Improvement actions: CNC air-conditioning according to ISO/DIS 14955-1				
No.	**Requirements on**	**Description**	**Relevant for machine type**	**Estimated Energy savings**
1	Minimize energy losses in power supplies	Usage of high efficiency transformer or voltage-proof converters instead of conventional transformers (e.g. controlled switching power for auxiliary power 24V).	Metal cutting	3,1 – 3,6%
2	Avoidance energy losses of power supplies	Avoid power losses in the transformer by use of e. g. voltage-proof converter, controlled switching power supply for 24V control voltage	Mechanical Press; Servo Press; Hydraulic Press	
3	Converter with power factor correction	Power factor in the infeed unit for feed operation and regenerative feedback saves energy losses.	Metal cutting	3,7 – 4,5%
4	High efficiency transformer	Load requirement of a machine tool is not constant during the cycle. Therefore it is more efficient to install transformers optimized on low Fe- losses instead of transformers optimized on low Cu- losses.	Mechanical Press; Servo Press; Hydraulic Press	3,1 – 3,6%
5	Thermal management regarding control cabinet	Optimized concept for thermal management of the control cabinet;1. Minimization of waste heat;2. If waste heat is not avoidable, it has to be dissipated (air cooling or water cooling); for reuse of thermal energy water is given a preference compared to air; further use of waste heat has to be checked/discussed with customer; 3. Controlled ventilation (fan).	Metal cutting	3,7 – 4,5%
6	Apply the simultaneity factor when designing the power system	Avoid oversizing of power supply leads to lower absolute energy losses. Avoid overload as well.	Mechanical Press; Servo Press; Hydraulic Press	3,7 – 4,5%
7	Converter/inverter with power factor correction	Power factor in the infeed unit for feed operation and regenerative feedback saves power losses.	Mechanical Press; Servo Press; Hydraulic Press	3,7 – 4,5%
8	Thermal management regarding control cabinet	Optimized concept for thermal management of the control cabinet;1. minimization of waste heat;2. if waste heat is not avoidable, it has to be dissipated (air cooling or water cooling); for reuse of thermal energy water is given a preference compared to air; further use of waste heat has to be checked/discussed with customer;3. controlled ventilation (fan);4. low maintenance air conditioner (no air filter) and thermostatic air conditioning with open-door-shutoff.	Mechanical Press; Servo Press; Hydraulic Press	3,7 – 4,5%

9	Thermal management of machine tool and all components (e.g. cooling devices, ...)	Optimized concept for thermal management of all machine tool components regarding:;1. Minimization of thermal power losses;2. If thermal power loss is not avoidable, it has to be dissipated by air or water cooling; for reuse of thermal energy water is given a preference compared to air; further reuse of thermal energy has to be checked/discussed with customer (e.g. via standardized interface);3. Controlled ventilation (fan)	Metal cutting	4,6 – 5,5%
10	Apply direct cooling of components depending on process (cooling at the source)	Temperature controlled	Metal cutting	3,7 – 4,5%
11	Demand dependend cooling	E.g. substituting line connected motors by inverter motors	Metal cutting	3,7 – 4,5%
12	Consideration of applied sub-systems with regard to synergies	To obtain the maximum possible energy savings it is often not sufficient to only look at the individual components and modules that are used for the individual functions. In addition it must be checked if it possible to extend the use of a supply unit (e.g. hydraulic), particularly during idle periods where other machine functions could be supplied or driven by it. In addition to the increase in the total efficiency of the supply unit due to the improved utilisation, a complete drive unit can be omitted (e.g. generation of high pressure coolant) and a large part of the previous energy requirement saved (avoidance of electrical, mechanical and volumetric losses).	Metal cutting	