Analysis of Spun Crank Hub (SCH) Issues Across Various Modifications and BMW F80 M3 Models

Date: 08/24/2024
Prepared by: Andreas Kefalas X Driver Spec Garage
Socials:

- LinkedIn
- Instagram
- GitHub

Introduction

This analysis investigates the prevalence of Spun Crank Hub (SCH) failures across different vehicle models and modifications. The dataset, sourced from a forum thread on the Bimmerpost website. The dataset includes details on vehicle models, modifications, transmission types, and the frequency of SCH failures. The objective is to identify patterns and provide actionable insights for mitigating SCH issues.

Data Summary

The dataset comprises 112 poll categories with the following columns:

- **Model:** The vehicle model.
- **Counts:** The number of occurrences for each category.
- **Percentage of Whole:** The percentage representation of each count relative to the total.

Data Cleaning and Analysis Overview

Data Preparation:

- I imported the raw Bimmerpost Poll * dataset from excel in jupyter and performed data manipulation and cleaning using python by removing unnecessary columns and fixing any inconsistencies. I split and organized the information into useful categories like Year, Transmission, Modification, and SCH_Status. The code, raw data and cleaned data version will be included in my analysis zip file.

Visual Example of Poll:

BMW M3 and BMW M4 Forum > BMW F80 M3 / F82 M4 Technical Topics > Engine / Drivetrain / Exhaust / Bolt-ons / Tuning

Ultimate Spun Crank Hub (SCH) Poll: ALL Members Please Vote!

User Name [User Name] Remember Me?
Password [ ] Log in

View Poll Results: Ultimate S55 Spun Crank Hub Poll -- Please vote

2014-2015 | 6MT | Stock | No SCH	103	6.47%
2014-2015 | 6MT | Stock | SCH Failure	6	0.38%
2014-2015 | 6MT | Modified 450-500 whp | No SCH	39	2.45%
2014-2015 | 6MT | Modified 450-500 whp | SCH Failure	10	0.63%
2014-2015 | 6MT | Modified 500-550 whp | No SCH	20	1.26%
2014-2015 | 6MT | Modified 500-550 whp | SCH Failure	6	0.38%
2014-2015 | 6MT | Modified 550+ whp | No SCH	10	0.63%
2014-2015 | 6MT | Modified 550+ whp | SCH Failure	5	0.31%
2014-2015 | DCT | Stock | No SCH	151	9.49%
2014-2015 | DCT | Stock | SCH Failure	4	0.25%
2014-2015 | DCT | Modified 450-500 whp | No SCH	101	6.35%
2014-2015 | DCT | Modified 450-500 whp | SCH Failure	11	0.69%
2014-2015 | DCT | Modified 500-550 whp | No SCH	46	2.89%
2014-2015 | DCT | Modified 500-550 whp | SCH Failure	8	0.50%
2014-2015 | DCT | Modified 550+ whp | No SCH	25	1.57%
2014-2015 | DCT | Modified 550+ whp | SCH Failure	7	0.44%
2016 | 6MT | Stock | No SCH	57	3.58%
2016 | 6MT | Stock | SCH Failure	3	0.19%
2016 | 6MT | Modified 450-500 whp | No SCH	26	1.63%

Summary statistics of the Counts and Percentage of Whole columns are:

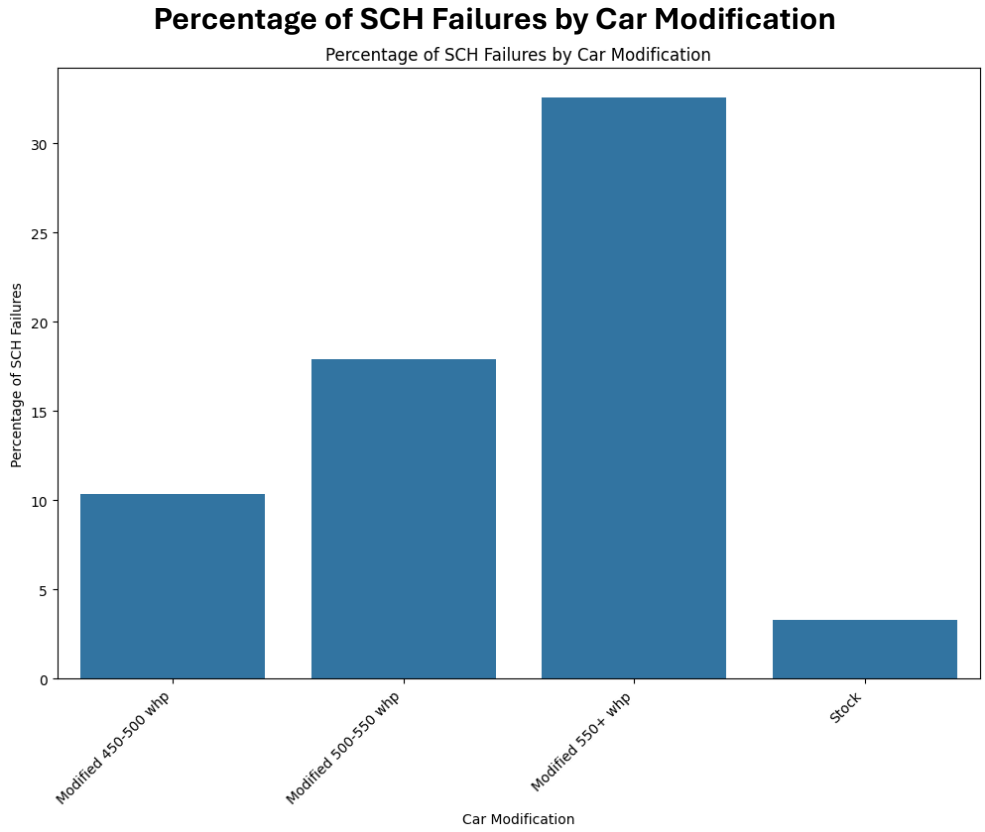
- **Counts:**
  - **Count:** 112
  - **Mean:** 14.54
  - **Standard Deviation:** 26.40
  - **Minimum:** 0
  - **25th Percentile:** 2
  - **Median (50th Percentile):** 4
  - **75th Percentile:** 13.25
  - **Maximum:** 151
  - **Total Number of Responses:** 1629
- **Percentage of Whole:**
  - **Mean:** 0.0091
  - **Standard Deviation:** 0.0166
  - **Minimum:** 0
  - **25th Percentile:** 0.0013
  - **Median (50th Percentile):** 0.0025
  - **75th Percentile:** 0.0084
  - **Maximum:** 0.0949

Analysis by Modification and SCH Status

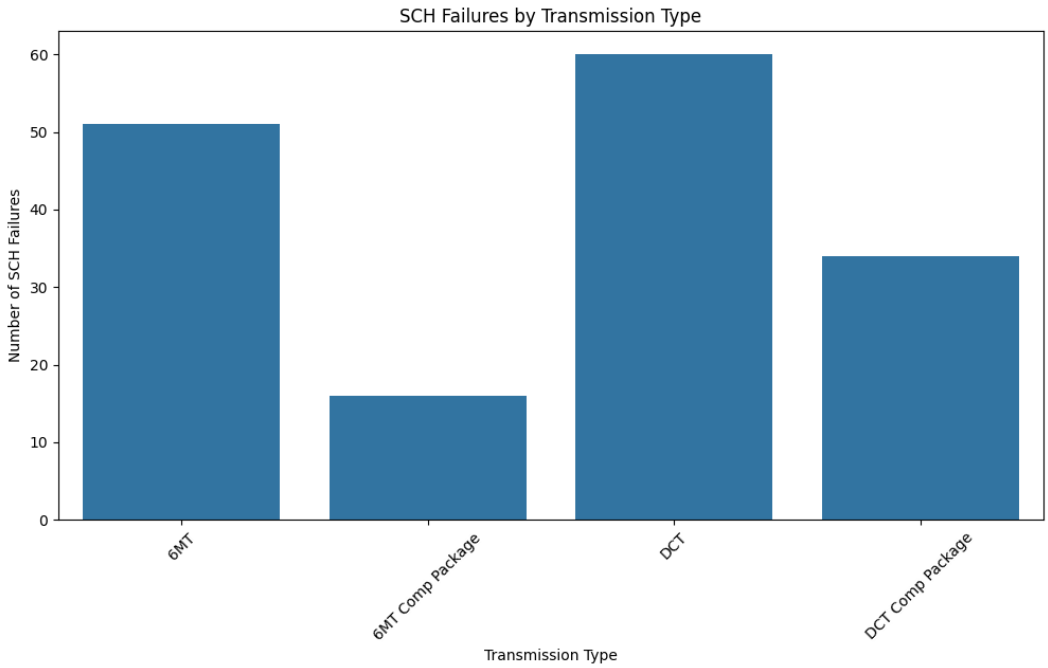
The dataset provides insights into SCH status across different modifications:

Modification	No SCH	SCH Failure	Total	SCH Failure Percentage
Modified 450-500 whp	311	37	358	10.34%
Modified 500-550 whp	183	40	223	17.94%
Modified 550+ whp	91	44	135	32.59%
Stock	883	30	913	3.29%

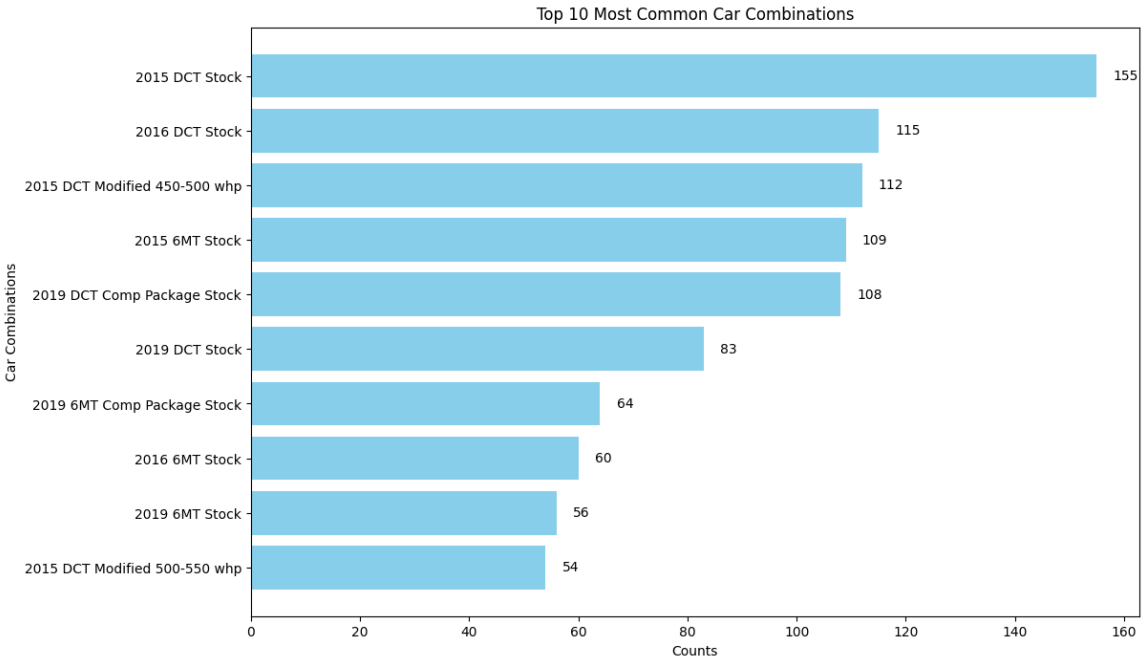
Visualizations:



SCH Failure Counts by Transmission Type



Top 10 Most Common Car Combinations



Key Findings

1. **Higher SCH Failure Rates in Modified Vehicles:** Vehicles with modifications, particularly those classified as "Modified 550+ whp," exhibit significantly higher SCH failure rates compared to stock vehicles. For example, "Modified 550+ whp" has an SCH failure percentage of 32.59%, much higher than the stock's 3.29%.
2. **Impact of Modification Intensity:** More intensive modifications are associated with increased SCH failure rates. This is evident from the data where "Modified 550+ whp" shows the highest SCH failure percentage, followed by "Modified 500-550 whp" and "Modified 450-500 whp."
3. **Consistency Across Years and Transmissions:** The dataset does not show significant variation in SCH failures based on the year of manufacture or transmission type. However, certain years and transmission types, such as DCT and 6MT, are frequently observed.

Suggestions for Mitigation

Based on the analysis, several measures can be considered to address SCH issues:

1. **Pinning the Crank Hub:** One effective preventive measure is to pin the crank hub. This technique involves adding a pin to secure the crank hub to the crankshaft, reducing the risk of it spinning and leading to SCH failures. Many enthusiasts and experts recommend this approach, especially for modified vehicles with high power outputs.
2. **Moderate Modifications:** Vehicle owners should be cautious when making significant modifications, particularly those that increase power substantially. Balancing performance enhancements with reliability is crucial to minimizing SCH failures.
3. **Regular Maintenance:** Implementing a rigorous maintenance schedule can help in early detection of potential issues related to the crank hub. Regular inspections and timely repairs can prevent SCH failures before they become severe.
4. **Further Research:** Additional studies are recommended to explore other influencing factors such as driving conditions, maintenance practices, and environmental impacts on SCH issues. This will provide a more comprehensive understanding and lead to more targeted solutions.

Conclusion

The analysis reveals a strong correlation between vehicle modifications and SCH failures, with higher failure rates observed in modified vehicles. This analysis could be used by BMW enthusiasts, mechanics, and potential buyers to understand the risks associated with SCH failures and take preventive measures. The recommendations derived from this analysis

can help in reducing the likelihood of SCH failures in BMW vehicles. Implementing preventive measures like pinning the crank hub and adhering to a balanced approach to modifications can help mitigate these issues. Further research will be beneficial in developing a thorough understanding of SCH failures and improving vehicle reliability.

References

- Bimmerpost Forum Thread *