

OPTIMAT BLADES

Progress made until MTA



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Problems encountered: Overview

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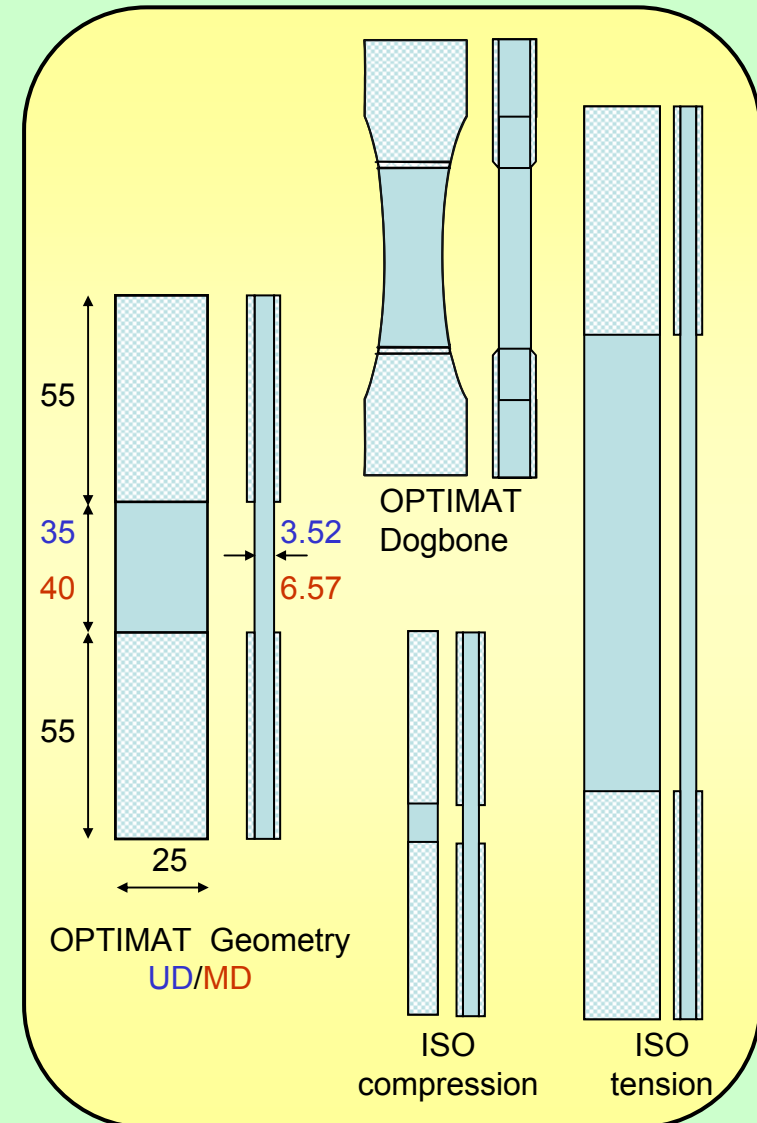
- Test Geometry Determination
- Fabrication of test specimens
- Move WMC
- Low fatigue frequencies
- Ambitious number of tests schedule in DPA
- Extra tests carried out due to problems in test geometry / testing frequency



Test Geometry Determination

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- General results comparable to ISO specimens
- Allow measuring techniques
 - Strain gauges
 - Acoustic Emission
 - Infrared imaging
 - Clip gauges
 - Ultrasonic
 - Temperature
- No buckling
- Not too thick
 - Maximum load: 100 kN
 - Load introduction through tabs
- Acceptable and/or consistent failure mode
- Bi-axial specimens
 - Cruciform
 - Tubes
- Delay in manufacturing





Low fatigue frequencies

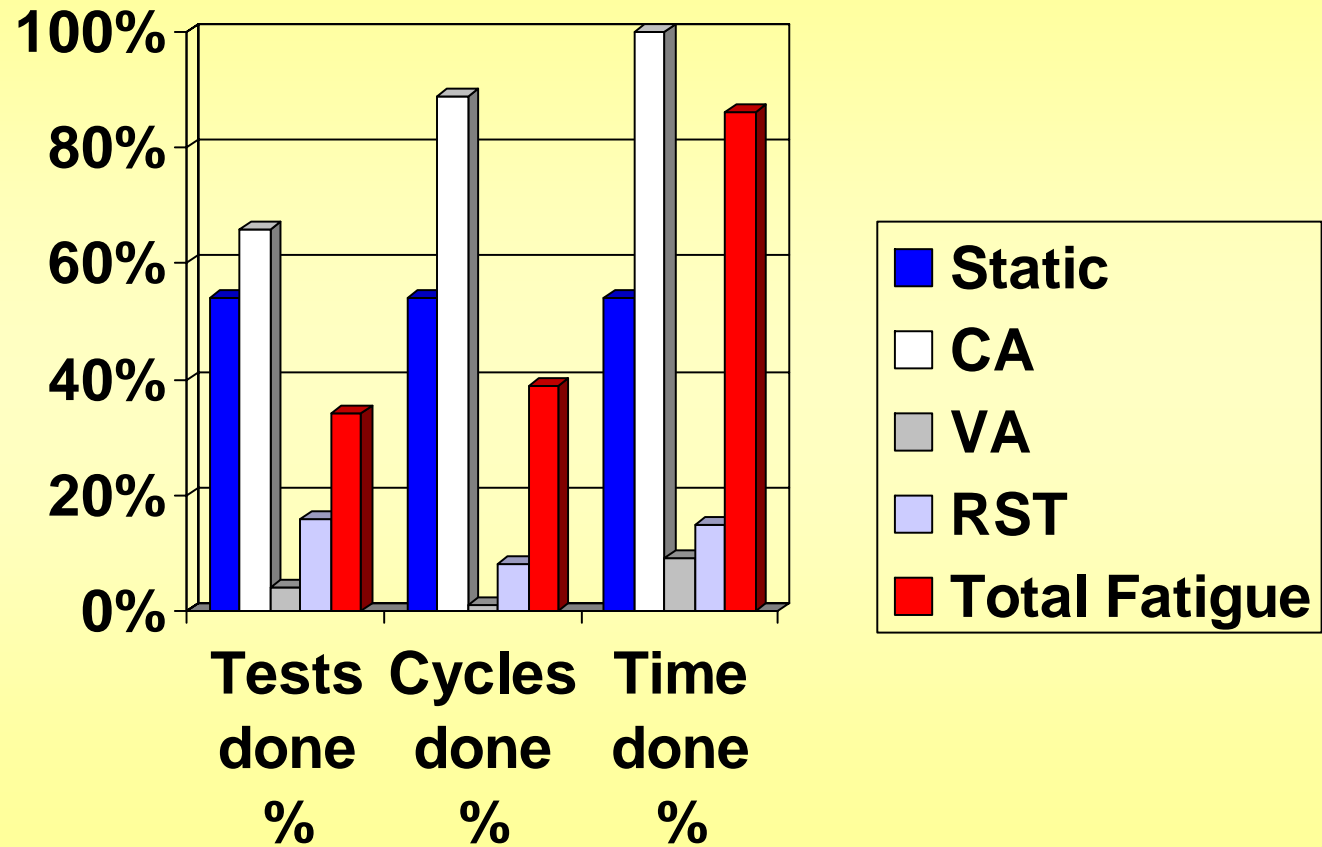
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- **Originally, a frequency of 5...10 Hz was expected**
 - Based on experience of all testing labs
 - High frequencies => significant heating
 - Can reduce fatigue properties
 - First results showed wide scatter
 - Extra meeting necessary
 - Added plan of action
 - Many extra tests done
 - First frequency per load established by preliminary tests
 - Round robin tests redone
 - Many results discarded
 - Longer test times



Tests carried out vs. planned

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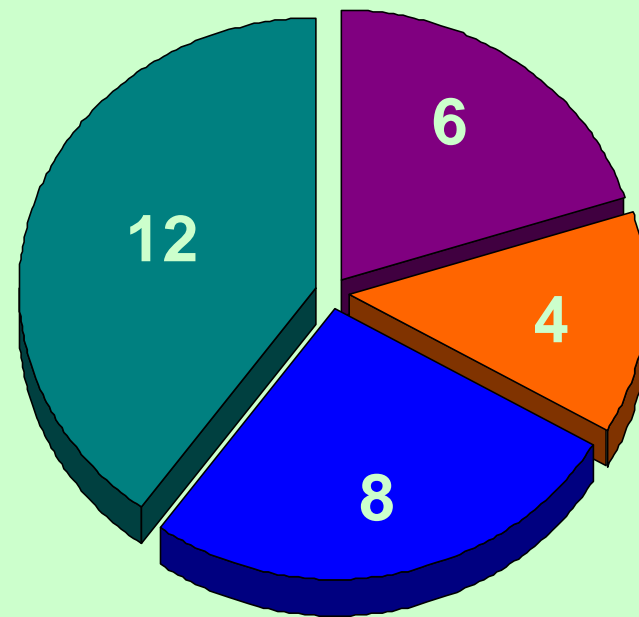




Delays per cause (months)

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- **NB: numbers are rough “guesstimates”**
- **Total delay is considerably smaller due to:**
 - Overlap in delays
 - Extra effort by the partners
 - Dedicating more test machines and effort
 - WMC bought two extra test machines
- **Overall delay is about 12 months**



- Geometry
- Manufacturing delay
- Frequency: extra tests
- Frequency: test time



Material testing: lessons learned

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- **Unexpected material behaviour and testing effects encountered**
 - Would never have been revealed in a number of smaller, unrelated projects
 - Plate-to-plate variation, specimen variation within a plate varies by type test (R-value etc.)
 - Influence of test methods
 - Highly sensitive for some parameters
 - Gives deeper insight in the material behaviour
- **Lab-to-lab variation appears to be small**
- **Basis for future procedures, standards**
 - Much knowledge gained on the value and uncertainties in future material specification by testing
 - New test standards (e.g. ISO)
 - Test specimen for fatigue and residual strength
 - Test frequencies and procedures
 - Possible spin-off to standard bodies outside of wind energy



Deliverables

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- **OPTIDAT: extensive material database**
 - Major bonus for future research projects
 - Largest European wind turbine material database (larger than FACT)
- **OPTIMAT website: with all documents available on-line**
 - Efficient documentation management
- **Already many scientific publications**
- **Enhanced and unique knowledge about the material behaviour and testing effects**
- **Standard Optimat test specimen geometry**
- **Knowledge for (making standard for) material characterisation**



Consortium Strengths

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- **The consortium includes unique expertise**
 - Proven capabilities to handle a huge amount of test results by developing a unique database: OPTIDAT
 - Fully automatic document database to handle the enormous flow of information: <http://www.ecn.nl/optimat>
- **Strong consortium that is intensifying its cooperation during the project and acts as a centre of excellence**
 - Partners all want to continue and are prepared to cover the extra efforts and costs themselves
 - Good cooperation between partners; even with all the technical problems encountered and overcome
- **Given the problems encountered:**

This is probably the only consortium that can resolve the current and future questions regarding rotor blade material behaviour and characterisation



Conclusions

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- **After the delays: the consortium now at full speed**
- **Major new knowledge has been generated by the consortium**
 - Also extending beyond the proposal in the field of material testing
- **The consortium needs to go ahead, because it is probably the only chance to resolve the issues at hand**
 - No other conceivable consortium would have this background in material testing for wind turbines
 - Setting up another project of this magnitude on material testing for wind turbines by the EU would be next to impossible
- **After the project, the consortium with its unique expertise should continue to extent the knowledge of material behaviour for the design of next generation rotor blades**
 - Also applicable outside of wind energy



Problems with MTA report

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- **Due to error at coordination team**
 - Base on prior progress reports
 - Two guidelines for reporting
- **MTA written in Scientific/Technical view**
 - Detailed description of what happened
 - Which results are reached etc.
- **Brussels needs Legal/Accountancy view**
 - Check against DoW how the contract terms are met



Remarks Scientific Officer, TPA

1: General

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- **Main problem: poor relationship with DoW (ANNEX I)**
 - One of the main criteria used in assessing project is the success rate in meeting the planned deliverables/milestones.
 - Structure by work package (as in the DoW) rather than by task group
- **Please consider these points**
 - Ensure that your project meeting next week addresses these issues.
- **Following the meeting, where Giles should become better acquainted with actual progress to date and your plans for the future**
 - Submit a revised MTA report that address our concerns
 - Submit a revised DoW by say the end of February.



Remarks Scientific Officer, TPA

2: Go / NoGo

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- **Clearly the project is significantly behind schedule**
 - We are pleased that you have given consideration to our request that you address what can be achieved within the remaining months of the project.
- **The project can achieve worthwhile outcomes within the 52 months originally envisaged**
 - we require the expectations to be formulated in terms of a modified DoW so that it is clear to everyone what is going to be delivered, by whom and by what date. This modified DoW would then be used in assessing progress between the MTA and the project end date.
 - Coupled with feedback on the meeting from Giles, I will then be in a position to judge whether the project remains of value and should continue, or not.



Remarks Scientific Officer, TPA

3: Manpower table

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- **The manpower table is missing**
 - (Table 1 in the FP5 Guidelines for Reporting)
- **In this table, you are asked to assess actual technical progress to date for each partner on each work package and this table provides a convenient overview of actual progress against man months used.**
- **Comment on exceeding the anticipated labour**
 - indicate that the partners are aware of this situation and have a solution to the problem.



What we are still lacking even in improved PM table

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Table 1 : Man Power and Progress Follow-up Table

(1st year example)															
----- Man-Month -----										----- Technical Progress % -----			Comments on major deviations and/or modifications of planned efforts.		
Task/Subtask (N°/title)	Partner (Name/ abbrev.)	Planned efforts - at start of period (MM)				Actual effort (MM)	Forecast effort (MM)			Devia- tion (MM)	Planned (%)	Assessed* (%)		Devia- tion (%)	
		Year 1	Year 2	Year 3	Total	Year 1	Year 2	Year 3	Total	Totals	Year 1	Year 1		Year (now)	
		a	b	c	d	a1	b1	c1	d1	d1-d					
1. Title.....	A														
	B														
	C														
	D														
	E														
	F														
	..														
	Total														
2. Title.....	A														
	B														
	C														
	D														
	E														
	F														
	..														
	Total														
Etc.....															
TOTALS	A														
	B														
	C														
	D														
	E														
	F														
	..														
	TOTAL														

*) Please note that the actual technical progress percentage and the updated remaining efforts must reflect the physically assessed status of the work.



Solution MTA report: 1

OPTIMAT BLADES

- **Add Table for milestones:** Done
- **Add WP and “% done” to Deliverables:** Done
- **Refine PM** Done
 - 4 tables with PMs per partner, per WP
 - DoW (Annex I)
 - 2002-2004
 - 2005-2006
 - Deviations
 - Commentary
- **Add Annex with progress relative to DoW**
Ongoing could be done at MTA



Solution MTA report: 2

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- **Progress per task per partner:** Add?
 - Format EC: about 3 tasks/page
 - => we have 66 tasks?
 - 20+ pages
 - Refer to OPTIDAT if high level of detail needed
 - Another FP5 project (MEXICO) didn't provide this table.....

- **New DoW** To be Done



To Do at TG meetings

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- Check deliverables
- Check milestones
- Check and amend text in Annex C
- Check PMs per partner in Tables 3-6
 - Add tables 7/8 ?
- Check and amend discussion in 7.3
- Torben, Hans Don: Check WP1/WP2/WP6 in Annex C and amend
- Spend the rest on technical matters