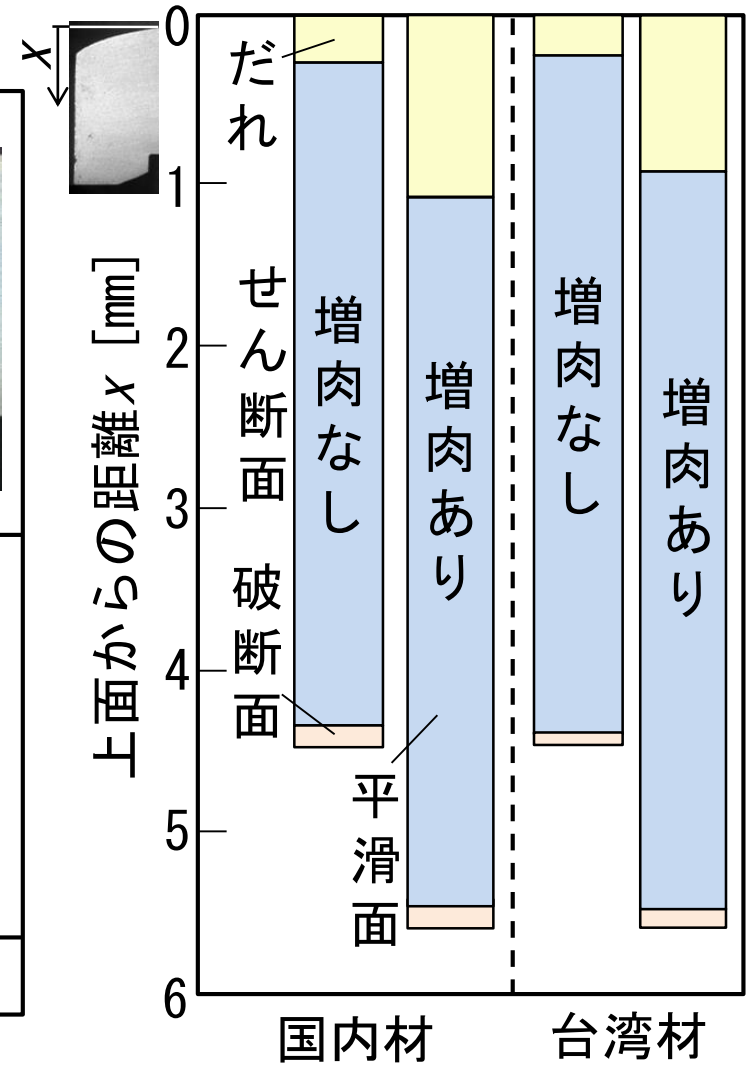
疲労試験条件

試験速度 /Hz	40
試験終了条件	試験片分離
最大繰返し回数	10 ⁶

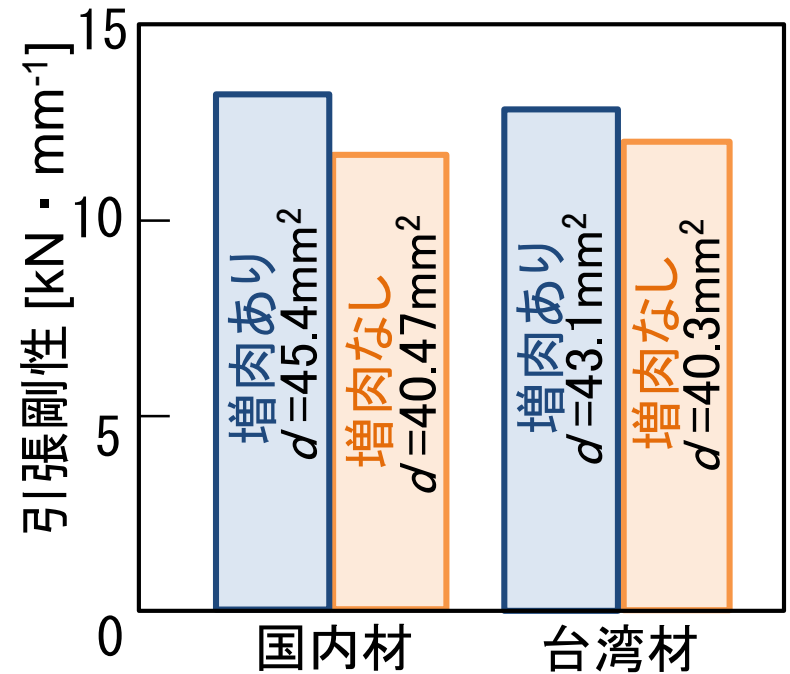
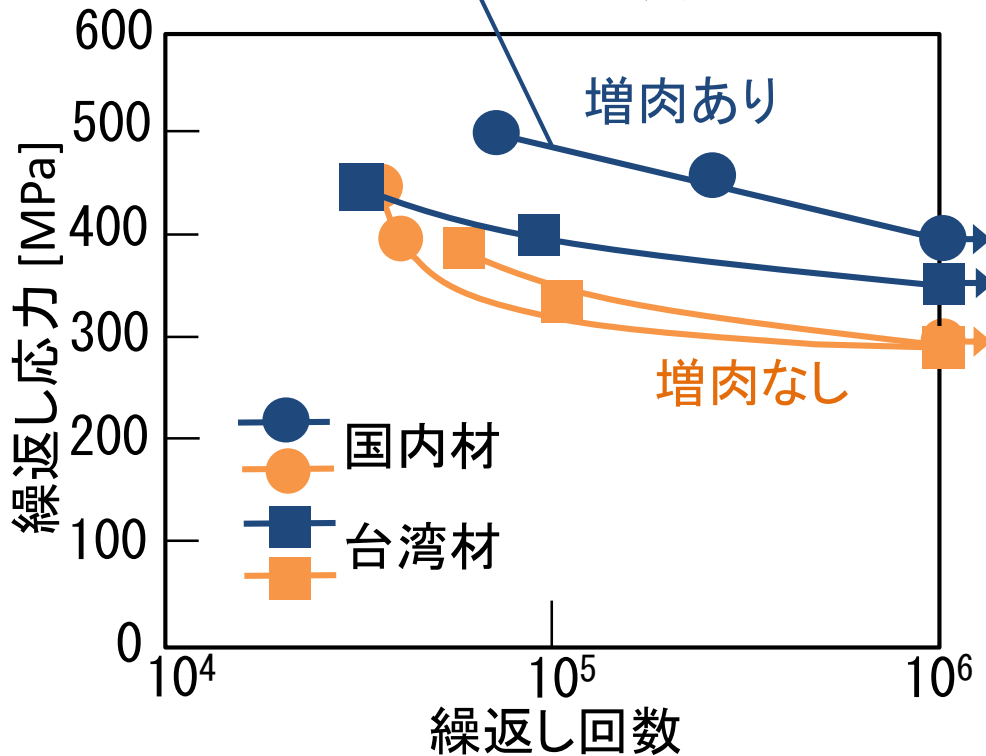
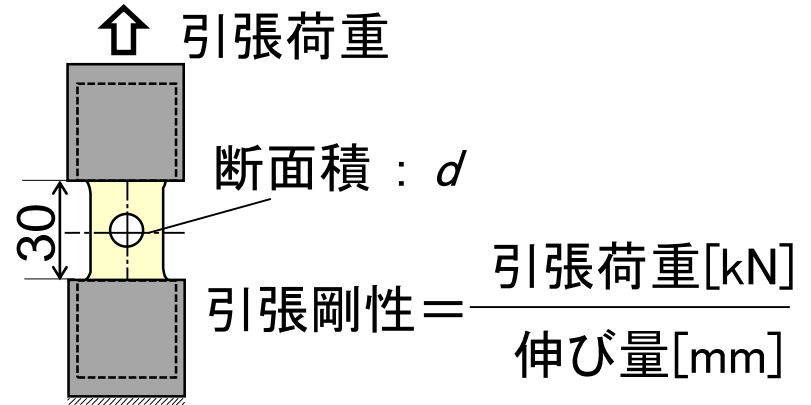
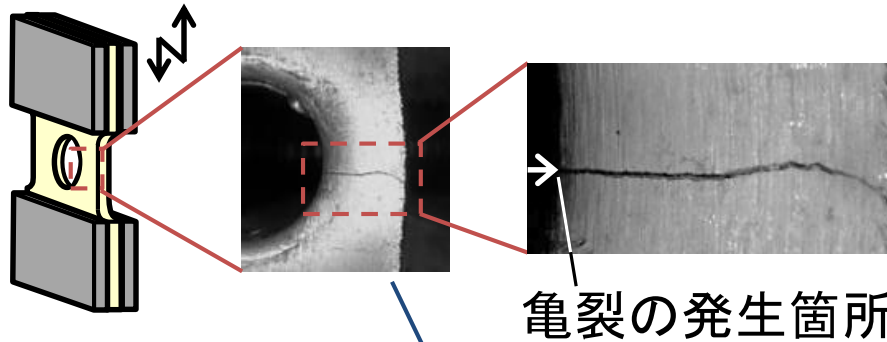
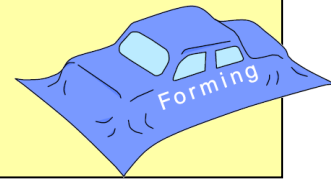
焼入れ後の増肉穴抜き加工された 穴縁面と構成比



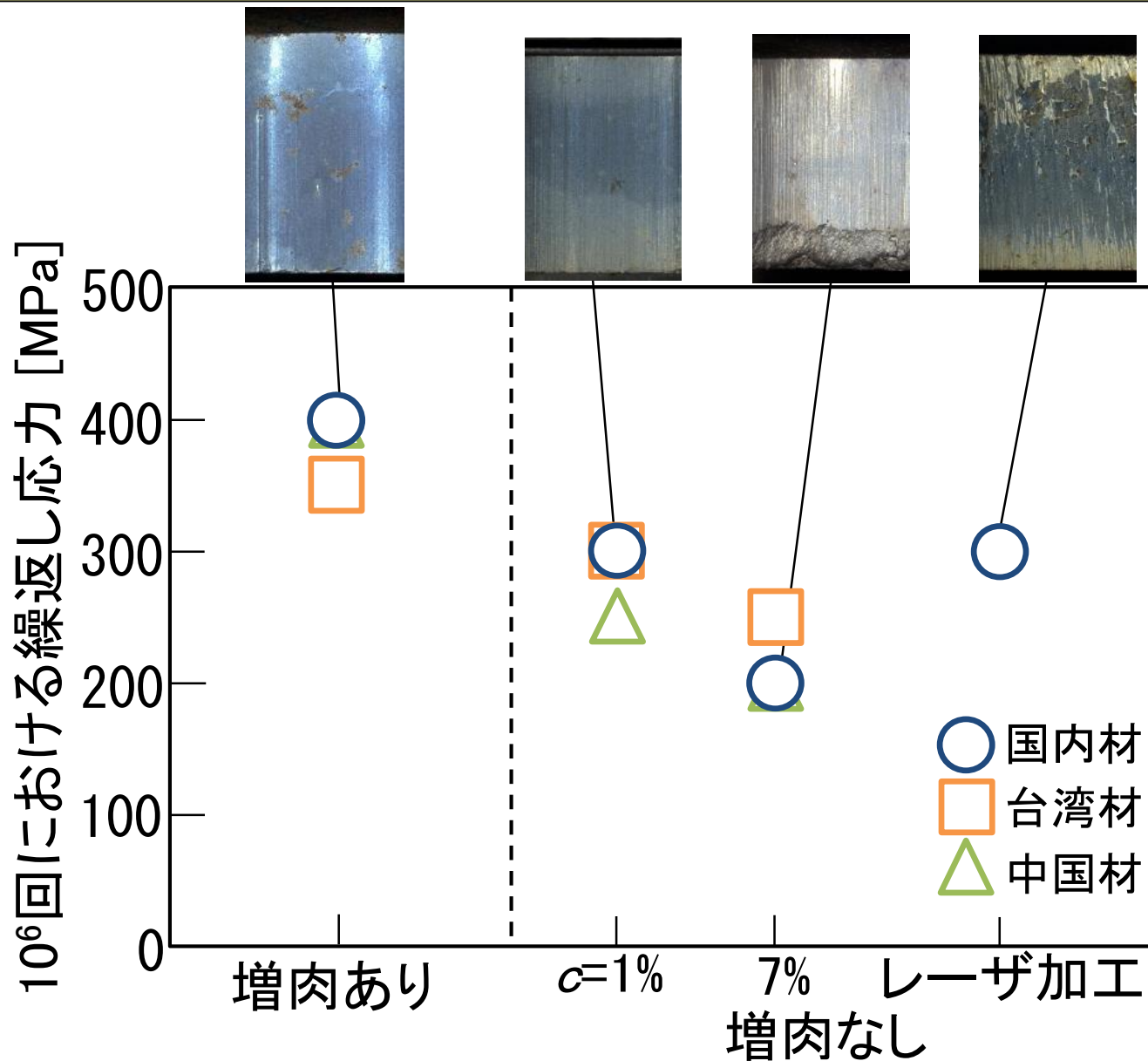
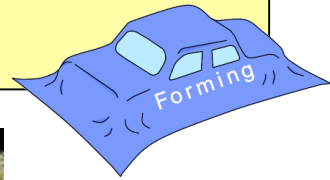
国内材	だれせん断面 破断面		平滑面	
				
		増肉なし		増肉あり



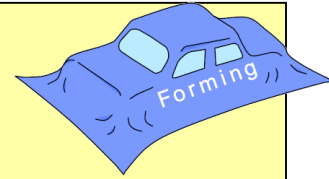
増肉穴抜き加工による疲労強度と引張剛性の向上



各加工条件における 10^6 回の繰返し応力

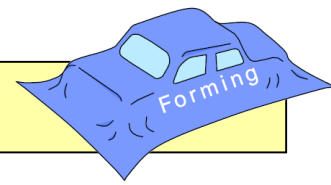


穴抜き増肉加工された焼入れ鋼板の 熱処理後の機械的特性

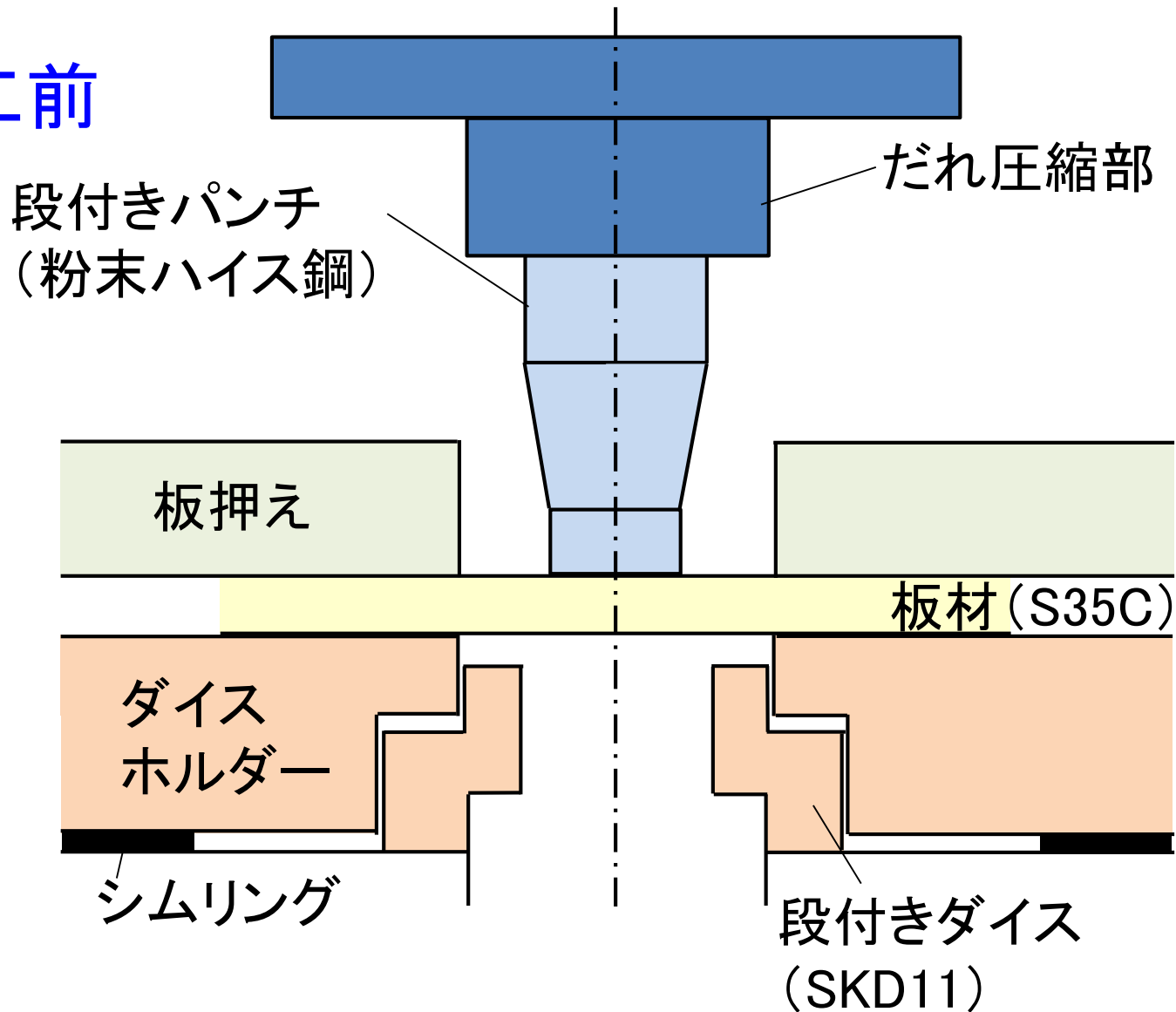


- 1) 増肉穴抜き加工による疲労強度の向上
- 2) だれ低減増肉穴抜き加工による疲労強度の向上

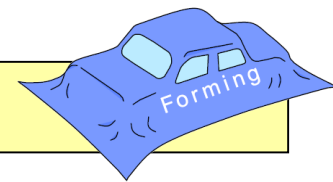
だれ低減増肉穴抜き加工方法



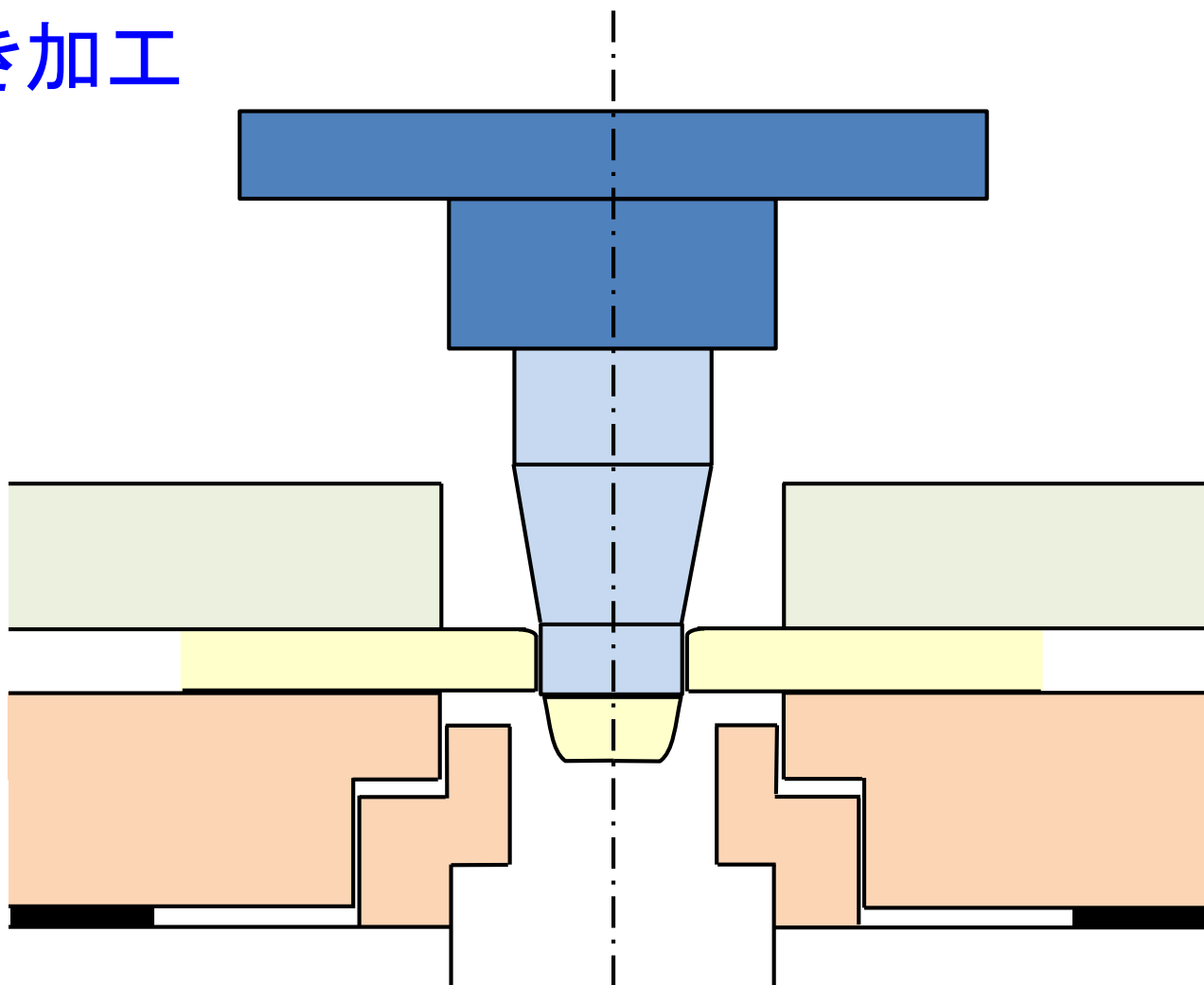
加工前



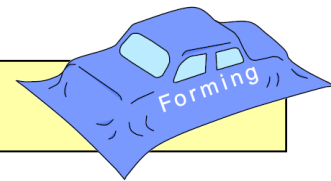
だれ低減増肉穴抜き加工方法



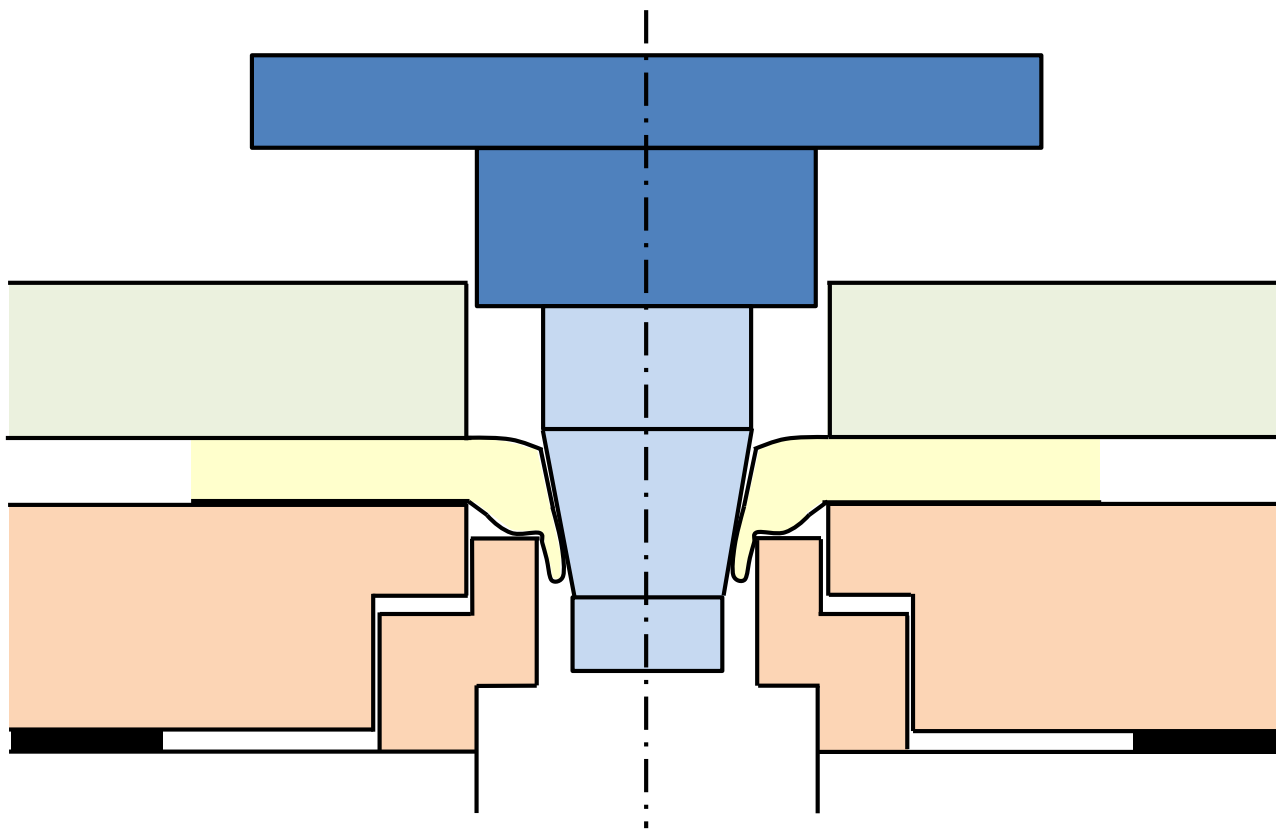
穴抜き加工



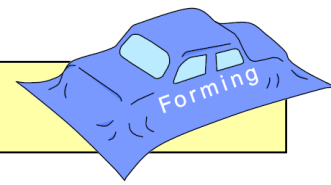
だれ低減増肉穴抜き加工方法



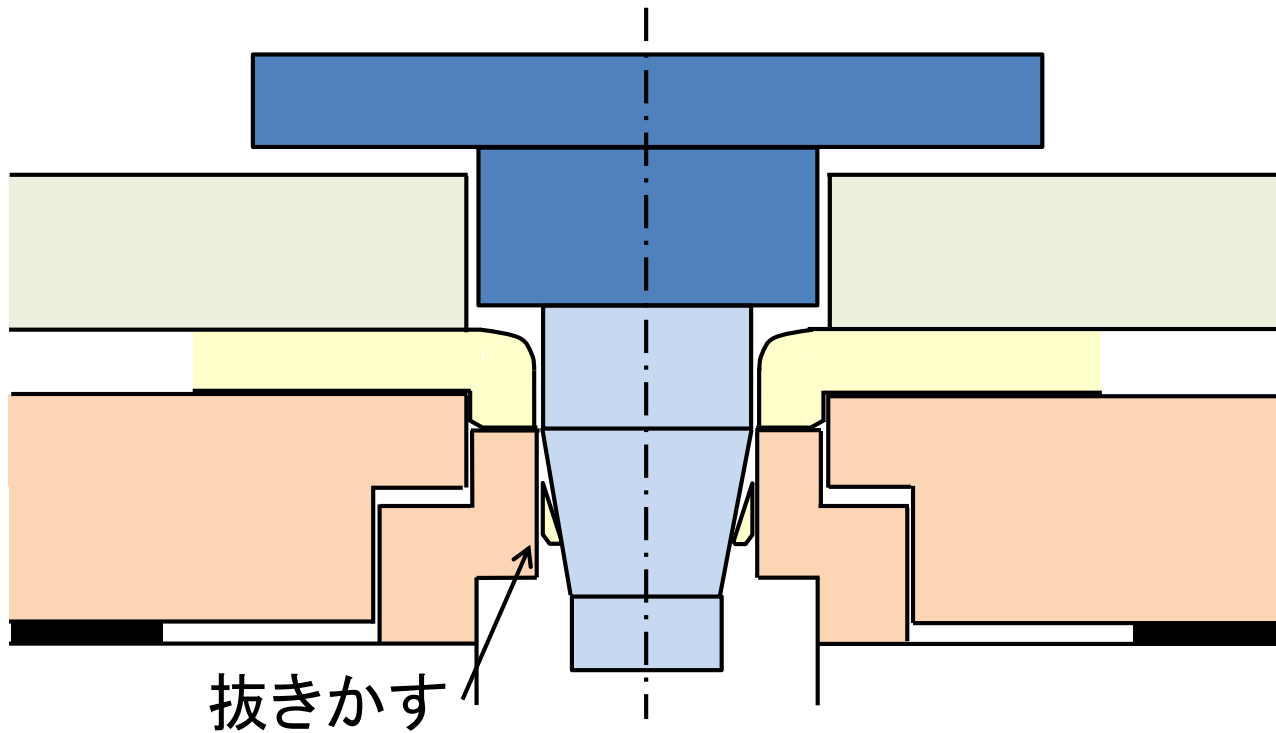
増肉加工



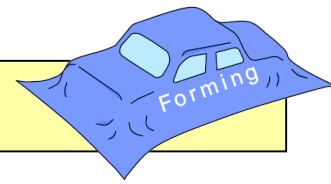
だれ低減増肉穴抜き加工方法



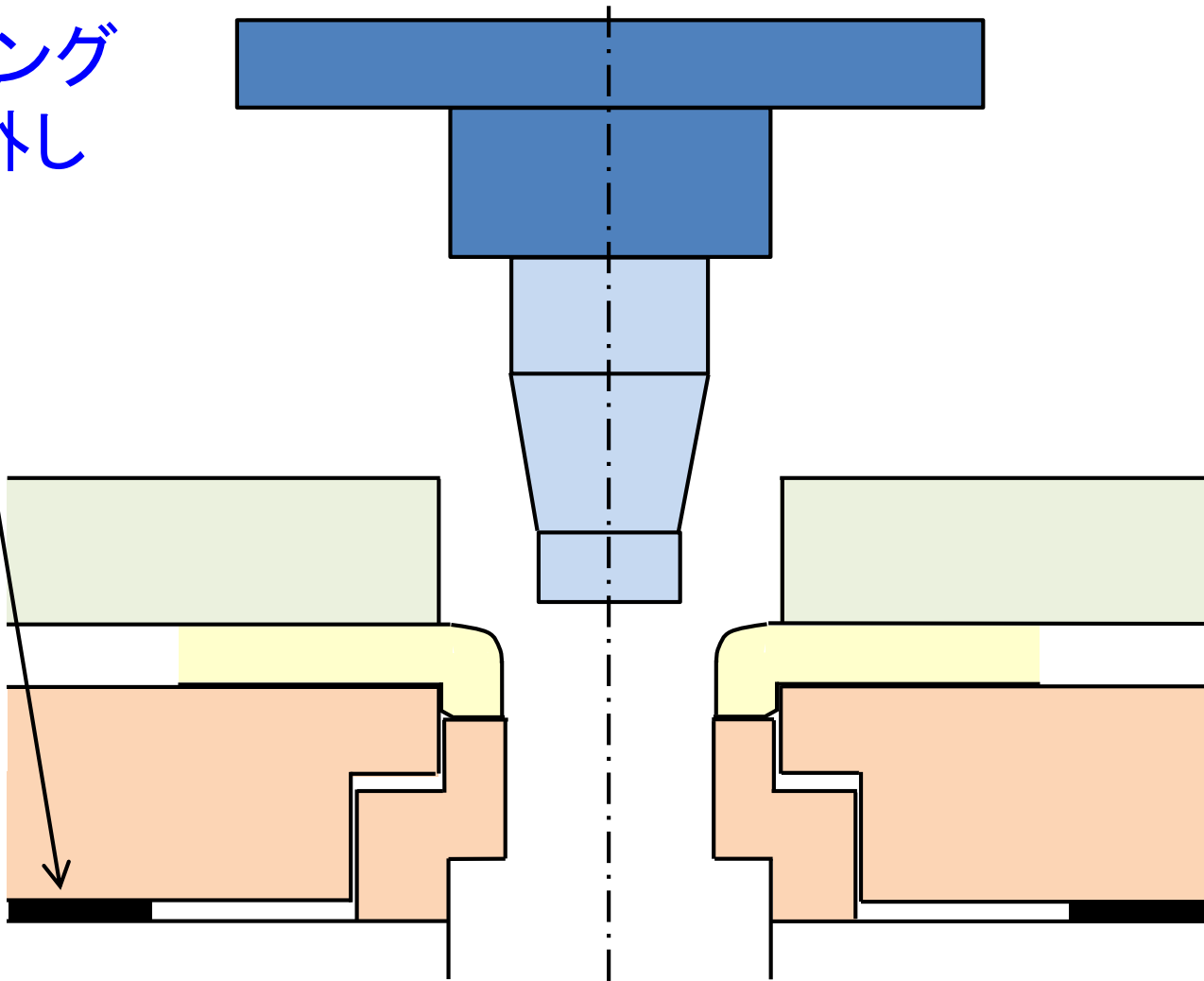
増肉加工



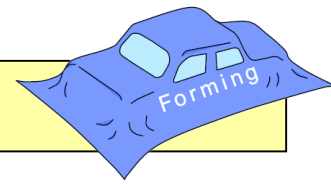
だれ低減増肉穴抜き加工方法



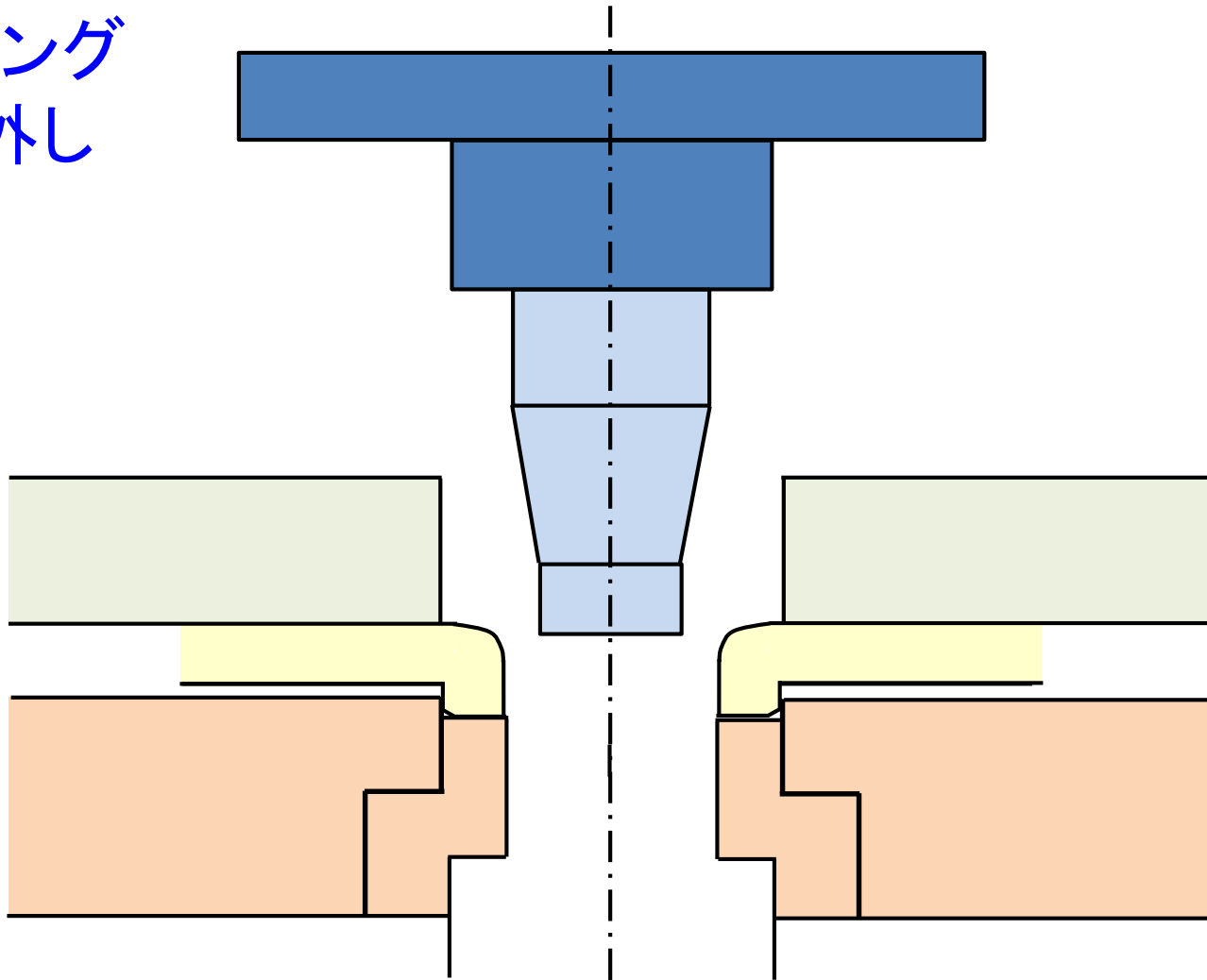
シムリング
取り外し



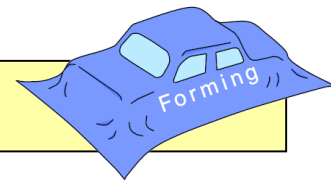
だれ低減増肉穴抜き加工方法



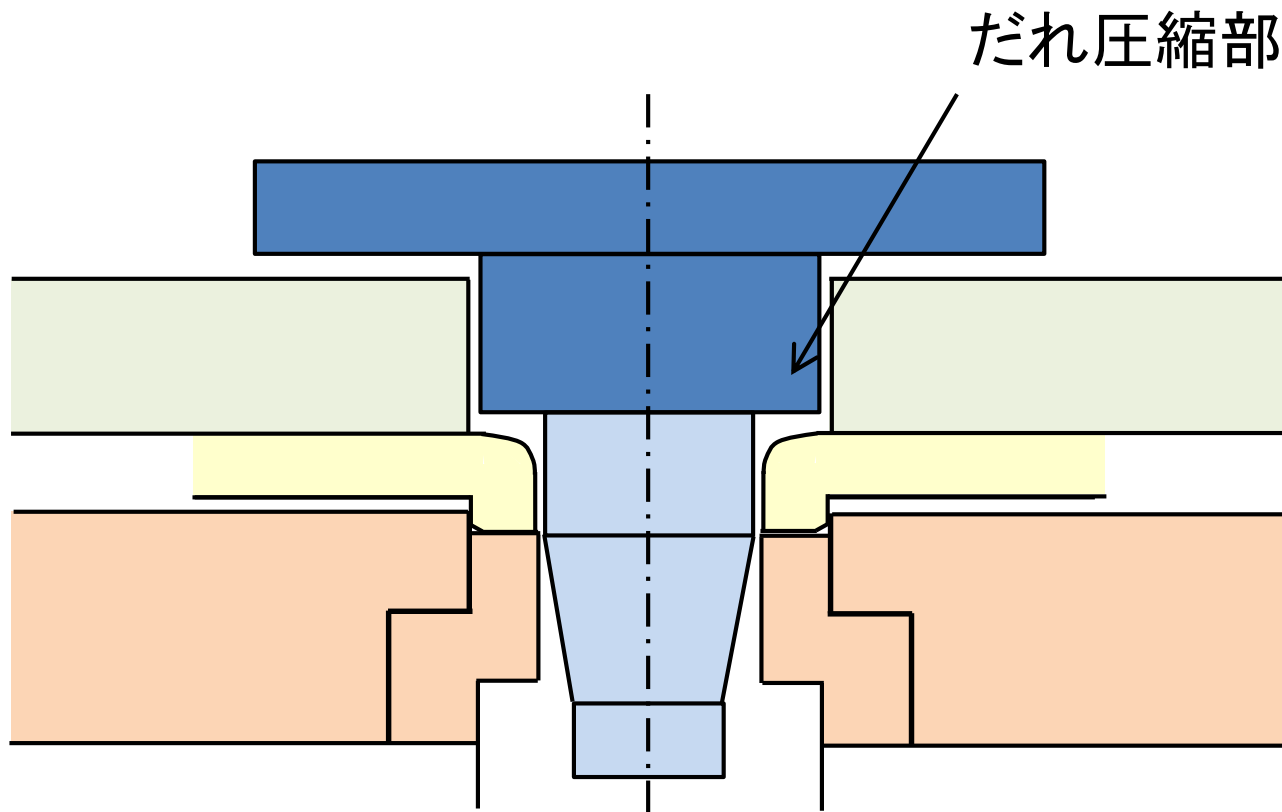
シムリング
取り外し



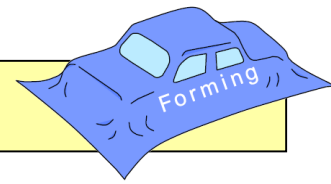
だれ低減増肉穴抜き加工方法



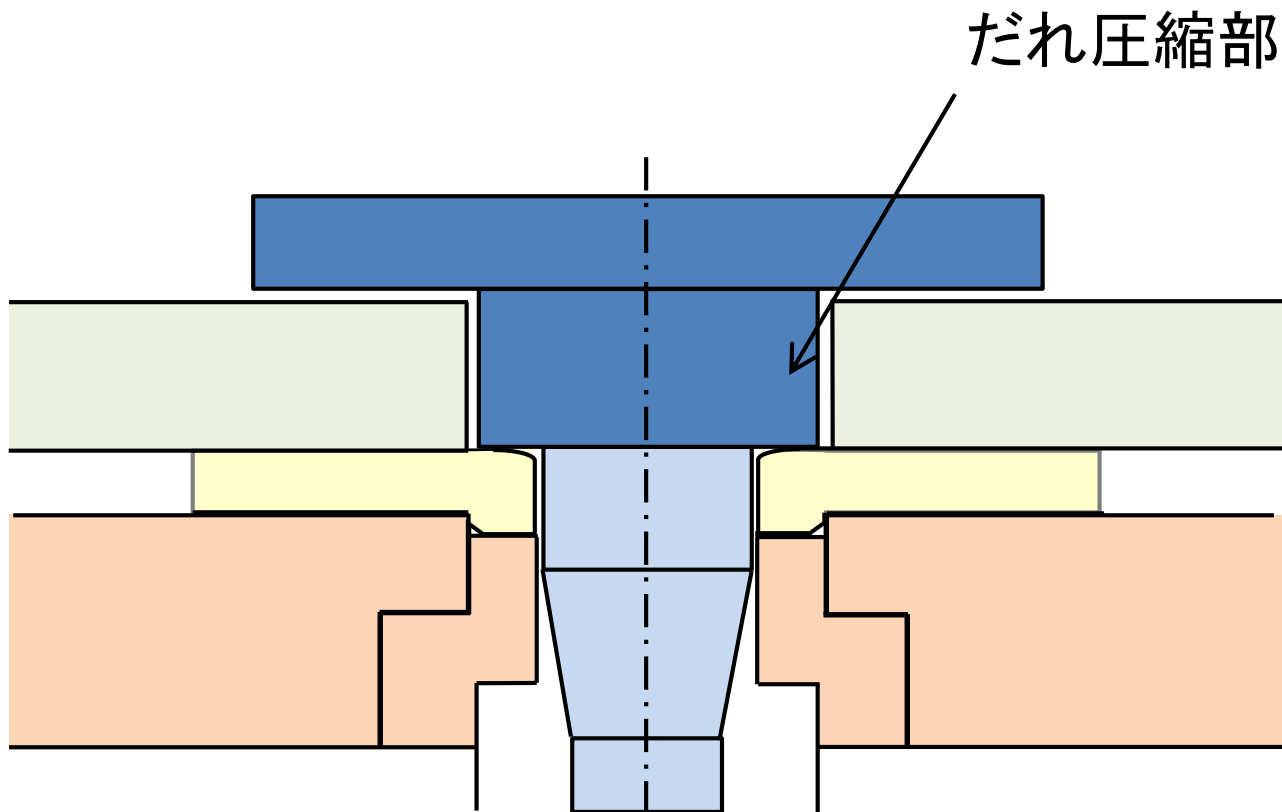
圧縮加工



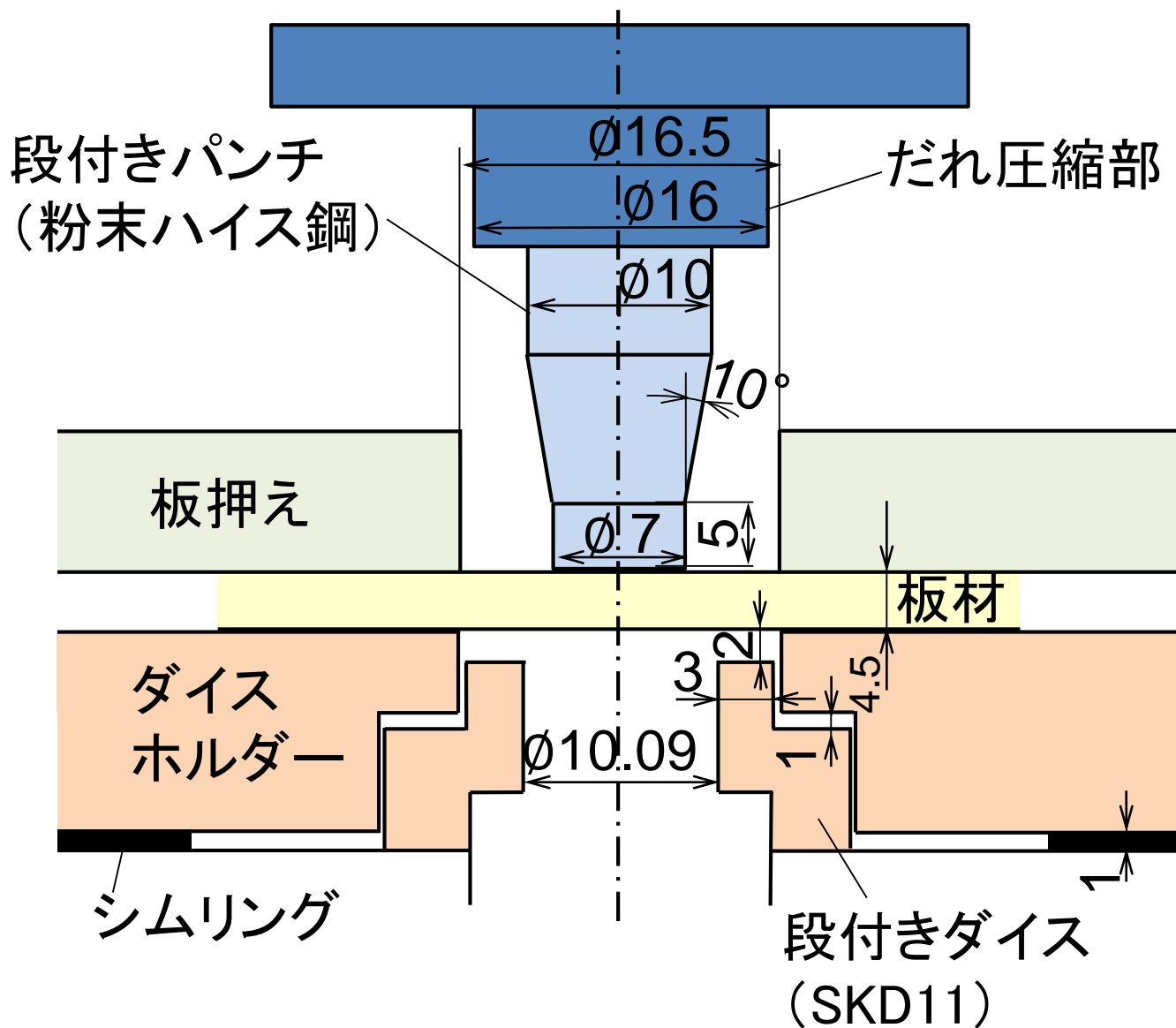
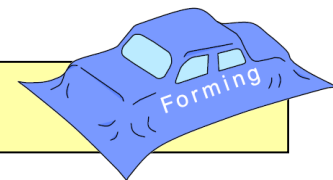
だれ低減増肉穴抜き加工方法



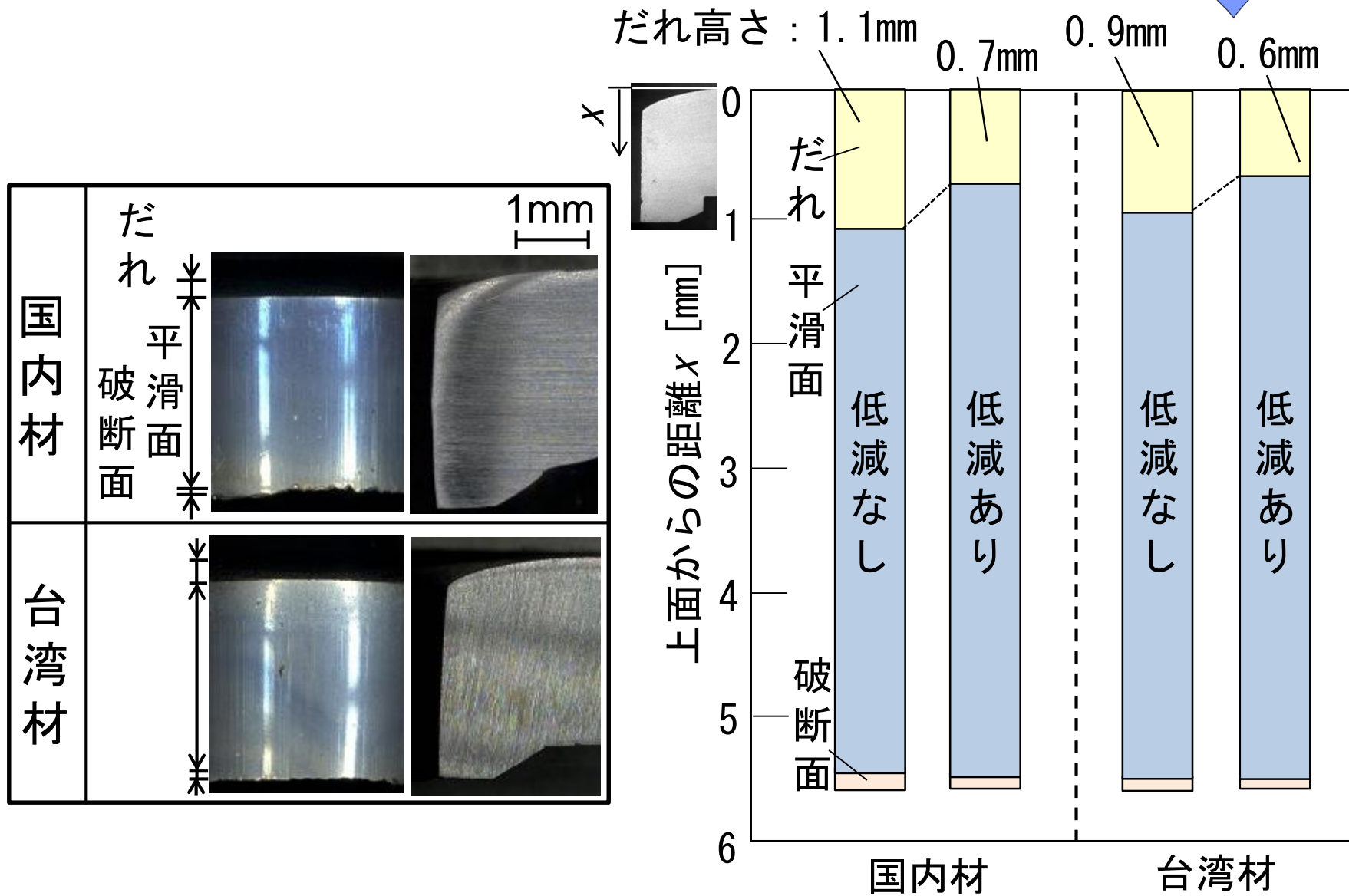
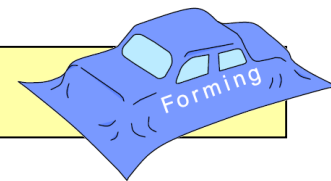
圧縮加工



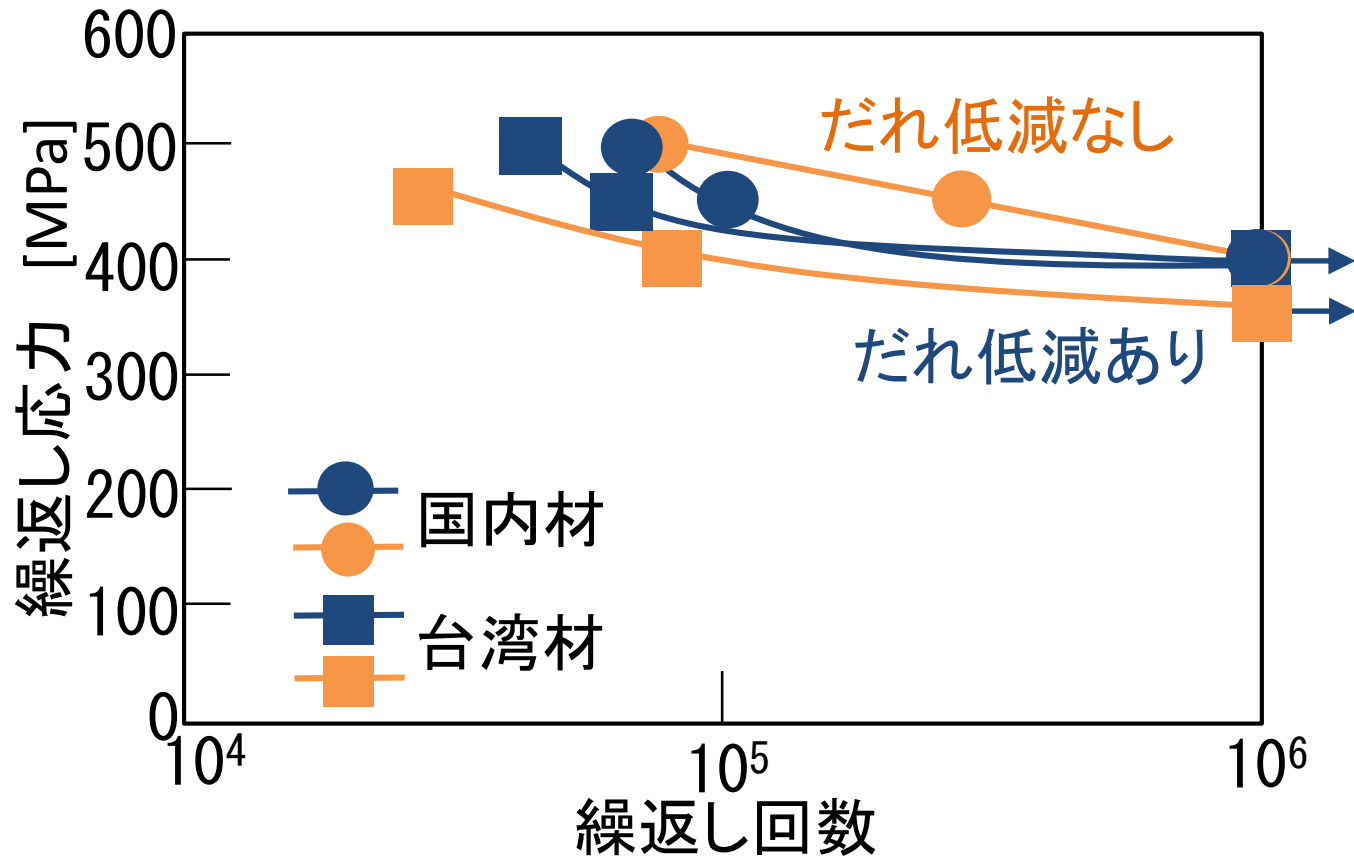
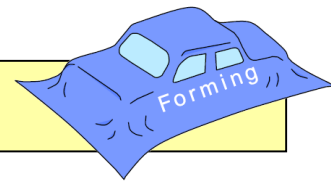
だれ低減増肉穴抜き加工方法



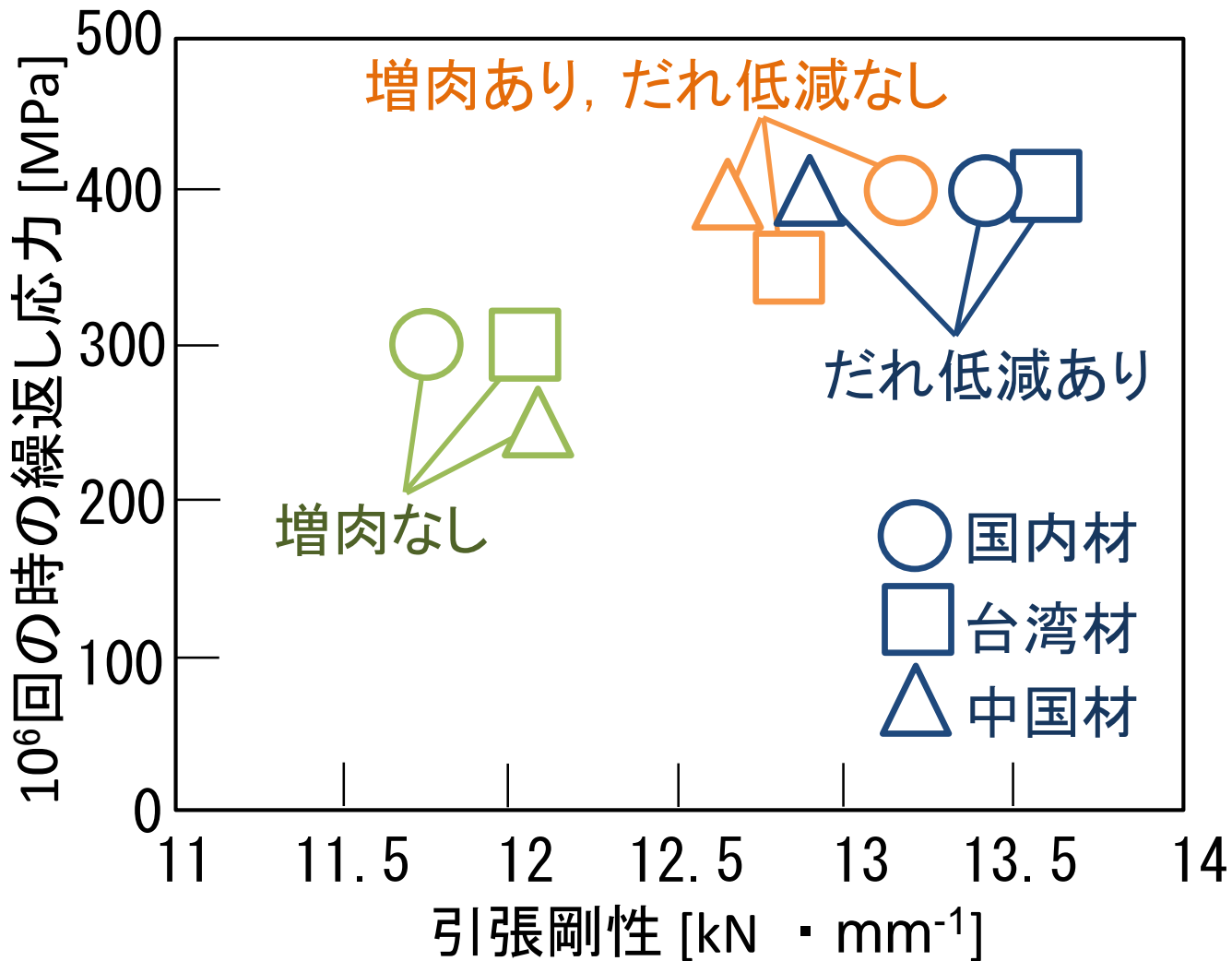
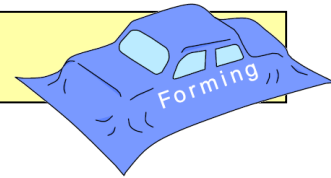
だれ低減された穴縁面と構成比



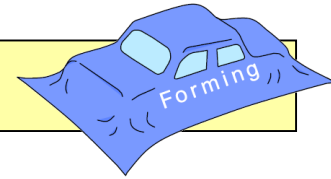
だれ低減による疲労強度の向上



疲労強度におよぼす引張剛性の影響



まとめ



- 増肉穴抜き加工を行うことで、引張剛性の増加とともに、疲労強度が国内材，台湾材ともに1.3倍向上した。
- だれ低減増肉穴抜き加工を行うことで引張剛性は向上したが，疲労強度は台湾材のみ1.14倍向上した。