APEX EXPO IPC
NEW IDEAS ... FOR NEW HORIZONS
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LAS VEGAS, NEVADA

Semi Quantitative Method for Assessing the Reworkability of Different Underfills

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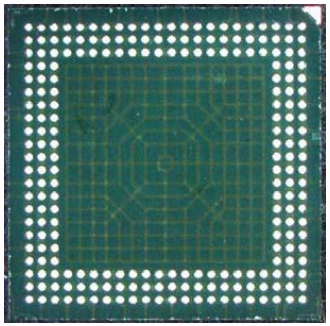
Agenda

- Materials
- Methodology
- Results
  - Comparison of underfills
  - Comparison of process
- Conclusions

Materials

- Capillary Underfills
  - None reworkable High Reliability underfill (HR)
  - Highly reworkable Mechanical shock resistant underfill (RE)
  - High reliability reworkable underfill (TC)
- Test parts
  - 228IO 0.5mm pitch
  - 10mm x 10mm
  - Perimeter array

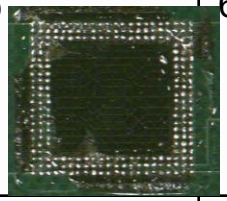
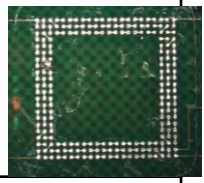
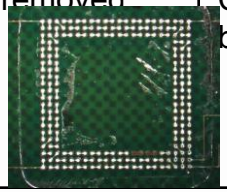
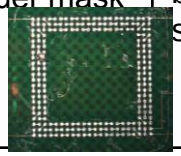
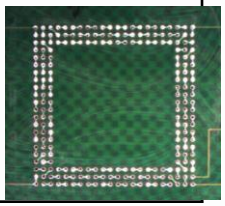


- Equipment
  - Bench top semi automatic rework station
  - Wooden implements

Methodology

- Rework Process
  - Segment process
    - Fillet removal
    - Component removal
    - Site Clean up
  - Allocate sore for each stage
  - Allocate weight for each stage
  - Run different profiles

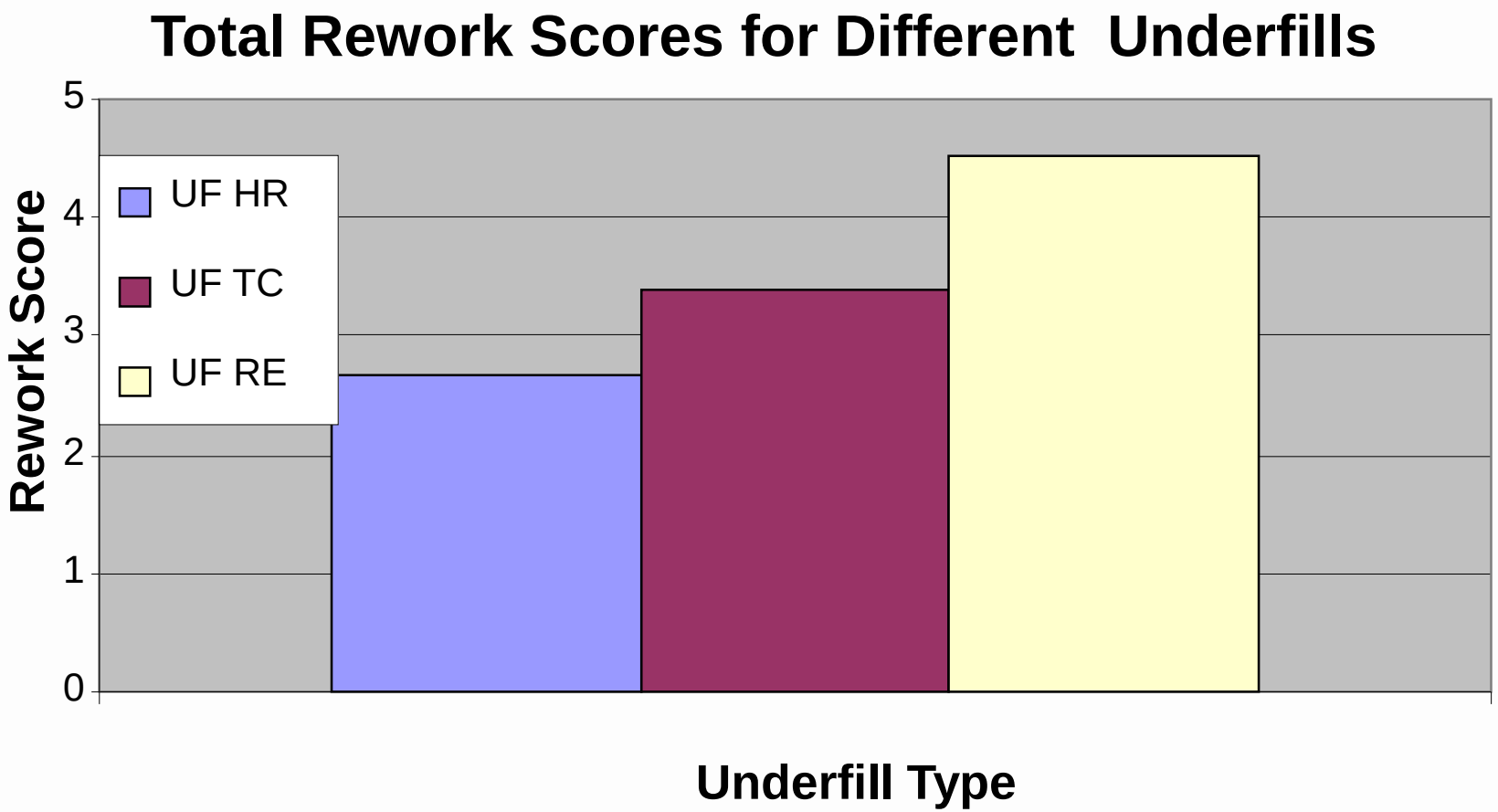
Methodology- Scoring

Score	1	2	3	4	5
Time to remove fillet	>40s	30-40s	20-30s	10-20s	<10
Ease of component removal	Component damaged before removal	Can not be removed with wooden pick	Medium force used lift component with wooden pick	Lifts component easily.	Removed with suction
Underfill remaining after t removal	>80% 	60-80%	40-60%	20-40%	<20% 
Time to clean	>150s	120-150s	90-120s	45-90	<45
Sit damage	Lands removed 	Copper exposed below solder mask 	Scratching but no breakthrough of solder mask	Light scratches	None 

Profile Optimization

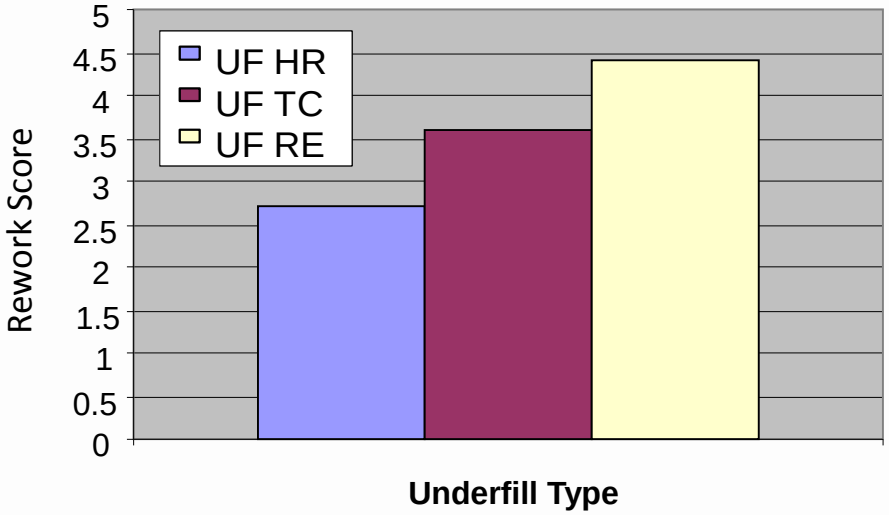
	Ramp ($^{o}Cs^{-1}$)	Peak (^{O}C)	Soak
1	0.8	245	none
2	1.2	245	none
3	0.8	260	none
4	0.8	245	190C in 90s
5	0.8	245	150C in 90s

Results

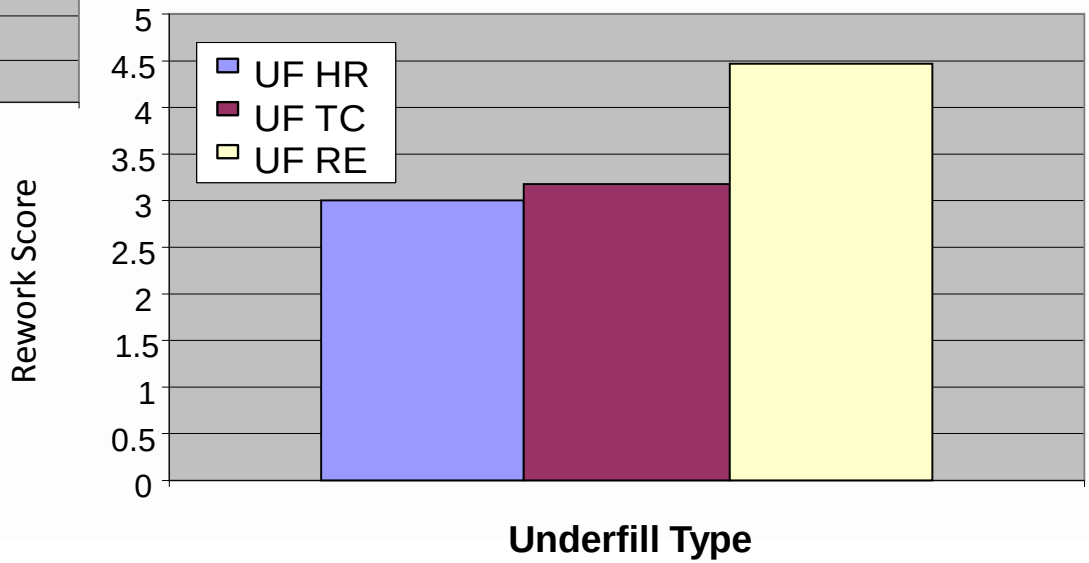

Total Rework Scores for Different Underfills
Rework Score
0
1
2
3
4
5
UF HR
UF TC
UF RE
Underfill Type

Results – Effect of Weighting

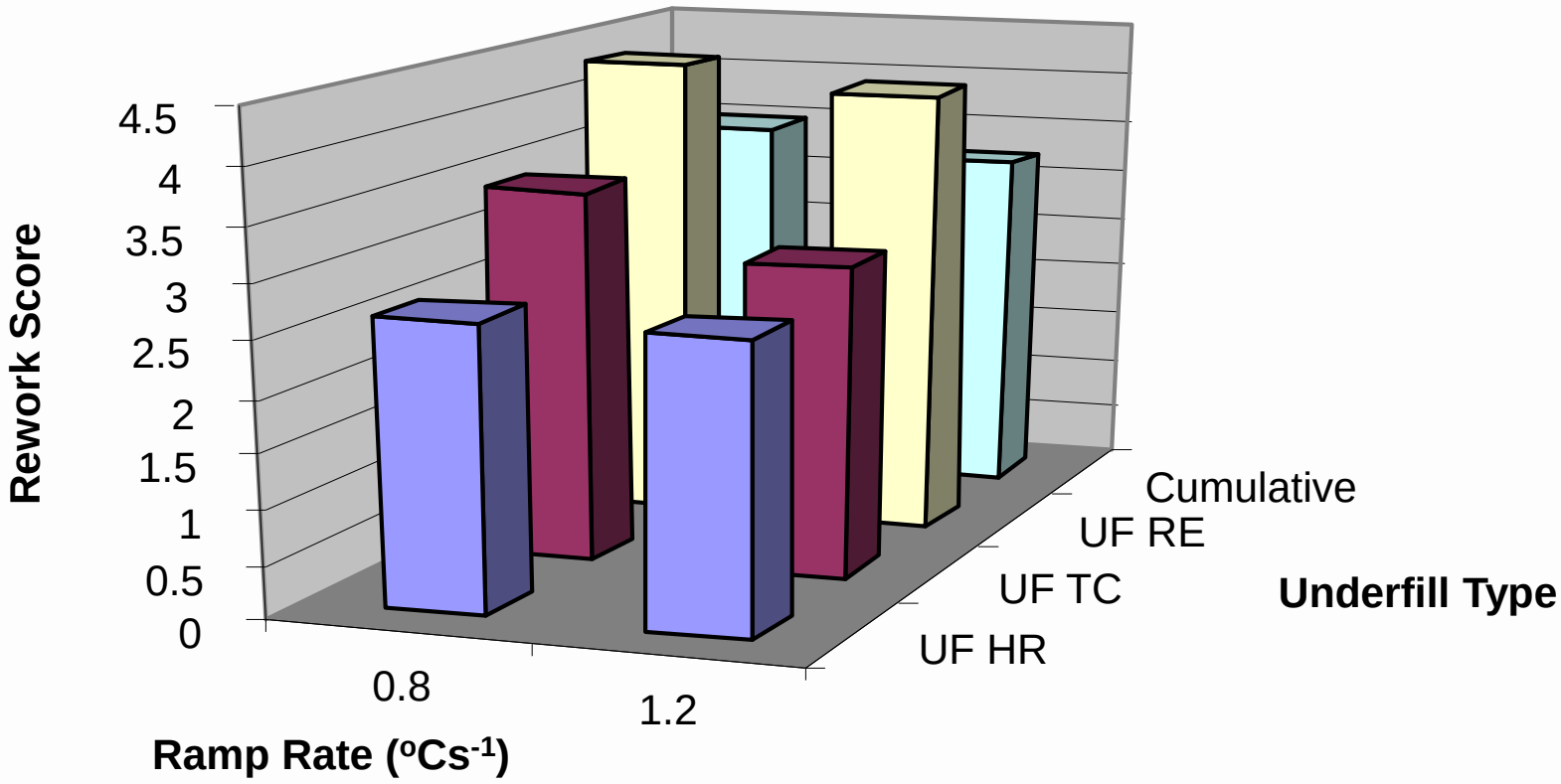
Emphasis on Component Removal



Emphasis on Site Clean Up

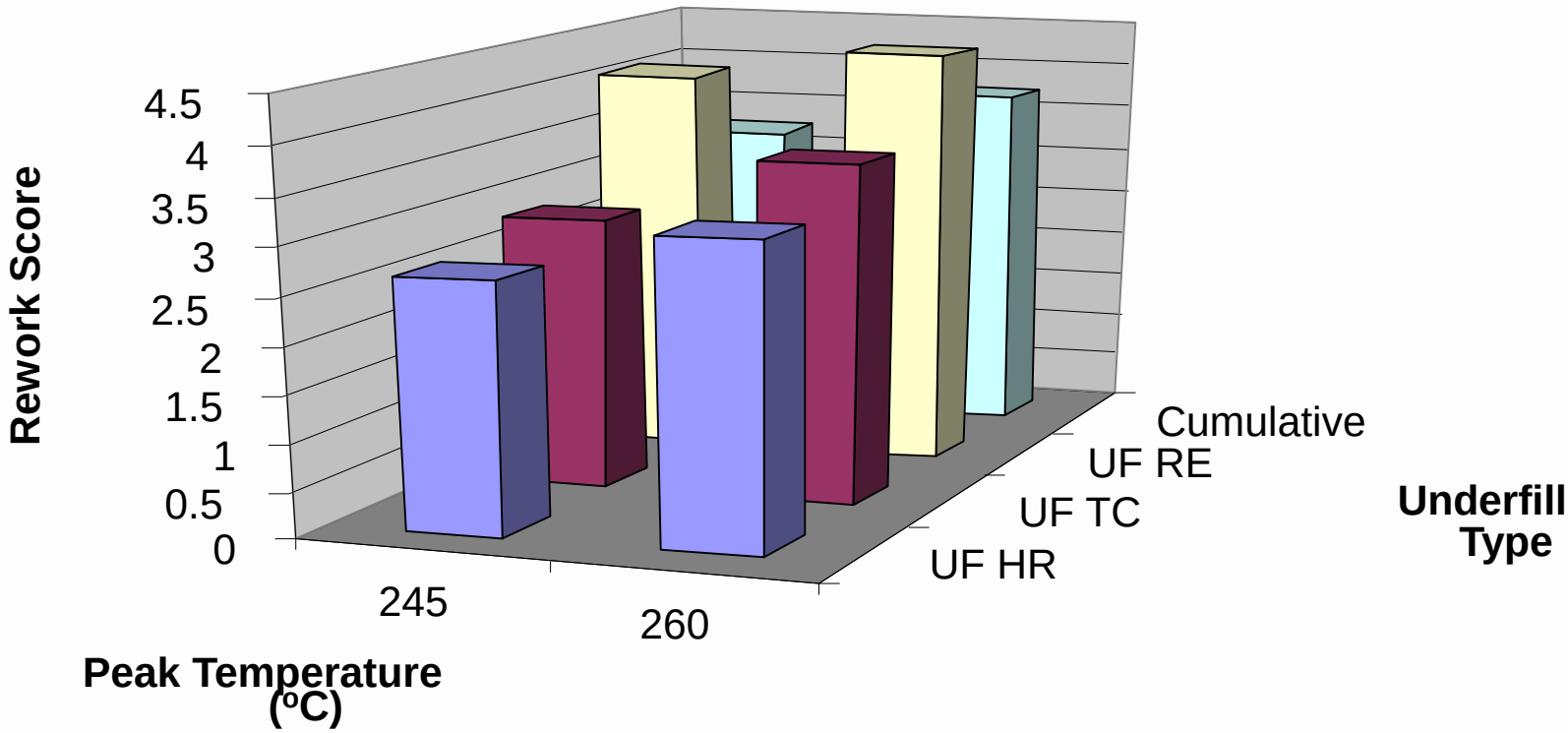


Results – Effect of Ramp Rate



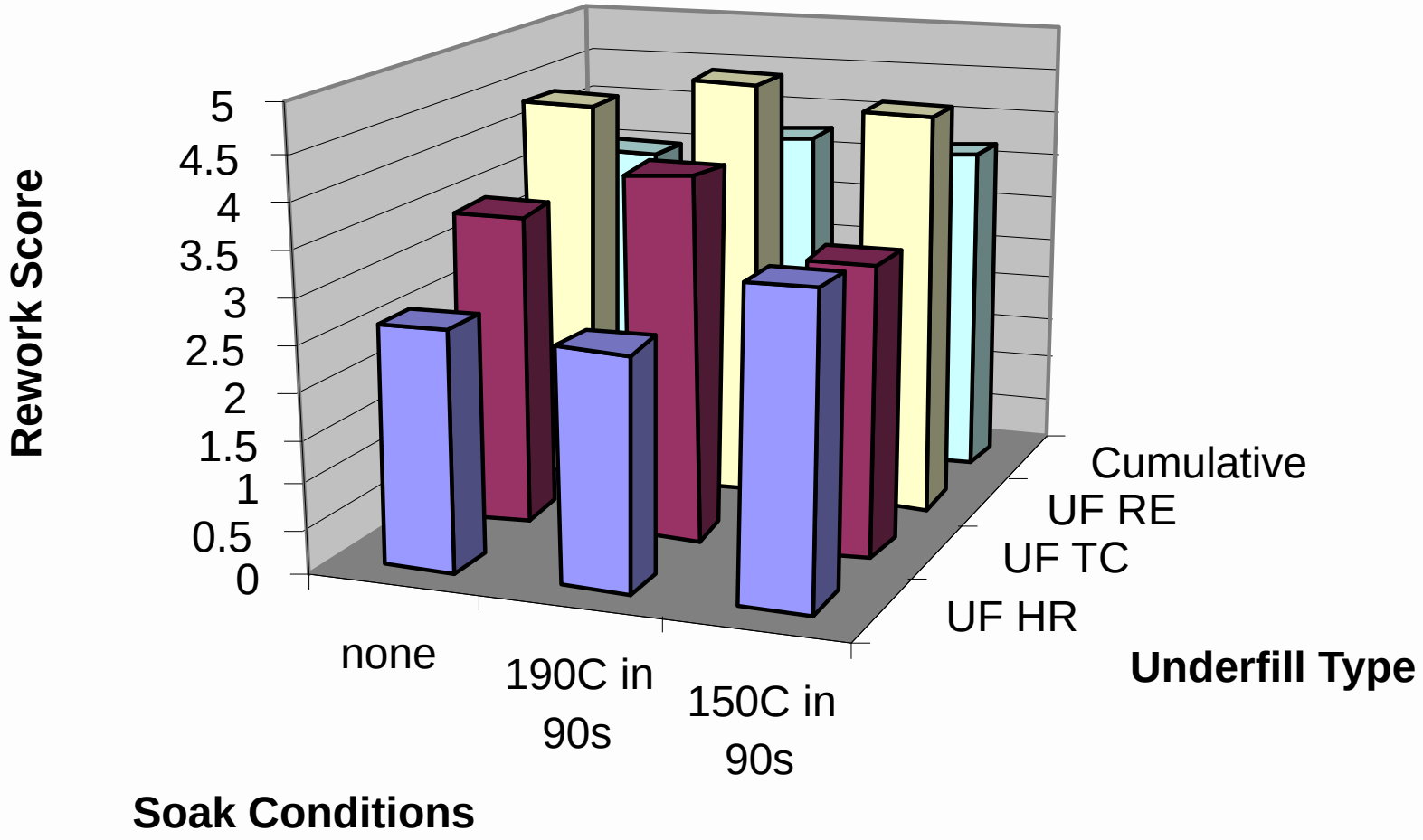
- Slower ramp rate improves reworkability (increased heat)

Results – Effect of Peak Temperature



- Higher peak Temperature improves reworkability (increased heat)

Results – Effect of Soak



- Hotter longer soak improves reworkability (increased heat)

Conclusions

- Segmenting the rework process allows for quantification of the overall rework process
- Changing the weighting of individual steps can change the relative performance of materials
- Increasing peak temperature improves reworkability
- Slower ramp rates improve reworkability
- Hotter longer soaks improve reworkability

Acknowledgements

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- Thank You