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Introduction and objective :

“All in one” parenteral nutrition bags are prepared in our University Hospital by a robot. Overall Equipment Effectiveness (OEE) identifies opportunities for production improvement by evaluating availability, performance and product quality. This tool is an indicator usually used in pharmaceutical industry to manage, monitor and optimize the use of machines. In the context of optimization of resources in hospitals, the production activity of the parenteral nutrition bags was studied using this tool allowing the continuous evaluation of resources.

Materials and methods :

The OEE has been determined for the robot Exacta-Mix 2400[®] over 2 years (2009 and 2010) (Baxa Corporation, Englewood, USA). Quality, availability and performance levels were calculated after measuring production data : planned production time, operating time, ideal cycle time of neonatology and pediatric bags and total number of bags per day (figure 1).

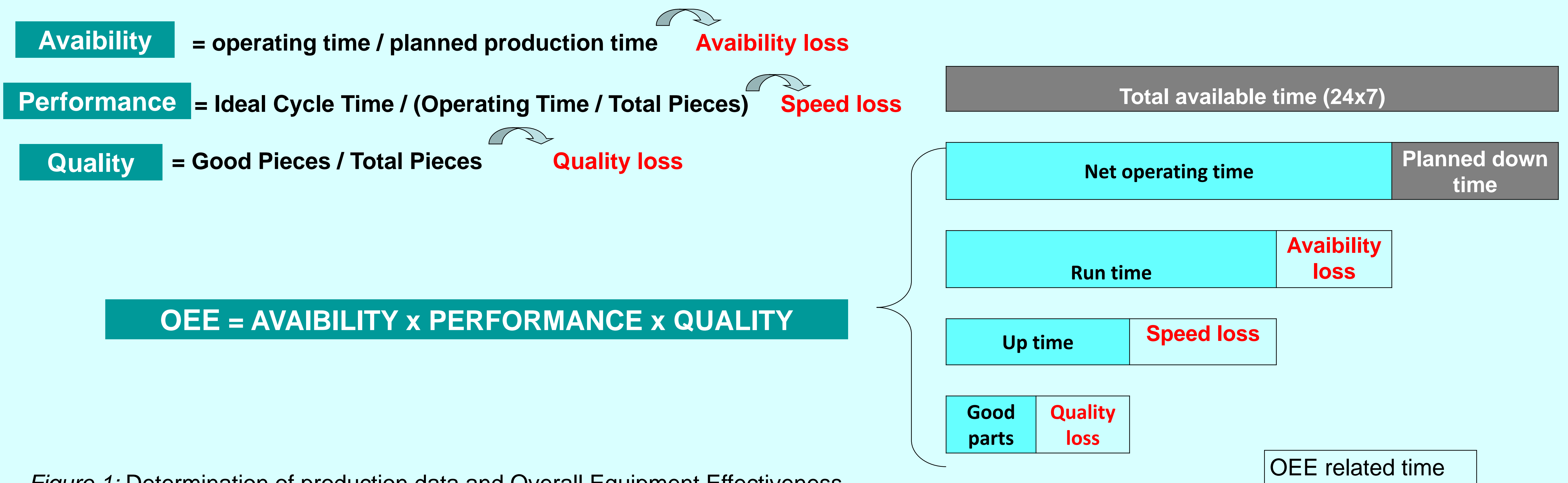
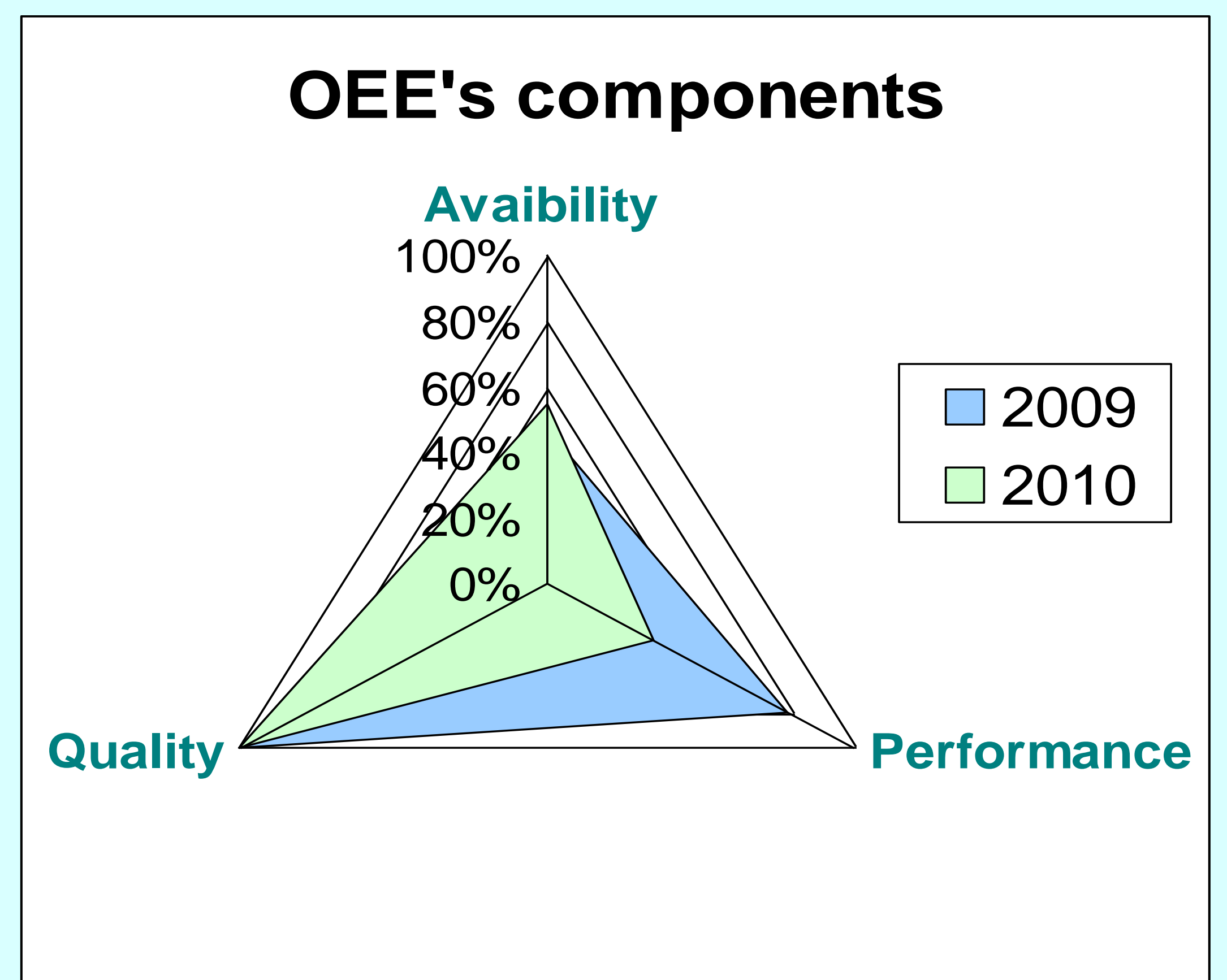


Figure 1: Determination of production data and Overall Equipment Effectiveness.

Results :

Regarding production data, the operating time increased from 67 to 90 min between 2009 and 2010, the ideal cycle time of pediatric bags increased from 4.9 min to 7.4 min. Total pieces per day decreased from 12.2 to 9.9. The quality level was 100% in 2009 and 2010, i.e. all bags were in accordance with Good Manufacturing Practice guidelines such as electrolyte identity and content, uniformity of mass and of content. The availability level, increased by 7.3%. The performance level decreased by 43.7%. Over the two year, the OEE decreased from 36.6 to 18.7%.

	2009	2010	2010-2009
Operating time (min)	67	90	23
Ideal cycle time bag (min)	4.9	7.4	1.55
Total bags per day	12.2	9.9	-2.3
Availability	47.20%	54.50%	7.30%
Performance	78.10%	34.40%	-43.70%
Quality	100%	100%	0
OEE	36.60%	18.70%	17.90%



Discussion :

Between 2009 and 2010, the increase of availability reflects an improvement of the scheduled time that the operation is available to operate : reduced downtime from changeovers (set-ups), cleaning, breaks etc...In pharmaceutical industry, the availability rate is always low because of long set-up times of equipment : cleaned up, set back up to GMP criteria.

The collapse of performance reveals a strong reduced speed : slower line speed, machine downtime, lack of material, in-process checks, minor stops, hesitations, operator fatigue etc...

The 100% quality over the two years shows that all bags were in accordance with Good Manufacturing Practice (GMP) guidelines such as electrolyte identity and content, uniformity of mass and of content.

Conclusion :

The drop of OEE between 2009 and 2010 indicates a decrease of the production effectiveness, particularly due to the decrease of the performance level (generally influenced by small stops and reduced speed). OEE appears as a good tool to evaluate and monitor effectiveness of nutrition bags production using a robot.