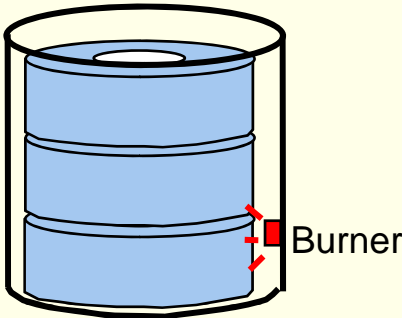
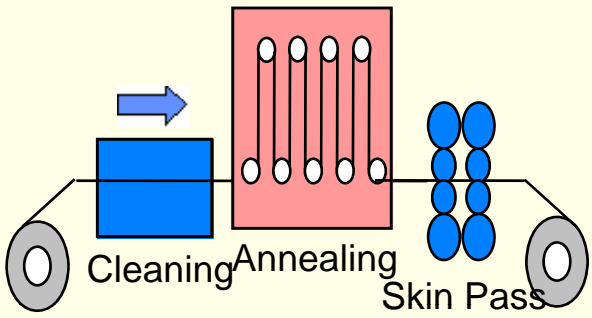
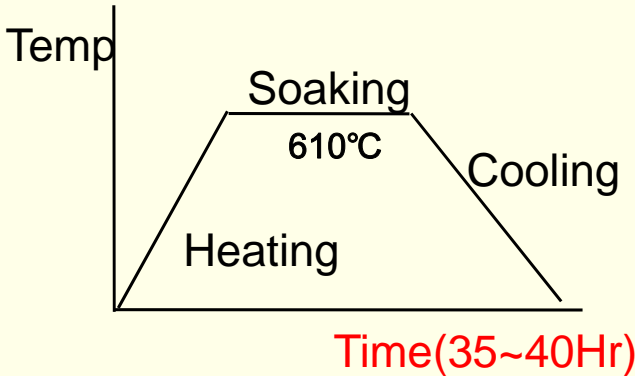
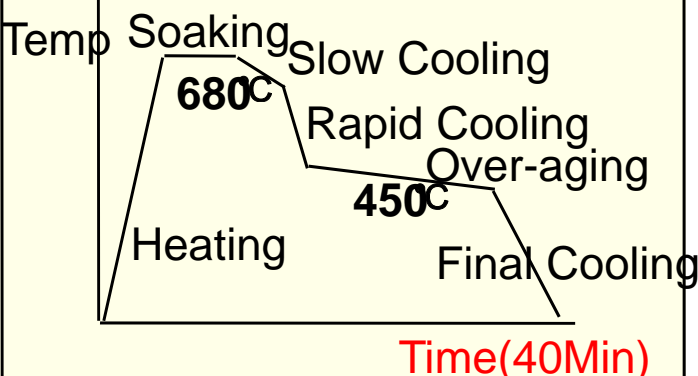
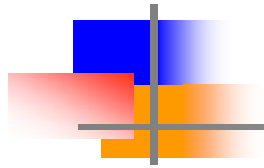


Introduction of CAL Material, substituting BAF Material(BP)

- 1. BAF and CAL process**
- 2. Quality differences**
- 3. Notice for can making**
- 4. Conclusion**

1. BAF and CAL process

Item	BA (Batch Annealing)	CA (Continuous Annealing)
Facility Lay-out		
Heating pattern		



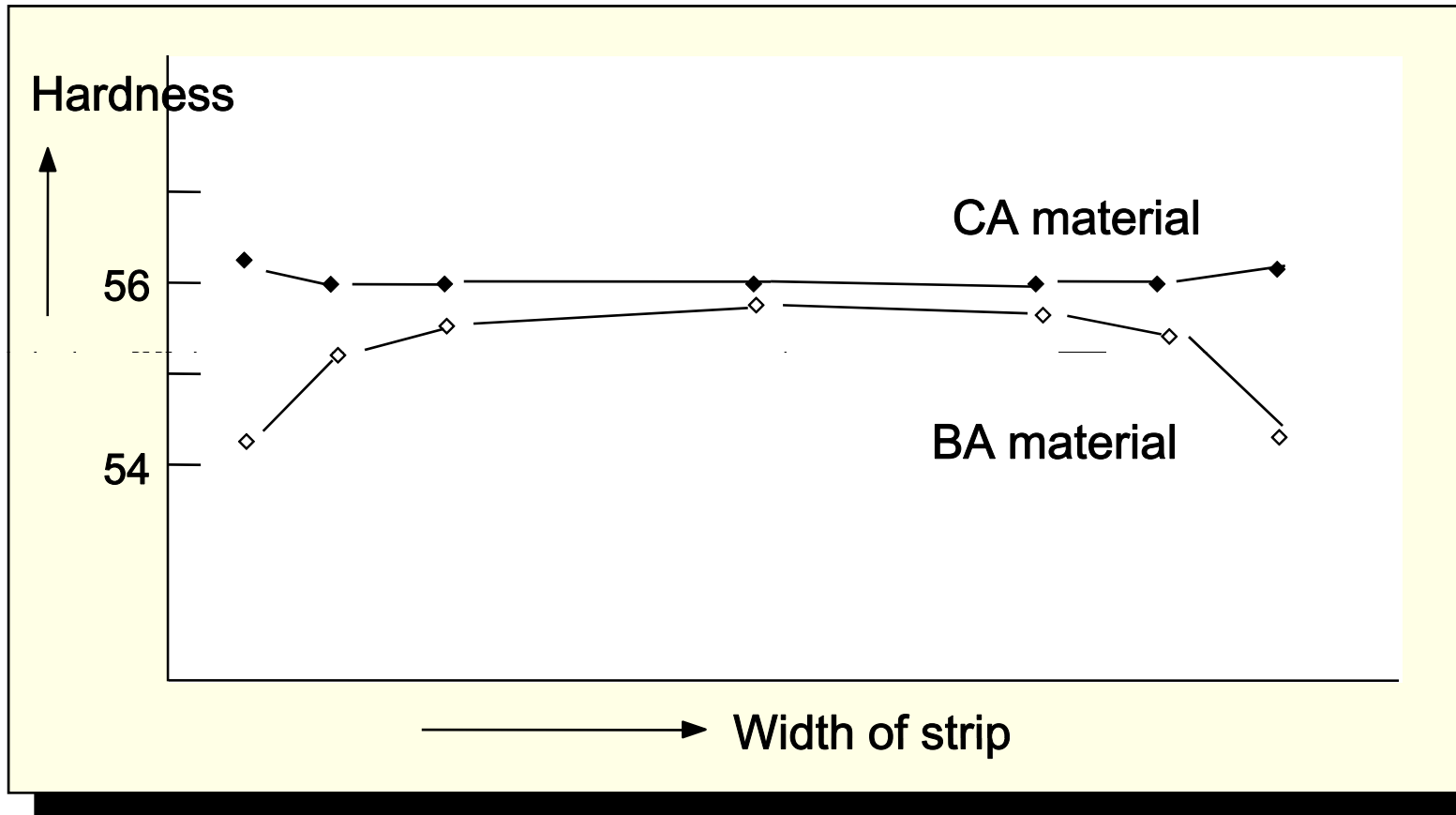
2. Quality differences

(◎ : Excellent, ○ : good, △ : moderate)

Component (Process)	Non- aging	Uniform material property	Surface	Shape	Welding	Form- ability
ULTRA-LOW CARBON (CAL)	◎	◎	◎	◎	◎	◎
LOW CARBON (BAF)	◎	△	△	△	◎	◎
LOW CARBON (CAL)	△	◎	◎	◎	◎	○

2. Quality differences

Hardness along the width direction

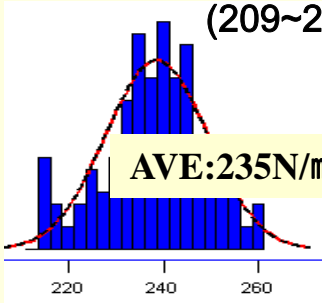
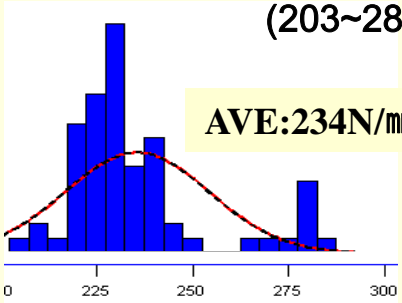
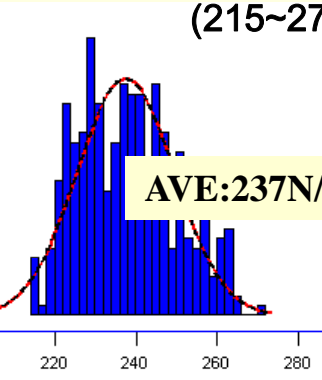
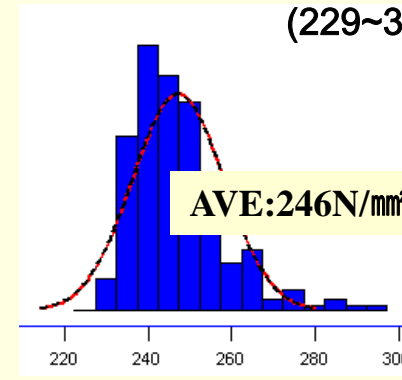
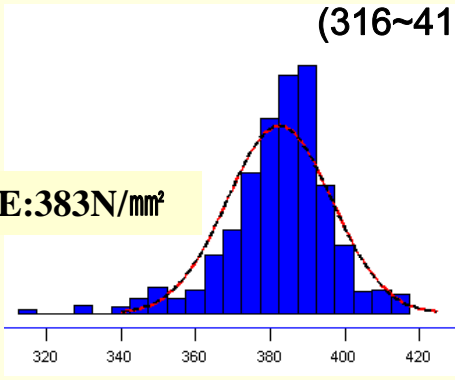


✓ BAF material shows hardness drop near the edge. However, CAL material shows uniformity along the width

2. Quality differences

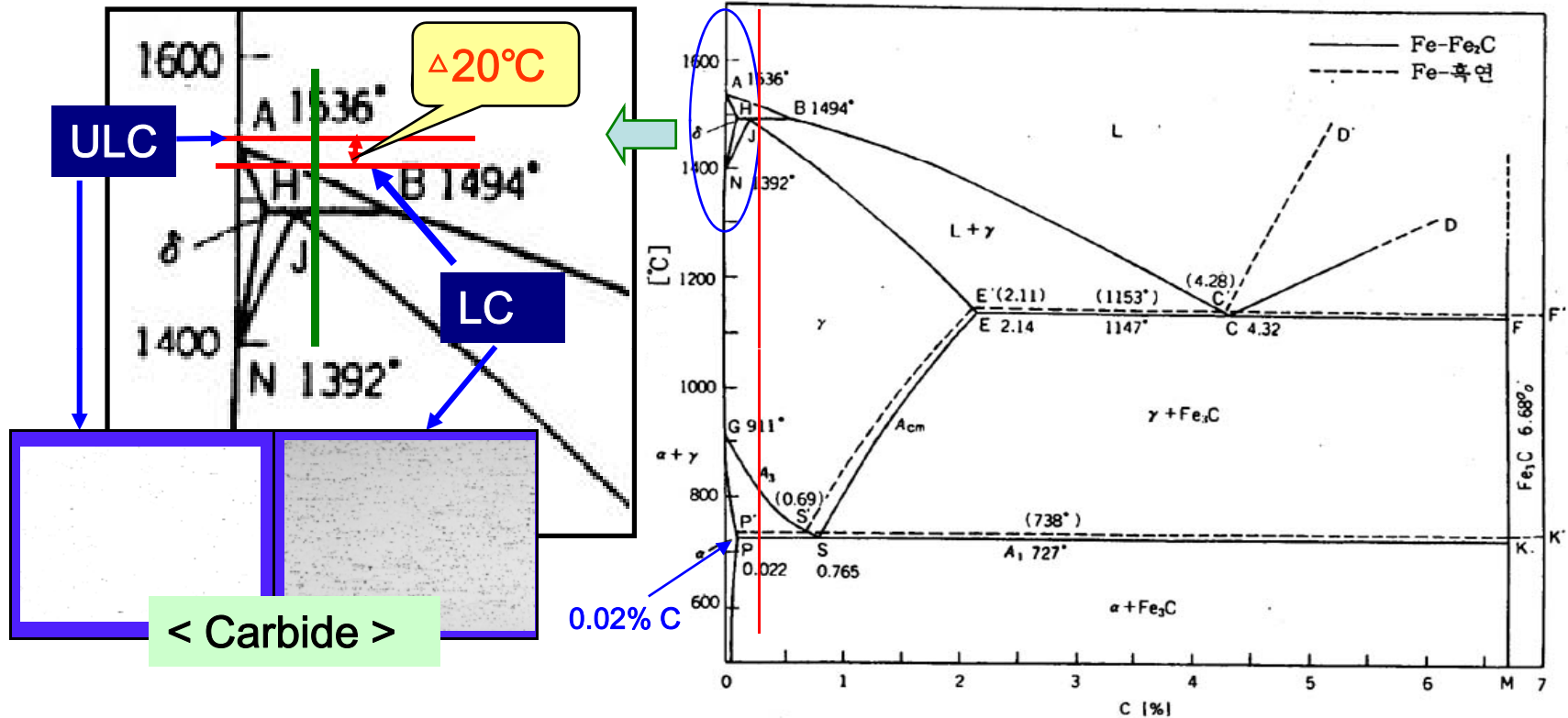
● Analysis of Yield point

() : Range

Grade	ULTRA-LOW CARBON (CAL)	LOW CARBON (BAF)	LOW CARBON (CAL)
T2.5 (YP)	 <p>(209~264) AVE:235N/mm²</p>	 <p>(203~283) AVE:234N/mm²</p>	Non
	TS:356 N/mm²	TS:367 N/mm²	
T3 (YP)	 <p>(215~270) AVE:237N/mm²</p>	 <p>(229~305) AVE:246N/mm²</p>	 <p>(316~417) AVE:383N/mm²</p>
	TS:357 N/mm²	TS:378 N/mm²	TS:398 N/mm²

3. Notice for Can Making

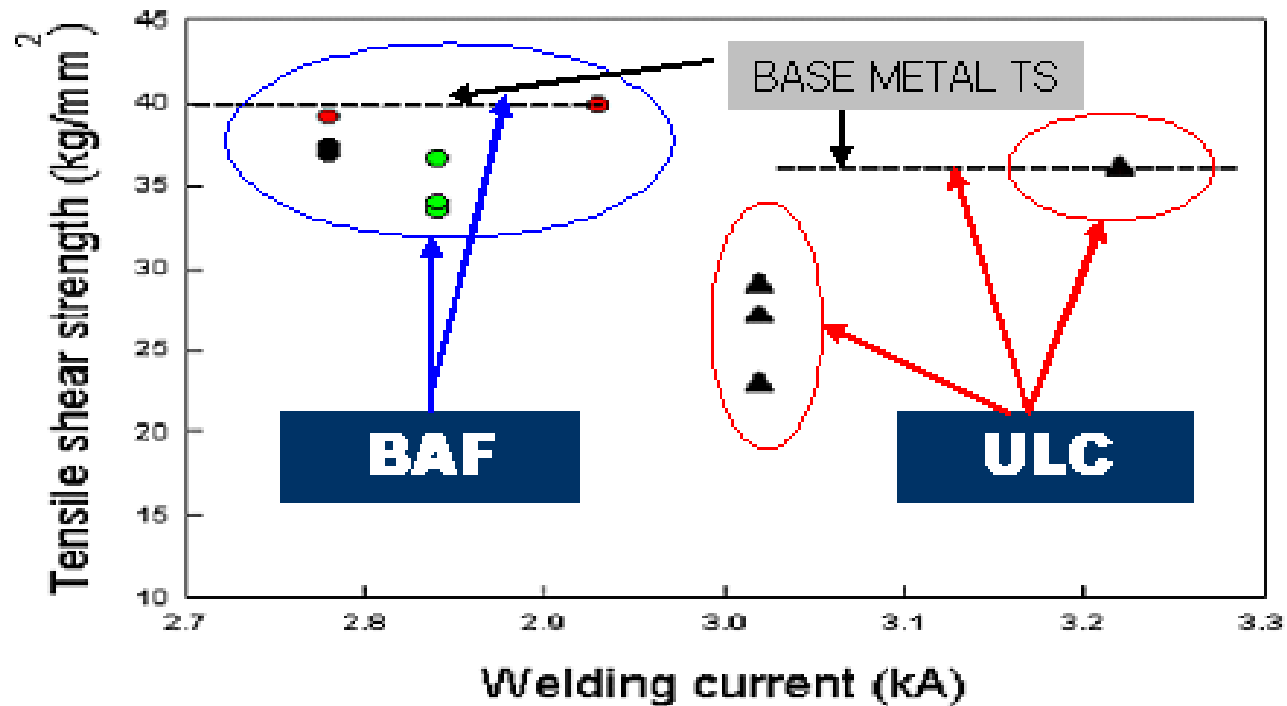
Metallurgy (Fe-Fe₃C)



- ✓ Due to the low electric resistance resulted from low [C] ratio of ULC, heat emission value is lower than LC at the same welding current.
- ✓ The melting point of ULC is slightly higher than LC, but its effect on welding is almost minor

3. Notice for Can Making

● Welding Current



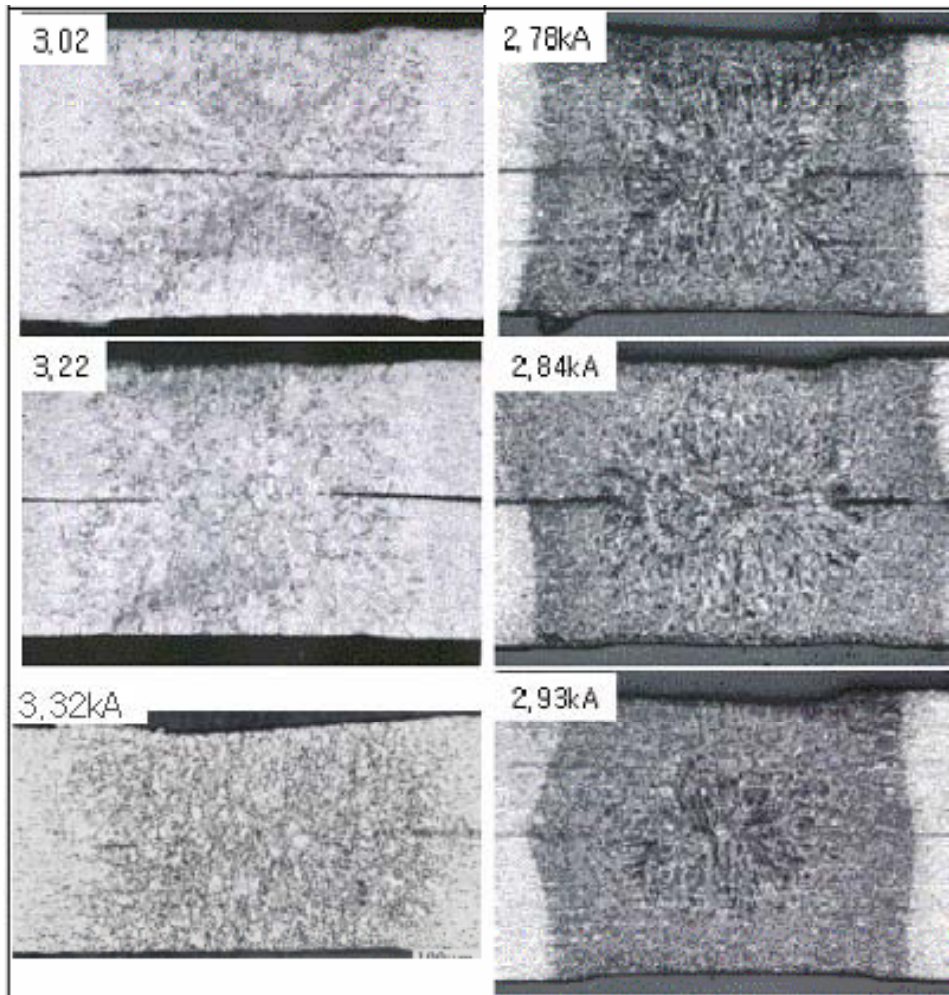
✓ The welding current of ULC is demonstrated to be higher than LC

3. Notice for Can Making

Micro Structure of Welding Interface (ULC, LC)

<Ultra-Low-Carbon>

< Low-Carbon >



○ Lab. Welding Test Result

	ULC-CA	LC-BA
Press` (Kgf)	40	
Speed(mpm)	10	
Thick.(mm)	0.35	
Coat.Weight(g/m2)	2.8 / 2.8	
Current(KA)	3.3	2.9

- According to the high MP and low resistance emission of ULC, increase of welding current is generally recommended
- Considering diversity of can maker, welding condition need to be re-optimized respectively .



4. Conclusion

- **It is well known that ULC(CAL) BP/TP shows better formability, drawing, uniform mechanical property and surface quality than BAF**
- **As ULC and BAF have similar mechanical property, mostly direct material substitution is possible without any change of present processing condition.**
- **But, it is desirable to change to ULC after some application evaluation since some difference in operation condition might occur for some customers.**
- **It would be possible that poor welding occurs with applying present BAF welding condition to ULC.
However, it is simply solved out by slight modification of welding current (generally increasing).**
- **According to the fact that more than 20 overseas customers are presently using ULC without any problem**