

بسم الله الرحمن الرحيم

(وَأَعِدُّوا لَهُمْ مَا اسْتَطَعْتُمْ مِنْ قُوَّةٍ وَمِنْ رِبَاطِ الْخَيْلِ
تُرْهِبُونَ بِهِ عَدُوَّ اللَّهِ وَعَدُوَّكُمْ وَآخَرِينَ مِنْ دُونِهِمْ لَا
تَعْلَمُونَهُمُ اللَّهُ يَعْلَمُهُمْ ۚ وَمَا تُنْفِقُوا مِنْ شَيْءٍ فِي سَبِيلِ اللَّهِ
يُوفَّ إِلَيْكُمْ وَأَنْتُمْ لَا تُظْلَمُونَ)

صدق الله العظيم

(الأنفال الآية 60)

DEDICATION

To my beloved parents and my small family, wife and daughters

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First, giving special thanks to my supervisor, Dr. Hassan Osman Ali, for his guidance during research, he always accessible and willing to help me.

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At last "thanks" for every one stood beside me and gave me a new hope for successful

ABSTRACT

Combat armored vehicles contribute significantly in military forces, they performed general or specified mission and support all war fighting function. WMZ551B is armored personnel carrier. The movable joint in a steering system is one of the main parts used to attain stability and steady movement of the vehicle. A repeated failure is detected in the steering mechanism at the movable joint of armored vehicle. The transmission system of the vehicle consists of several components which sometimes encounter unfortunate failures. Some of this failure may cause by the manufacturing and design faults, material faults, maintenance faults as well as user originated faults. The work in this research is carried out to investigate the failure mechanism and cause of the failed part of the movable joint. The work dealt with two steps. First part involves the experimental process, including the metallurgical analysis and mechanical testing to find out the properties of the material and identify the fracture mechanism. While second part involves stress analytical analysis to determine the combined stresses affecting the failure part. The chemical tests for the steering movable joint shows that the joint part has low carbon content of (0.208%) and higher content of chromium (0.873%) results in adherent, stable chromium oxide for corrosion resisting property of the material. Rockwell hardness test is conducted at the specimen and the results shows that the specimen has a surface hardening with 60 HRC at the outside surface and around 16 HRC at the cross section area. Examination of the fractured surface with SEM machine revealed a combination of ductile and brittle overload (dimpled rupture and cleavage) fracture with no indications of progressive crack growth via fatigue noticed. This transition in fracture morphology coincided with the change in properties of the material.

تجريدة

العربات القتالية المدرعة ذات أهمية اعتبارية في القوات العسكرية، إذ أنها تؤدي المهام العامة والخاصة وتدعم كافة العمليات القتالية لما تتميز به من خصائص. الناقل (WMZ551B) هي عبارة عن ناقلة جنود مدرعة. المفصل المتحرك في نظام الإنعطاف هو من الأجزاء الرئيسية ويلعب دورا أساسيا في عمليات الإلتزان والحركة المحكمة للعجل. هنالك عمليات كسر متكررة تحدث في هذا الجزء من نظام الإنعطاف في العربات المدرعة. يحتوي نظام نقل الحركة في المدرعة علي عدة مكونات تتعرض في بعض الأحيان للأعطال، بعض من هذه الأعطال تحدث بسبب أخطاء التصميم والتصنيع، المواد المستخدمة علاوة علي سوء الإستخدام وعدم اجراء عمليات الصيانة المخططة. لمعرفة اسباب ونمط الكسر للمفصل، ارتكزت منهجية البحث علي محورين حيث تناول الجزء الأول اجراء التجارب العملية والتي شملت تحليل ميتالورجيا المواد والإختبارات الميكانيكية لمعرفة خواص المادة ولتحديد نمط الكسر، بينما تناول الجزء الآخر تحليل الإجهادات المختلفة التي تؤثر في المفصل. أظهر التحليل الكيميائي للمفصل ان نسبة الكربون منخفضة (0.208%) علاوة علي ارتفاع طفيف في نسبة الكروم (0.873%) الذي يساعد في تكوين طبقة رقيقة من أوكسيد الكروم التي تحسن من مقاومة التآكل للمعدن. إختبار روكويل للصلادة التي أجريت للعينة اظهر ان هنالك تباين في الصلادة حيث أنها مرتفعة جدا علي السطح الخارجي (60 HRC) ومنخفضة داخل المقطع (16 HRC). إختبار سطح الكسر بواسطة المجهر الماسح الإلكتروني اظهر هذا التحول في نمط الكسر من قصف الي لدن مما يعزز النتيجة المتحصلة بواسطة إختبار الصلادة.

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