Efficient BOF – Refractory Maintenance

Total Cost / Value of Ownership

Integrated Plants Refractory TCO

Life Cycle Costs/ Total Spend (approx. 1/3)

- REF material purchase
- Storage/ internal logistics
- Lining / Demolition
- Claims
- Processing costs
- Waste

Operational Costs (approx. 2/3)

- Lime/Dolo management
- Slag splashing management
- Un-efficiency of Stirring
- Losses due to vessel re-linings
- Losses due to unavailability in operation
- Losses due to lack of reliability/ incidents
- Metal yield losses

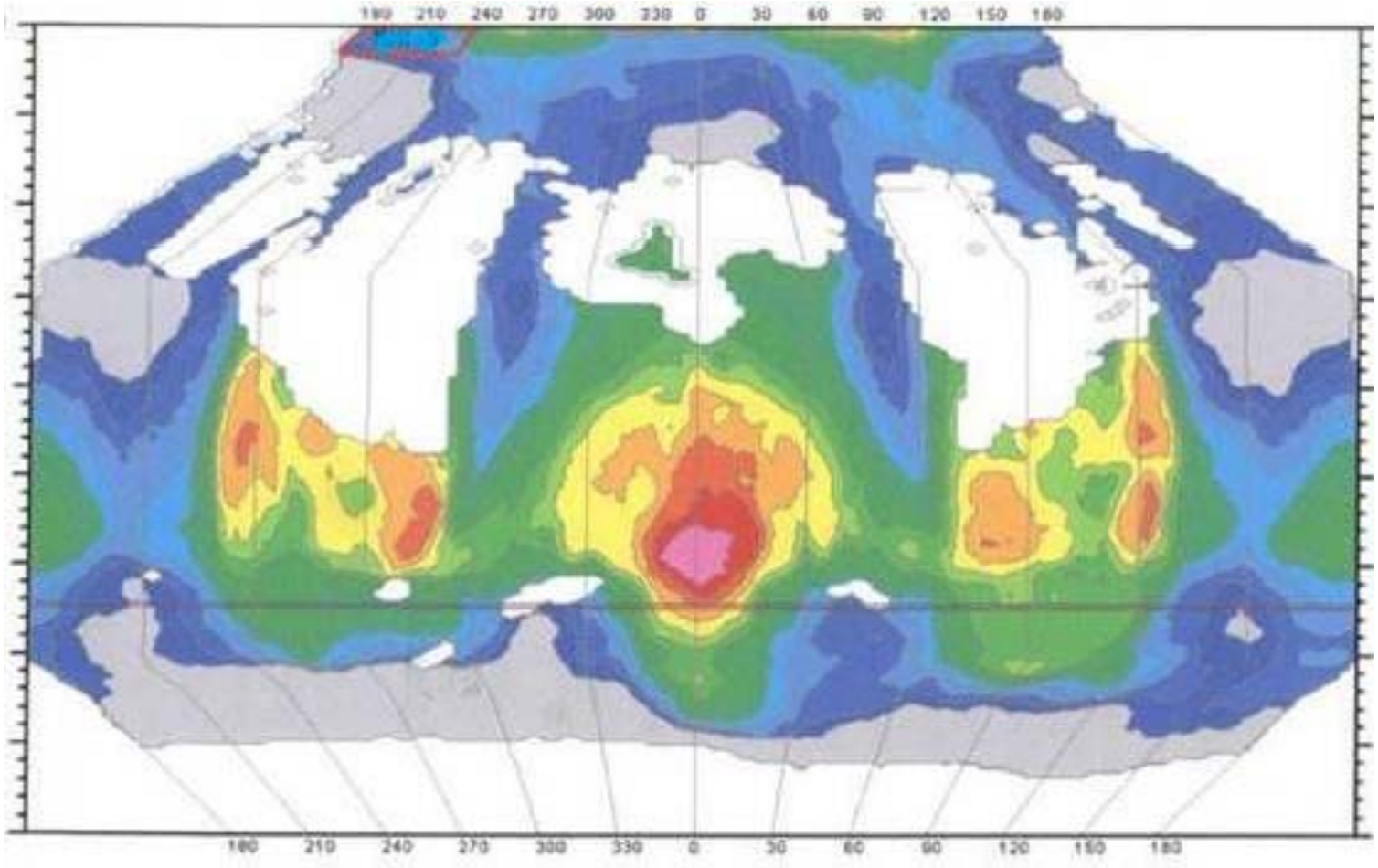
BOF Gunning Criteria

Material, Machine, Manpower

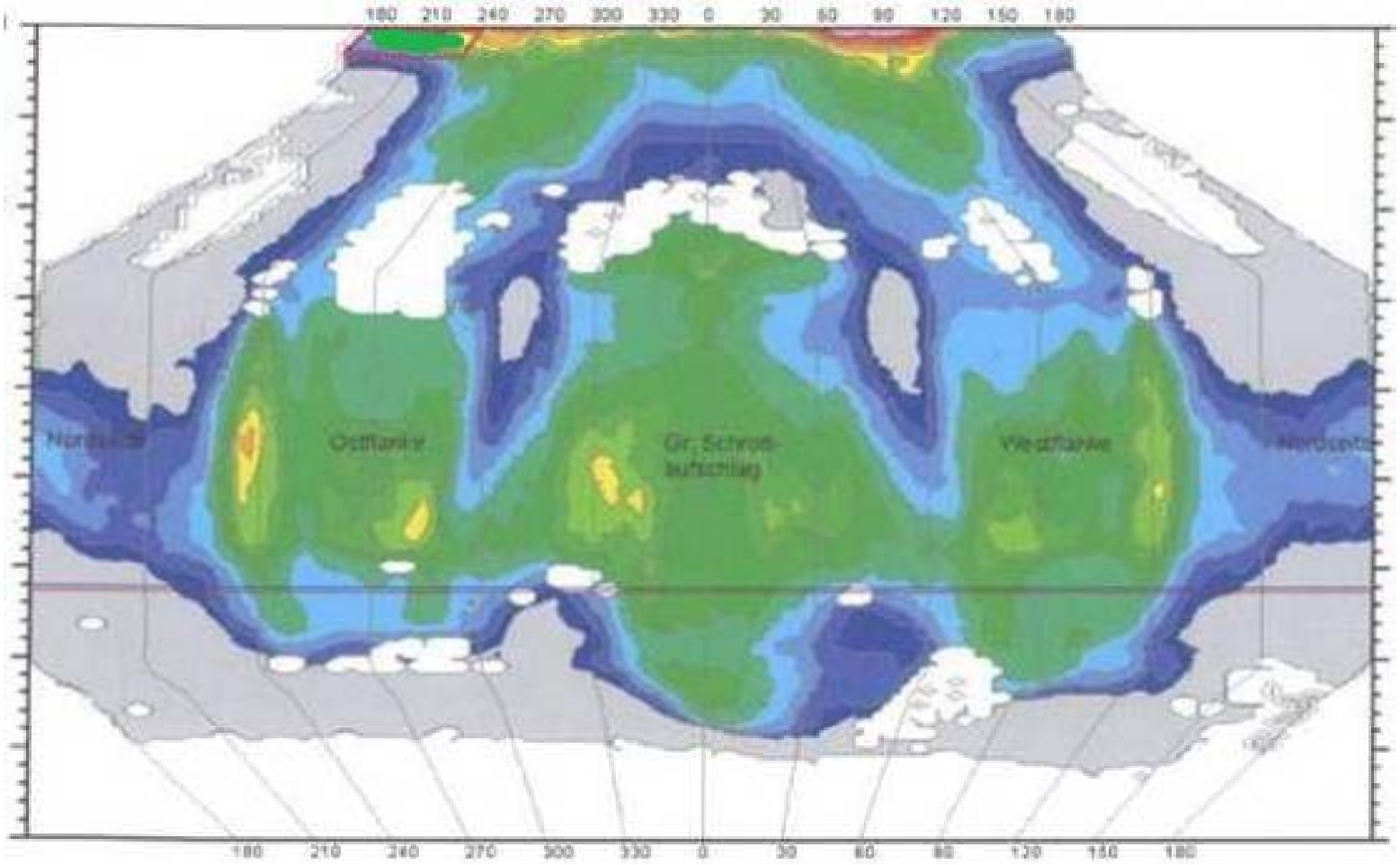
Recipy	grain size distribution binder and additives mixing (homogenization)	**Processing**	machine personnel aggregate temperature application
Tranport	damage segregation	**Durabilty**	process temperature
Storage	storage time climate	**Price**	price / performance

Results

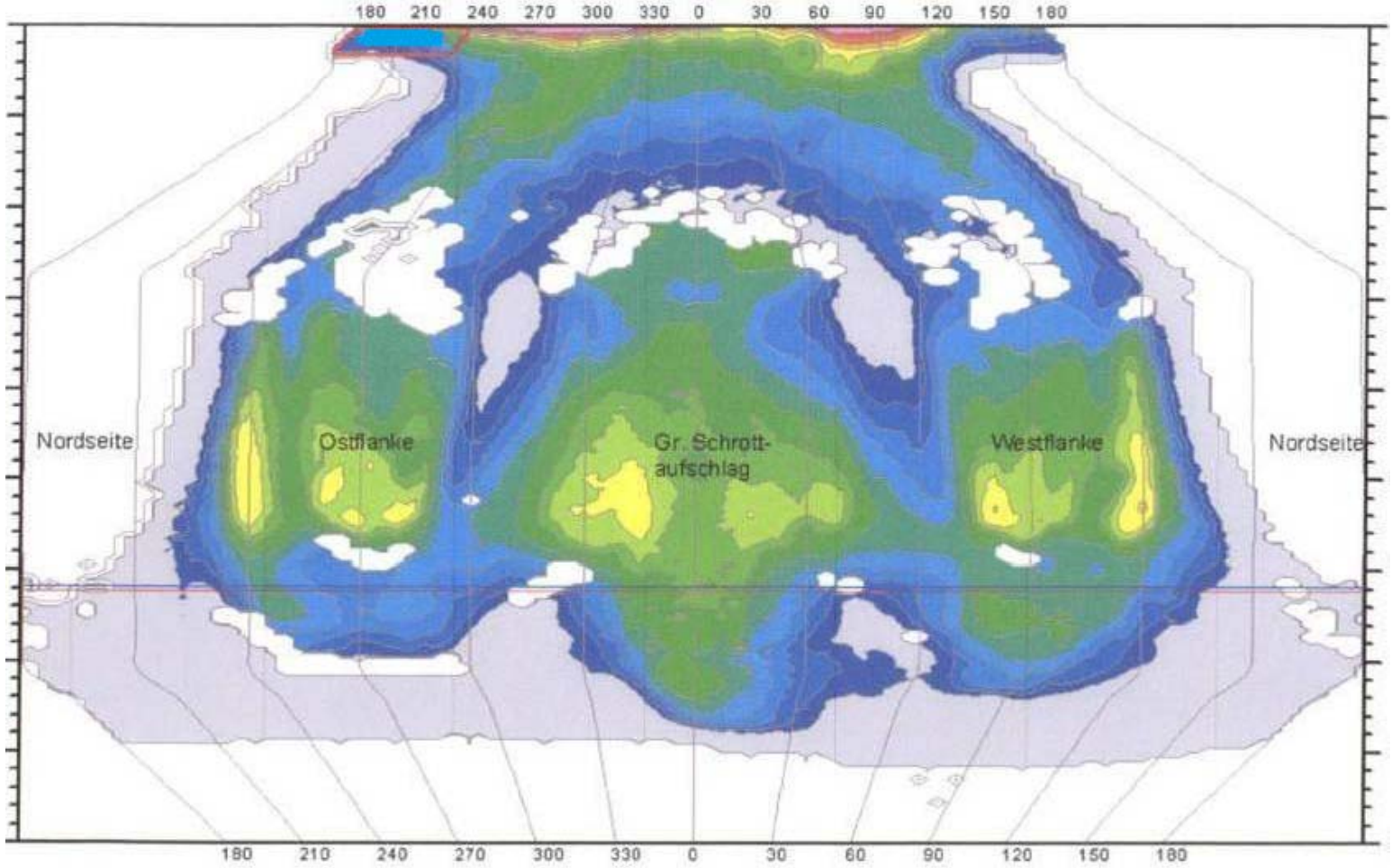
1976 heats (before gunning), slag lines and impact pad 50-100mm



1989 heats (13 heats after gunning) slag lines + impact pad 200-300 mm



2003 heats (27 heats after gunning), slag lines + impact still 150-250 mm



Systems Comparison

	Manual	Shooter	TBR
Kg/min	80-100	>250	500-600
Gunning time (BOF down time)	100%	40%	20%
Bulk Density g/cm³ Open Porosity %	2,4 28	2,5 24	2,7 19
Precision (angle, distance, adhesion)	low	medium	high
Personnel Factor (skills)	high	medium	low
Heats until next gunning	8-12 (3 times/day)	10-20 (3-2 times/day)	30-35 (once/day)