

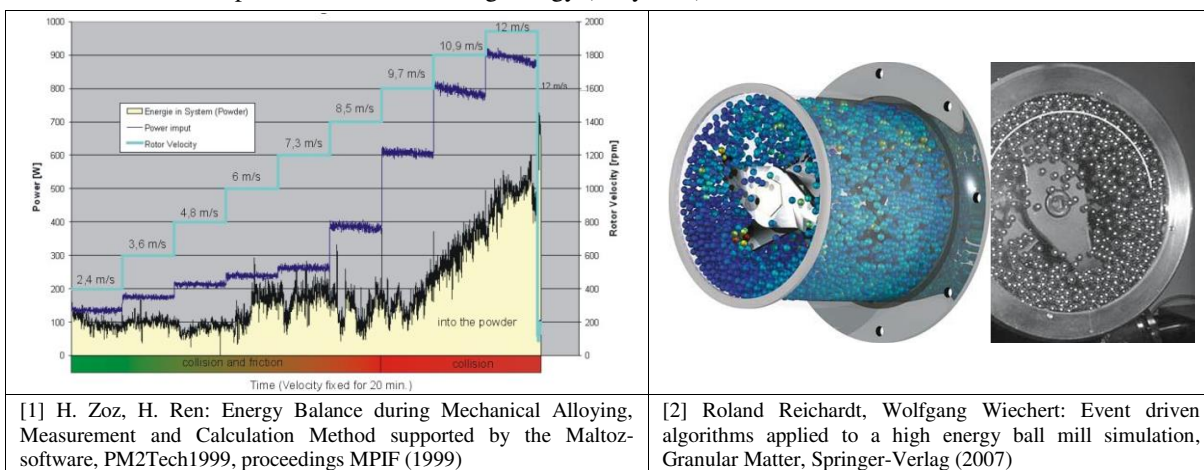
## HKP in the Simoloyer®

### Heating vs. Cooling at Scale-up, GM impact & surface

unit-size, nominal volume, drive power									
Simoloyer®	CM01b		CM08a		CM20b		CM100b	CM400b	CM900
Mahleinheit [l]	01	02	05	08	10	20	100	400	900
Antriebsleistung [kW]	2.7		11		22		110	400	2x400
Nennleistung/Vol. [kW/l]	2.7	1.35	2.2	1.375	2.2	1.1	1.1	1.0	0.89

High Kinetic Processing (HKP) leads to deformation, fracture and welding of powder particles by high energetic ball (GM) collisions. GM undergo elastic and marginal plastic deformation. Next to „energy in system“, also heat and noise are generated, noise is neglected in this survey.

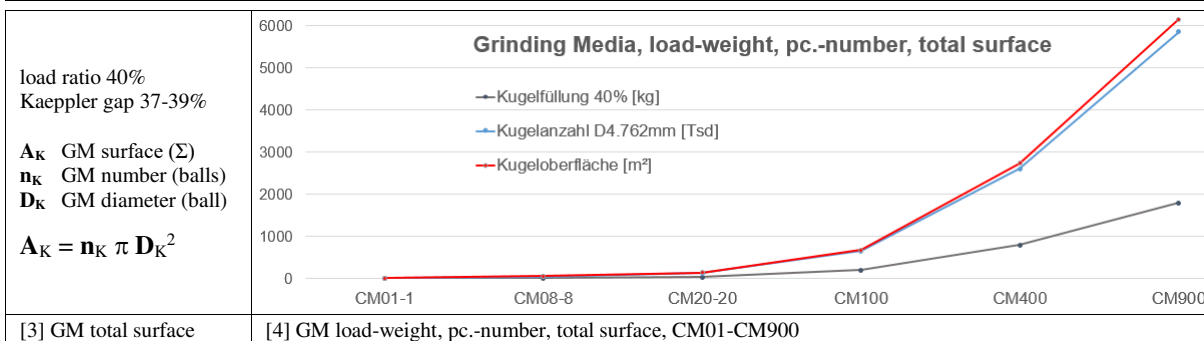
Energy in system has been addressed in previous work [1] investigating the Energy Balance during HKP demonstrating correlation between impact velocity and remaining energy after all losses namely friction, cooling/heat and noise. Test-stand was based on a CM01-2l energetically isolated in measurement frame. The resulting graph confirms a severe increase of energy efficiency at change of slope at about 10m/s MRV and higher. The surface under slope determines remaining energy (in system).



On theoretical approach, Reichardt and Wiechert [2] presented an event driven simulation of CM01-2l simulating motion and energy transfer of GM during HKP. In both cases, not any product (powder) was incorporated.

In short, heat generation is caused by energy from the main-drive rotating the rotor accelerating GM. Energy impact insofar causes wear resulting in contamination where decades experience does confirm, that major contamination (>90wt%) is caused by the grinding media. Major criteria for wear under collision is the number of contact points/events and for shear/friction interaction, this is surface. Heat generation by ideal impact at plastic/elastic deformation is neglected.

Grinding Media, load-weight, pc.-number, total surface									
Simoloyer®	CM01b		CM08a		CM20b		CM100b	CM400b	CM900
Mahleinheit [l]	01	02	05	08	10	20	100	400	900
Kugelfüllung 40% [kg]	3.2	4.4	10.3	16	23.6	40	200	800	1800
Kugelanzahl D4.762mm	<b>7.218</b>	<b>9.953</b>	<b>23.186</b>	<b>36.092</b>	<b>53.273</b>	<b>90.293</b>	<b>451.466</b>	<b>1.805.861</b>	<b>4.063.187</b>
Kugeloberfläche [m²]	<b>0.51</b>	<b>0.71</b>	<b>1.65</b>	<b>2.57</b>	<b>3.79</b>	<b>6.43</b>	<b>32.17</b>	<b>128.59</b>	<b>289.32</b>



CM900 carries about 4Mio “processing bullets” offering a surface of almost 300m².