digital sensors, advanced and digitally connected machines, using special condition monitoring software, data is analyzed by data scientist, and organizations have highly skilled data analysis capabilities. The improvement must consider the four dimensions of maintenance strategy planning: service delivery strategy, organization and work structure, treatment methodology, and support system (Rahayu et al. 2019). This implementation can lead a company to be more competitive, especially in the resource costs (Wibowo and Nurcahyo 2020), by controlling or reducing failure before significant physical deteriorations occurs (Dachyar et al. 2018).

Table 6. Result of questionnaire (indicated by the green color)

Capability	Level 1 Visual Inspections	Level 2 Instrument Inspections	Level 3 Real Time Monitoring	Level 4 Predictive Maintenance in Industry 4.0
Process	• Physical inspection is carried out periodically • Recording using checklist paper	• Physical inspection is carried out periodically • Recording using digital instruments	• Remote inspection is carried out continuously • Recording using digital sensors	• Remote inspection is carried out continuously • Recording using digital sensors
Content	• The machines are old and can only be visually inspected manually • Existing data describe conditions at several points on the machine • Routine data is used	• The machine has a mechanism that is built in or retrofitted to be able to retrieve data • Existing data describes the condition at one point on the machine • Routine data is used	• The machine has a mechanism that is built in or retrofitted to be able to retrieve data • Existing data describe conditions at several points on the machine • Routine data is used	• Advanced, digitally connected machines • Existing data describe conditions at several points on the machine • The existing data depicts maintenance history digitally • The data is used with advanced algorithms to predict the component life cycle or root cause of failure
Performance measure	• Data verification is done visually • Paper-based data trend analysis • Predictions are made based on expert opinion	• Data verification is done automatically • Digital data trend analysis • Predictions are made based on expert opinion	• Data verification is done automatically • Digital data trend analysis • Monitoring is carried out using condition monitoring software	• Data verification is done automatically • Digital data trend analysis • Predictions are made with statistical software • There is advanced decision support for predictions
IT	• Using MS Excel • Data is stored locally	• Using the software embedded in the instrument • Data is stored in a simple database	• Using special condition monitoring software • Data is stored in a simple database	• Using special condition monitoring software • Using statistical software • Data is stored on big data platforms and networks
Organization	• Data is analyzed by experienced mechanics or technicians • Little or no expertise with data related to the organization both internal and external • None or only initial governance and strategy is still under development	• Data is analyzed by trained supervisors • There are several levels of organizational awareness and data-related process development • There are data-driven asset management governance and strategies	• Data is analyzed by reliability engineers • There are several levels of organizational awareness and data-related process development • There are data-driven asset management governance and strategies	• Data is analyzed by reliability engineer • Data is analyzed by data scientist • Organizations have highly skilled data analysis capabilities • Data-driven asset management is a key element in corporate strategy and governance

6. Conclusion

Diagnosis of maintenance maturity level is an important step to develop maintenance strategy. This activity should be taken if an organization want to shift their maintenance level to the higher maturity level. This study is carried out to determine which maintenance maturity level is an Indonesia's coal mining contractor. Some literatures are taken as a baseline to create the questionnaire. The questionnaire is a multiple-choice type and spread to owners of related

maintenance processes. Their answers are mostly mapped in level 4 of maintenance maturity (predictive maintenance in I4.0). The compliance of their current state is 65% of the defined characteristics. As a recommendation, management should improve their process so that it will be fit with the characteristics. For future research, this diagnosis can be used to develop a framework for the company to be fully mature in maintenance. The framework should cover all maintenance aspects so that it can be fully deployed effectively. Due to limitation of diagnosis that is only conducted in a company, future research should be taken for other companies so we can compare which one is better. Based on this comparison, management can take counter measure to be more competitive.

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