AB Risk Limited

Task Analysis Masterclass

Andy Brazier

www.abrisk.co.uk/taskanalysis

Tel: (+44) 01492 879813 Mob: (+44) 07984 284642
andy@abrisk.co.uk
www.abrisk.co.uk

My plan over the next hour is to describe how I carry out task analysis with my clients. This may not work exactly the same for every industry but as you have heard, this is based on quite a lot of practical experience.

Contents

- What is task analysis?
- When should you use task analysis?
- Hierarchical task analysis
- Human error analysis
- Performance Influencing Factors (PIF)
- Using the output.

AB Risk Limited

This is what I plan to cover. I presume you are here because you know a bit about task analysis; and I know plenty of you have more knowledge than that. My main aim is to share some practical insights.

A systematic method for

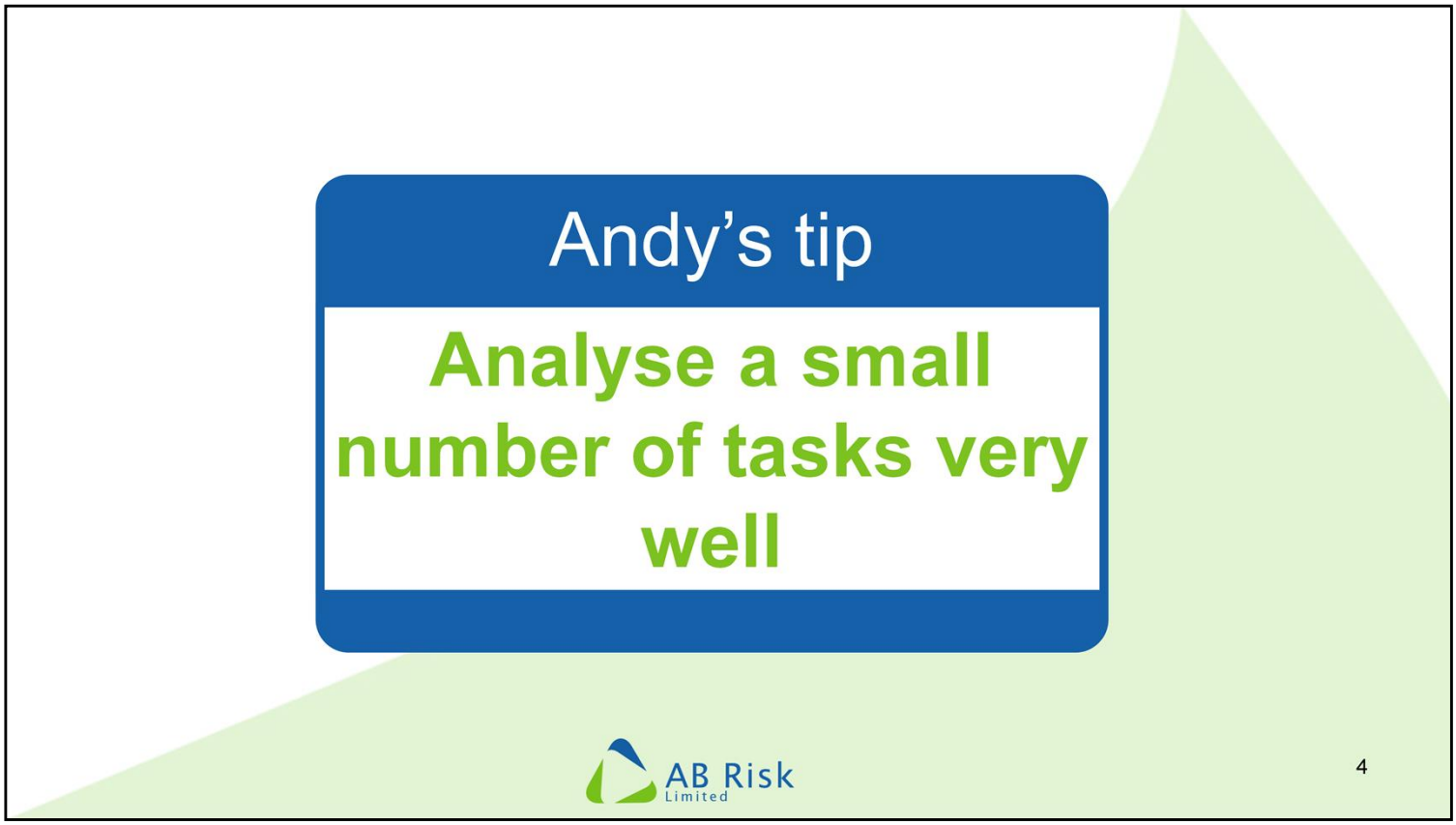
- Identifying tasks
- Focussing on important tasks
- Understanding how tasks are performed
  - Risks
  - Controls
  - Conditions.

AB Risk Limited

I will be talking about how to analyse a particular task, but one of the most important steps in the overall process is identifying the tasks to analyse.

Task analysis requires quite a lot of resource so you need to be focussed on analysing the right tasks and using the analysis for the right purpose.

In my line of work our main interest is in understanding the process safety risks, how those risks are controlled and how conditions can affect those risks.



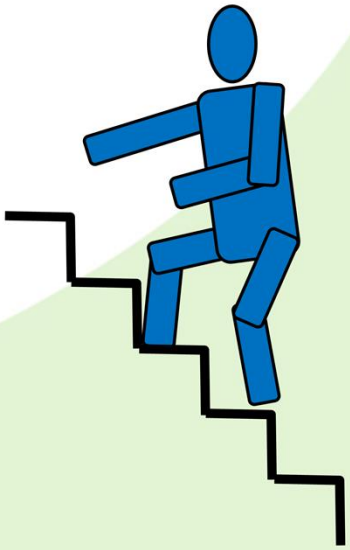
The first of my tips

There can be perception that we need to analyse every task. This is not possible or sensible. My very strong advice on this is to be very focussed and identify the most important tasks and analyse them as well as you can.

One thing I have observed many times when starting task analysis with a new group of people is a look of fear as they start thinking about how many different tasks they perform, and hence how long they are going to be trapped in a meeting room going through task analysis workshops. I always make the point of pointing out that is not the plan.

What is a task?

- Done by a person
- Clear start and finish
- Discrete steps
- Change of status occurs.



AB Risk Limited

Now this may sound obvious but task analysis is only meant to be used for analysing tasks. But that means we have to understand what a task is.

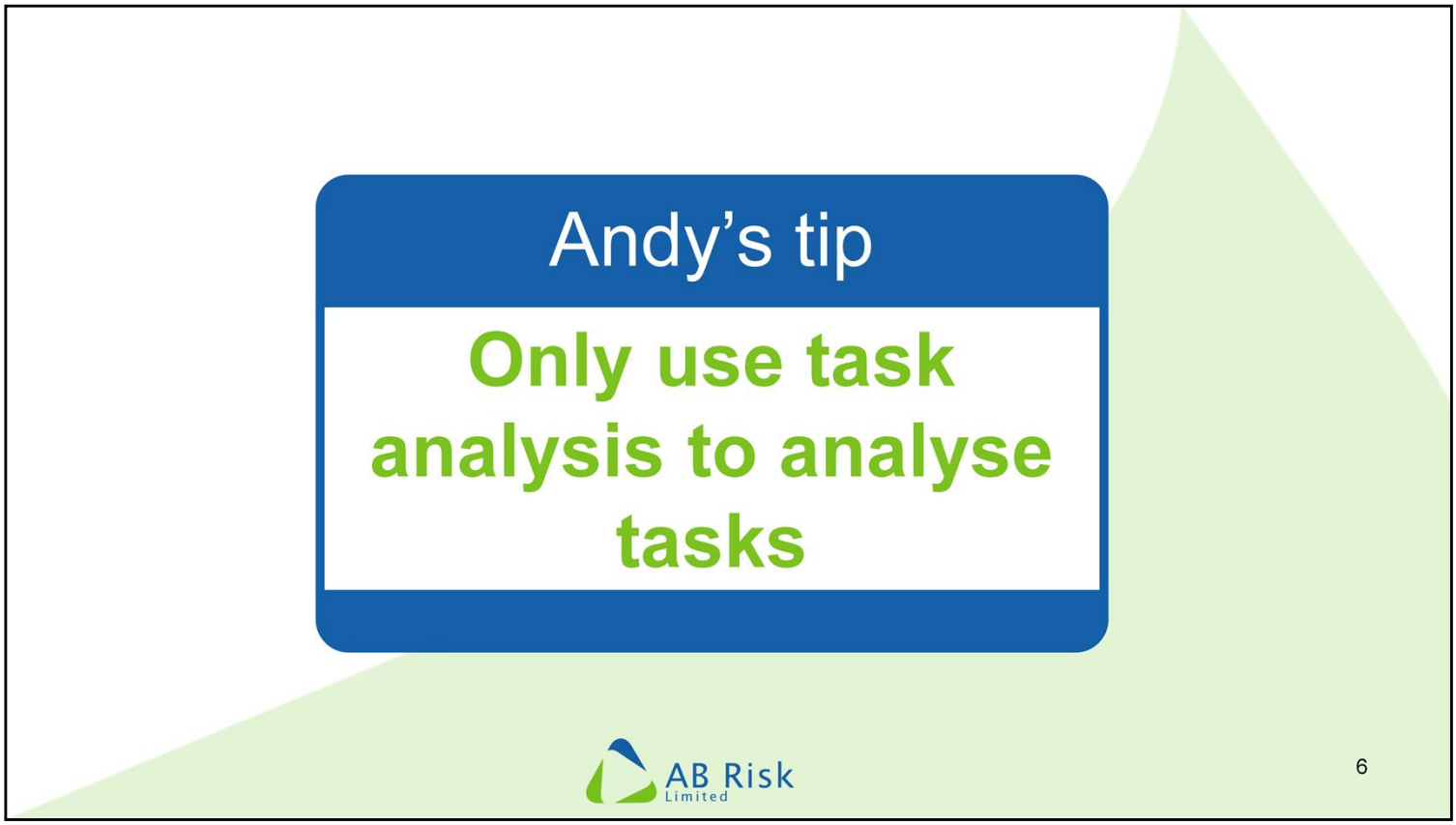
These are the criteria I set.

It has to be something done by a person - not an automated system.

There must be clear start and finish points with a set of discrete steps in between.

You should be able to observe some sort of status change between the start and end points.

There are lots types of human activity that do not satisfy these requirements. In those cases there may still be merit in carrying out human factors analyses of some sort, but do not try to make task analysis fit.



Just to emphasise the point.

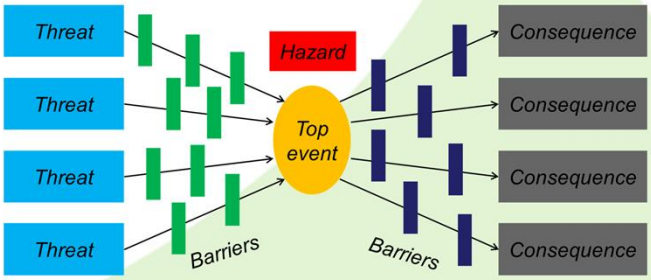
Activities where task analysis does not fit include things like monitoring and controlling a process. For this the most important thing is the information available and how it is presented. How the human machine interface compares with human factors principles is much more important than trying to break it down into a task.

General maintenance, inspection and testing is another. You may be able to identify some specific tasks, and for the most complex and critical you can perform task analysis. But most of this work is very general in nature and it is more important that it is done often enough, by people using the right tools. Bear in mind that maintenance technicians may be working on 1000s of pieces of equipment, so you cannot analyse even a fraction of this.

Responding to emergencies is one where I think trying to perform task analysis is actually dangerous. You may think that you can identify specific tasks but the key point is that emergencies are unpredictable. It is the ability to handle that unpredictability that is most important.

Identifying tasks

- Existing procedures
- Safety studies

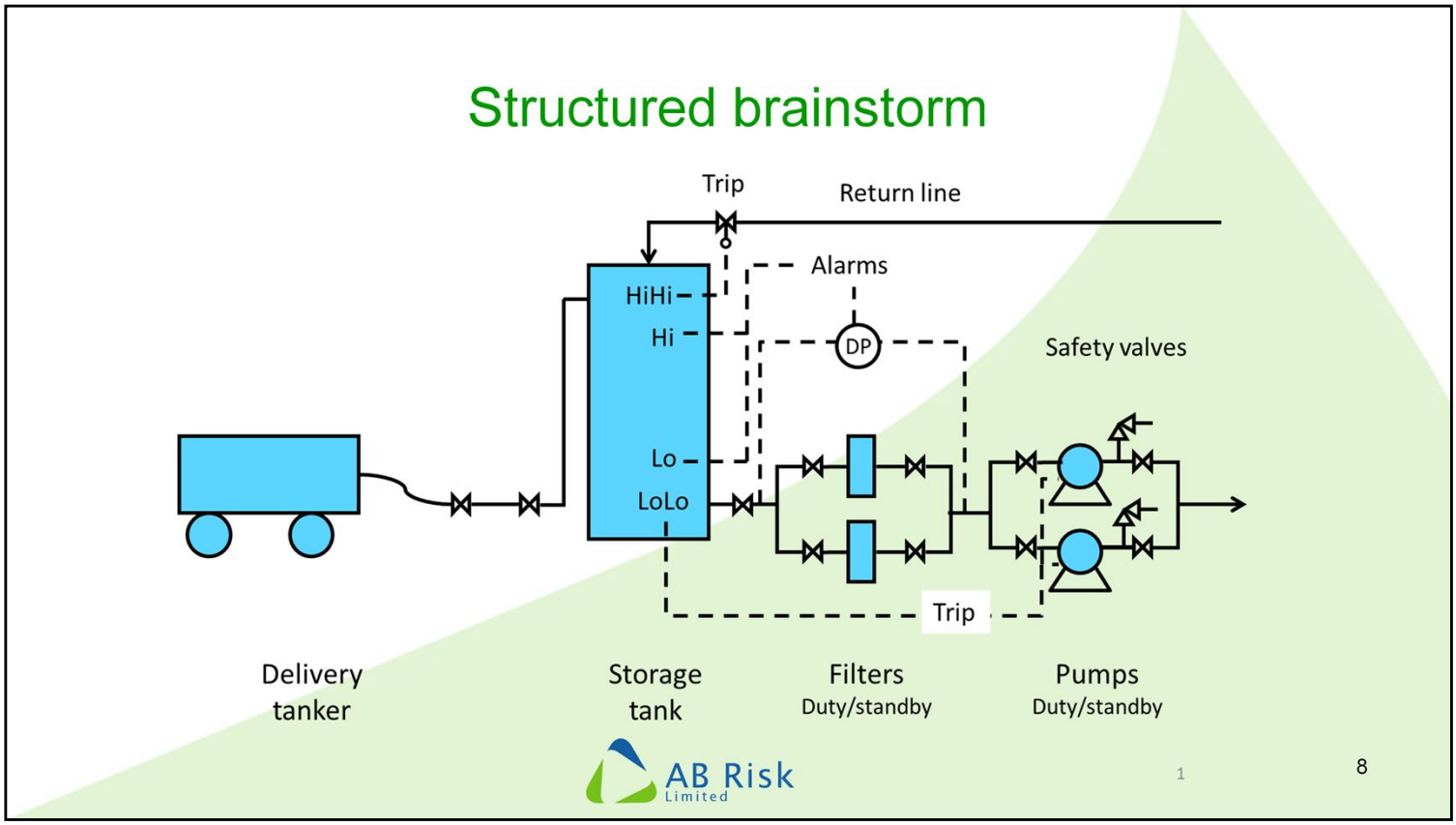


AB Risk Limited

We have a few sources of information we can use when we are identifying tasks. Existing procedures should give a good starting point but they can be a bit mixed up. Sometimes one procedure covers several tasks and some tasks may be divided between several procedures.

A key message is to not try to shortcut the task analysis process by just taking the contents of the procedure as a true reflection of how a task is performed. I can say that I have never yet found that to be the case.

Other places to look for task references is safety studies. Things like bow ties. In practice these are rarely comprehensive. You can have some confidence that any tasks mentioned in the reports are potentially important but they rarely set out to identify every task.



I would say the best approach is a structured brain storm with a group of people knowledgeable of the system using drawings of the system as a prompt. We then cross reference with procedures, safety studies etc.

From this drawing I can see there is a tanker delivery, so that is a task. There are pumps that need to be started, filters that need to be cleaned, safety valves that need to be calibrated.

Tasks

- Operations
  - Receive delivery from tanker
  - Start transfer from tank to plant
  - Changeover filters
  - Changeover pumps
  - Restart after a trip
- Maintenance
  - Clean a filter
  - Overhaul a relief valve
  - Function test the high level trip.

AB Risk Limited

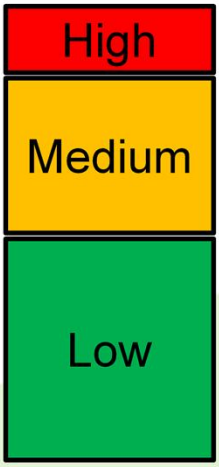
Very quickly we can come up with a list like this. We can divide them into operations and maintenance, because they are often performed by different groups of people but there are often some overlaps.

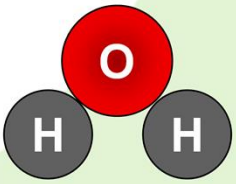
At this stage we are only developing a list. We are not necessarily going to analyse all or even any of these.

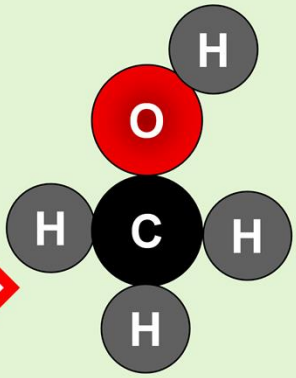
Also, you can see we have identified some maintenance tasks but these are very specific. Any item could break and need to be fixed. All will need some form of inspection at some time. If we tried to list all of those the list would be very long, and this is why we need to handle those more general activities differently - which is not on the agenda for today.

Are the tasks critical?

- Is safety your concern?
- It depends on the substance







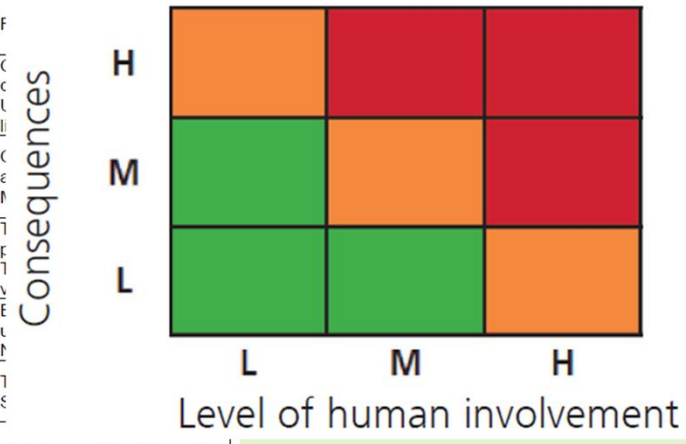
AB Risk Limited

Having identified the tasks we need to decide which ones we want to analyse. They will be the ones that are most critical.

In my work our main focus is on process safety. Yours may be product quality, patient safety or even profit. Whatever it is you need a method to identify the most critical tasks, maybe the top 10 or 20%.

In the example I showed the criticality is likely to be related to the product handled. The same basic system could handle any liquid. If it is water there is very unlikely to be any significant safety concern. If it is methanol, which is flammable and toxic, clearly the safety concerns are much greater.

	None (score 0)	Low (score 1)	Medium (score 2)	High (score 3)
How hazardous is the system involved?	Non-hazardous system (operations)	Small amount of low hazard / condition	Large amount of low hazard or small amount of high hazard	High amount of high hazard / condition
	Non-hazardous system (maintenance)	Task carried out after hazardous system has been proven hazard free	Actions taken to remove hazard, but some may remain	Work carried out whilst adjacent/related systems remain live
To what extent does the task involve the introduction of energy or an ignition source?	No ignition / energy sources	Low pressure or temperature rise	Medium pressure or temperature rise. Combustion engine.	High pressure or temperature rise
	No possibility of a flammable atmosphere	Electrical switching. Electrical equipment used.	Potential for sparks or hot surfaces	
To what extent does the task involves changes to the operating configuration?	No change required	Simple valve changes (few valve moves)	Complex or multiple valve changes. Use of temporary connections	
		Connect/dis-connect points designed for routine use (e.g. quick coupling, plug and socket)	Make/break small number of bolted joints	
What is the potential for error in performing the task?	Fully automated task	The potential for error cannot be rule out although there is no specific concern	There is a recognised possibility for error	
	Very simple and errors would have no consequence	A 'normal' task	Complex task	
To what extent could the task affect performance of a safety system?	No systems overridden or defeated	Task involves a deviation from an original procedure or design.	Warning devices may be made inoperable (e.g. alarms, gauges, meters)	
	Fully automated layers of protection against major accidents	Simple response to alarm considered as a layer of protection (e.g. push button to trip machine)	Task to be performed to achieve a layer of protection	Task is considered the only layer of protection
	No safety system affected by task	May affect system calibration. Safety system may not operate as normal.	One of several layers of protection may be made inoperable	Multiple layers of protection may be made inoperable. Potential for common cause failure



11

You need a method to rank the criticality of tasks on your list. You can of course just ask people but they tend to identify a higher proportion as being highly critical. This seems to be a natural human reaction. People are concerned that they may be criticised if they something is low criticality so feel safer taking a risk averse approach.

The dreaded risk matrix can be used to do this but it doesn't always perform much better than just asking people to rank tasks. Also, it can be difficult to explain how the ratings were selected.

I prefer a simply scoring system that has evolved over the last 20+ years from an HSE report. This example has 5 criteria list in the left hand column. They are basically asking about the hazards, human involvement and nature of the task. There is guidance on how to score for each. It is still quite crude and has some subjectivity but it is easier to explain your judgements.

All I can say is that it tends to work well enough in that we do get a fairly useful ranking.

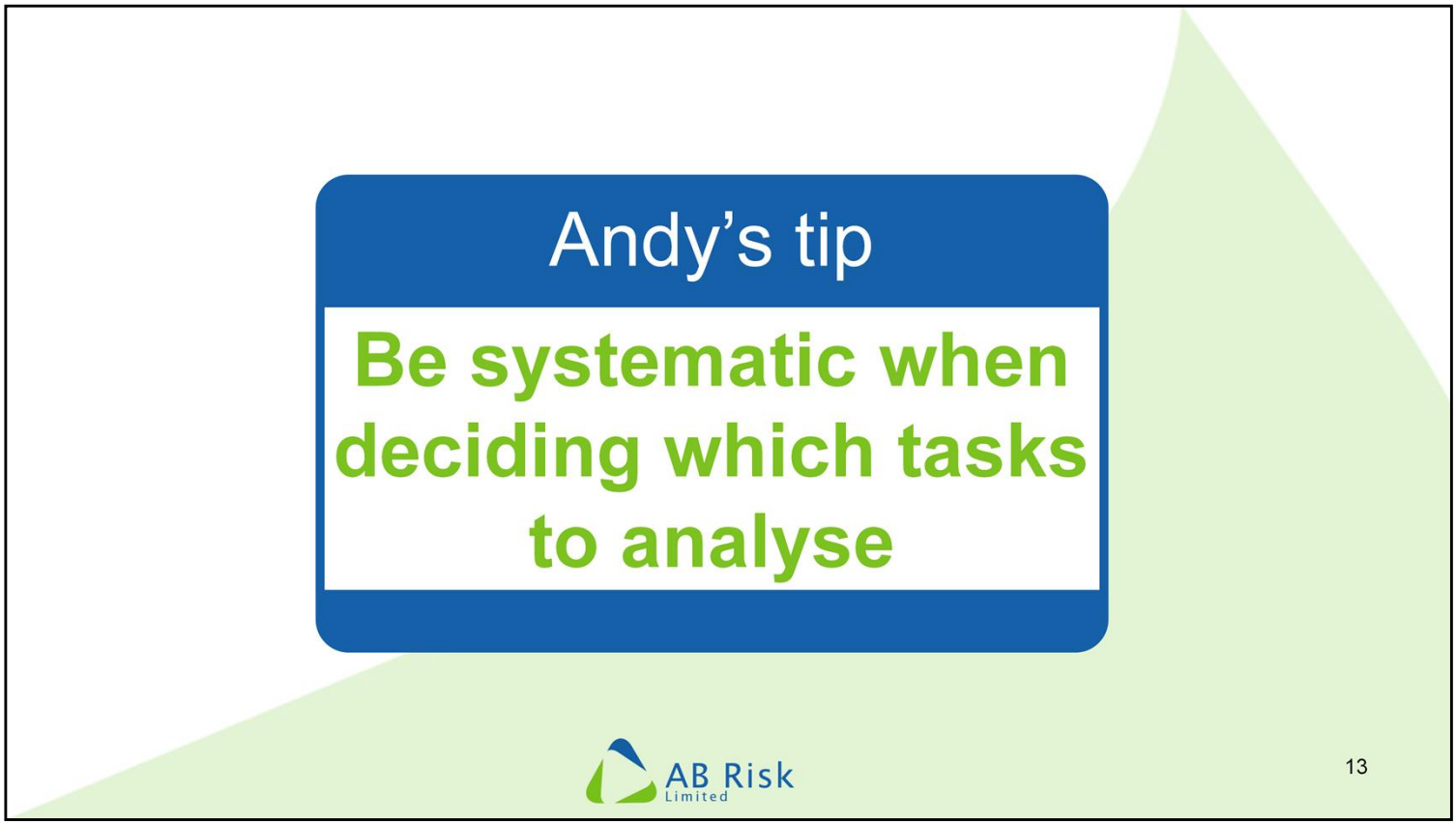
If you are working in a different industry you could easily take the criteria and adapt them to your requirements.

Operating tasks (acid)

	Hazard	Energy	Change	Error	Safety system	Total	Priority
Receive delivery from tanker	3	2	2	2	0	**9**	**H**
Start transfer from tank to plant	3	1	1	1	0	**6**	**M**
Changeover filters	2	0	1	1	0	**4**	**L**
Changeover pumps	2	1	1	1	0	**5**	**M**
Restart after a trip	3	1	1	1	2	**8**	**M**

AB Risk Limited

And this is how the results come out for the example I showed. IN this case we are assuming the liquid is the hazardous methanol. You can see that if it was water the hazard scores would be zero so the overall scores would be lower.



And here is one of the key messages. You need to focus your resources where they can have the greatest impact. Being systematic when deciding which tasks to analyse will help you do that.

Your boss or client will be pleased. More generally, this is really important if we are going to increase our credibility. Spending a budget on analysing lots of trivial tasks does no one any benefit.

Questions

AB Risk Limited

Hierarchical Task Analysis (HTA)

- Systematic
- Task is properly understood
- Only necessary details
- Group activity in workshop (remote works well)
- *Site visit*
- Excellent basis for:
  - Writing procedures
  - Developing training and competence programs
  - Human error analysis
  - Design control rooms and interface.

AB Risk Limited

Let's have a look at how to analyse a particular task.

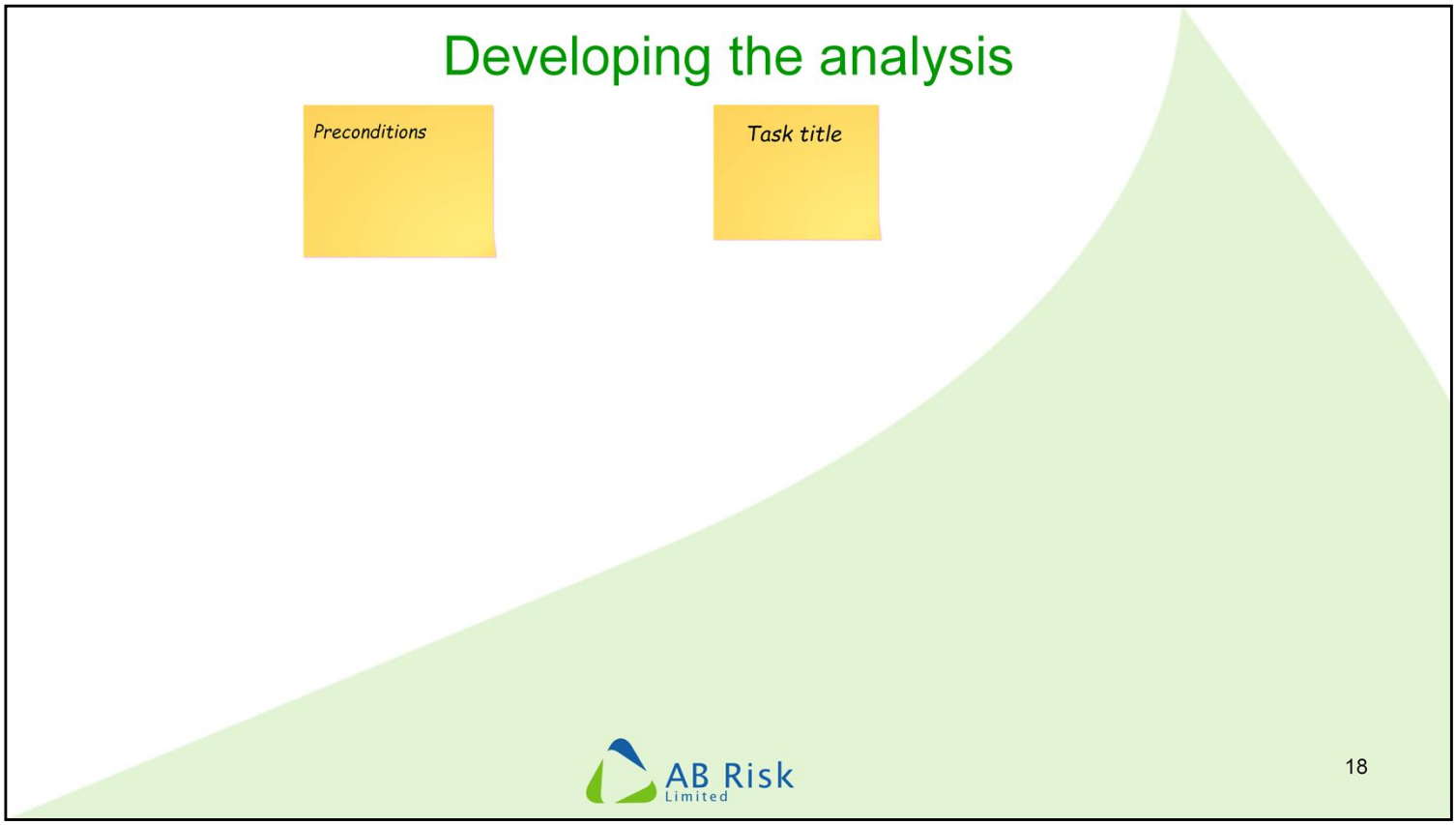
Hierarchical Task Analysis or HTA is a very effective tool to systematically understand how tasks are carried out. One key benefit is the ability to drill down into detail where it is needed but leave it out where it does not add value to your assessment.

It should be carried out as a group, with active involvement of people who actually perform the task. This can be difficult to organise but it has to be done. This is another reason to be very focussed about which tasks are going to be analysed. If you plan to do too many there will be a tendency to short cut the process. One of the good things to come out of the pandemic is that it has proved that task analysis workshops can be carried out remotely. In some cases I have found this is actually working better than face to face because it is easier to get the right people to attend.

I have put site visit in italic because it is an important part of the overall process but in my experience the workshop is by far the most productive part. I see the main purpose of the site visit is to validate the analysis, so I will usually do it towards the end of the process. I know guidance puts a lot more emphasis on site visits and observing tasks being performed. That makes sense for simple tasks because you can see what is happening. Really our focus should be on more complex tasks, where your observations are actually less useful.

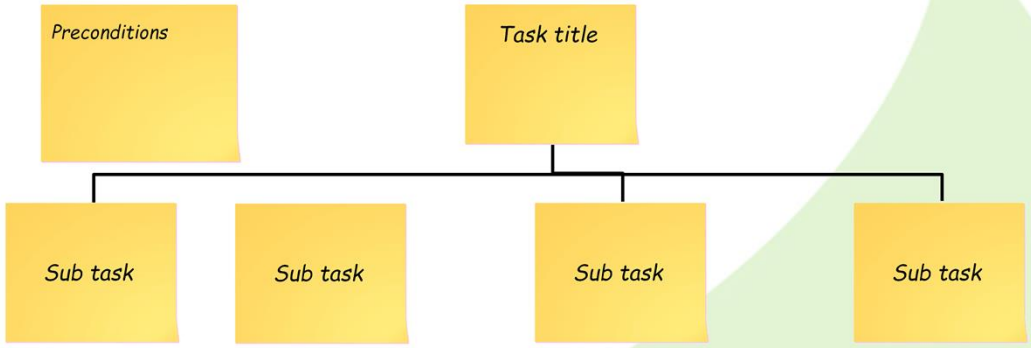
You can run very successful task analysis workshops with post-it notes. There are some software packages available which work well and the major advantage is that they can be used with Microsoft Teams, Skype etc.

To be honest this is more than a tip - it is absolutely essential. You have to actively involve people who perform the task in the analysis workshop. It is not good enough just to watch them do the job or ask them a few questions in the workplace. Active involvement is key so you have to be careful about other attendees. Sometimes, supervisors and managers can do all the talking, which can mean the practitioner is reluctant to speak up to say what really happens.



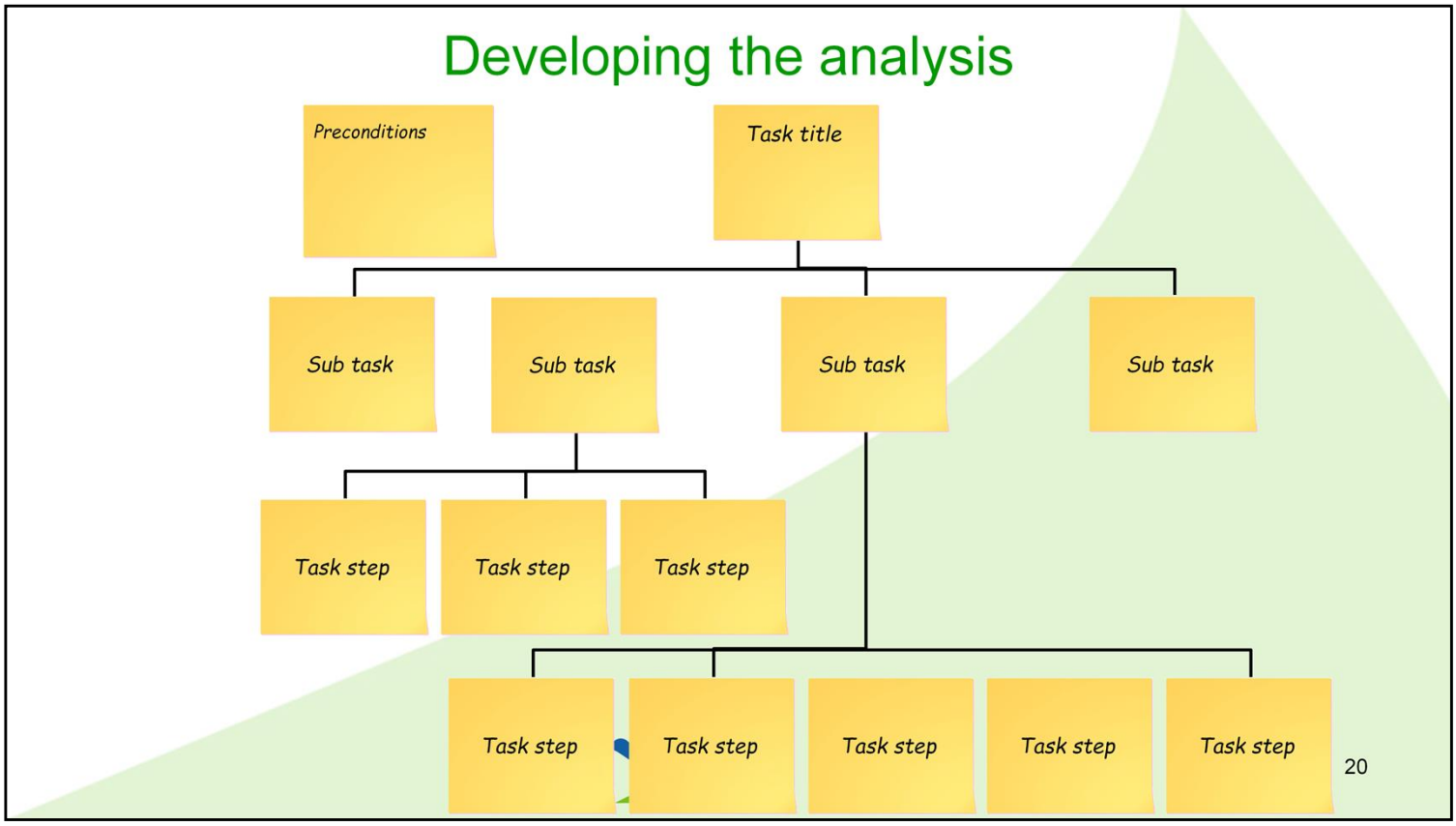
The key components that make up HTA are task title, preconditions.

Developing the analysis



AB Risk Limited

Sub tasks



And the detailed task steps. I am going to show you how to do this with an example.

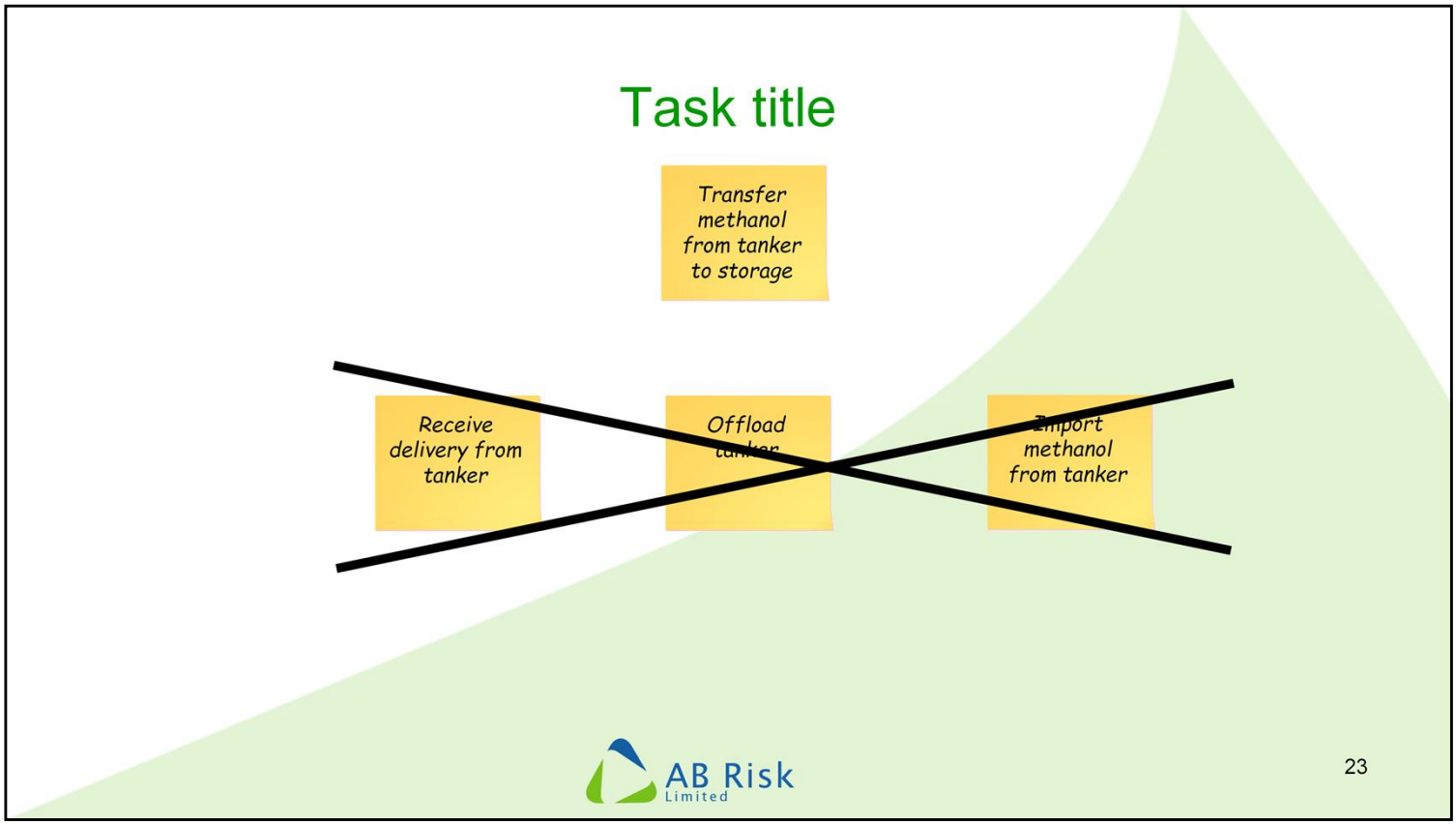
Task title

Having a task title is a fairly obvious requirement but deciding what it should be is actually a very important part of the analysis.

I am going to use the tanker delivery task as my example.

You will actually see different titles on procedures for this task. They usually make perfect sense to the people who wrote them but can be misinterpreted.

The third one here using the word import is a good example. A plant operators perspective is that an import is always to the storage tank. However, the driver will view it from the opposite and expect the import to be to their tanker.



This is the title I would recommend. It is very clear what material is being handled and what direction it is travelling. That reduces the potential for any confusion.

This may seem trivial but it is not uncommon to find right at the start of an analysis that people have a different view of what the task is all about.

Preconditions

Preconditions
- Delivery from approved supplier
- Tanker located in unloading bay

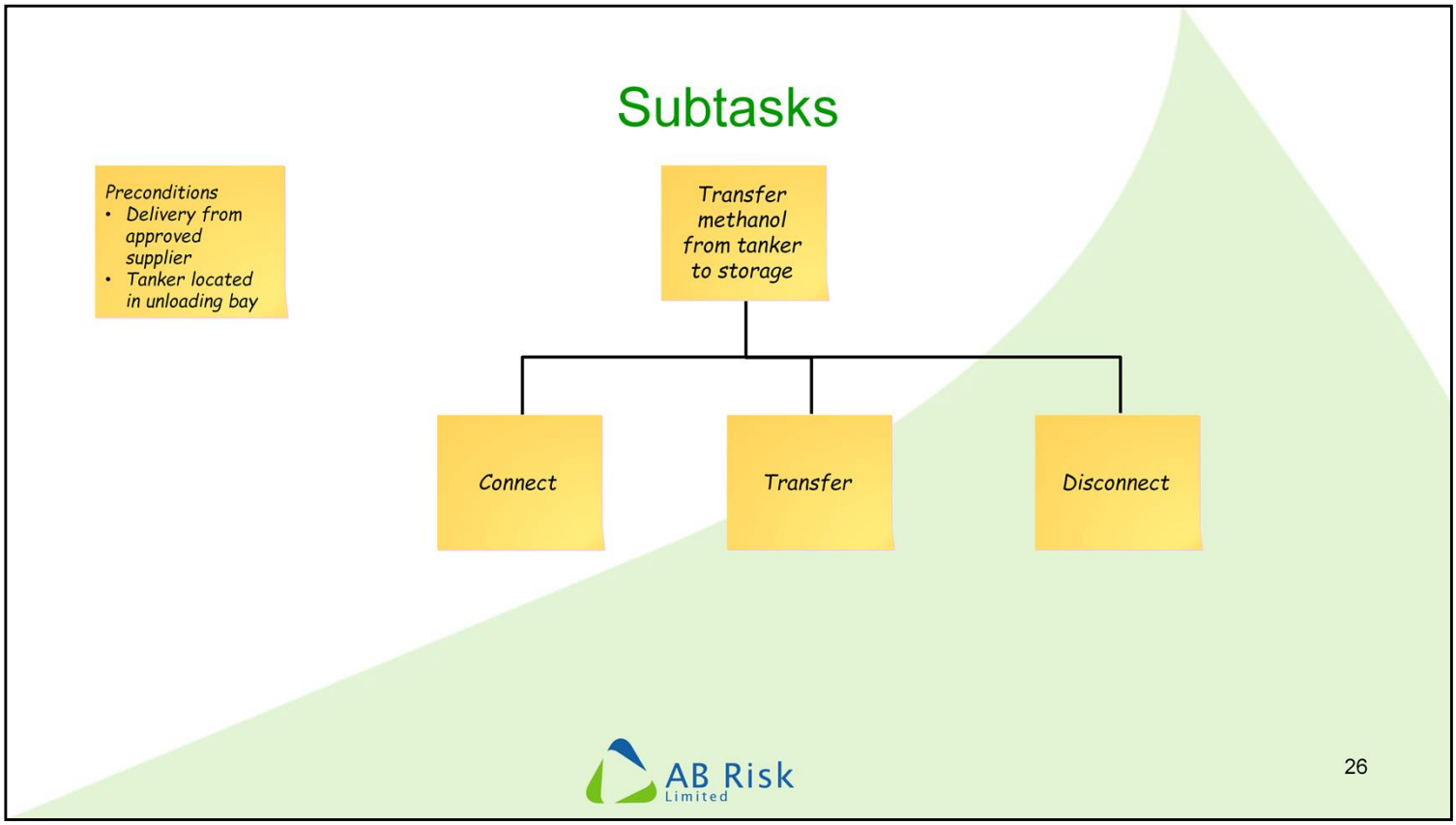
Transfer methanol from tanker to storage

AB Risk Limited

After the task title we agree the preconditions. These set our assumptions for the starting point for the task. They should be conditions that already exist or things that have already been done before the task starts.

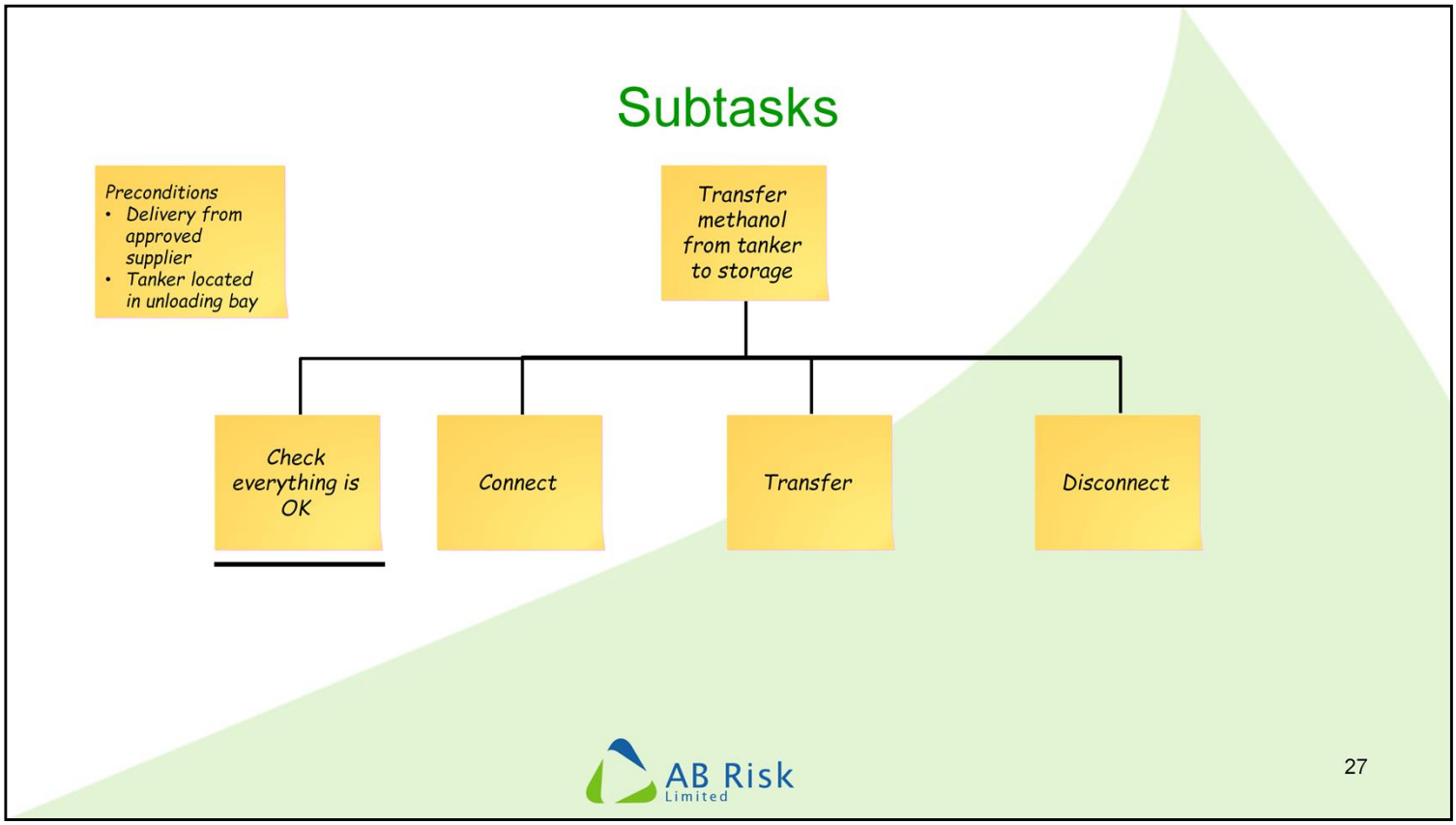
It can be a bit arbitrary about what we consider the start point. That is why it is important that we write down our assumptions. It means that if someone else looks at our analysis they know what we were thinking.

In this example the starting point could be when we order the methanol for delivery. It could be when the tanker arrives at the front gate. In this case we have decided that our analysis will start from the time when the tanker has already arrived on site and is parked at the unloading bay.



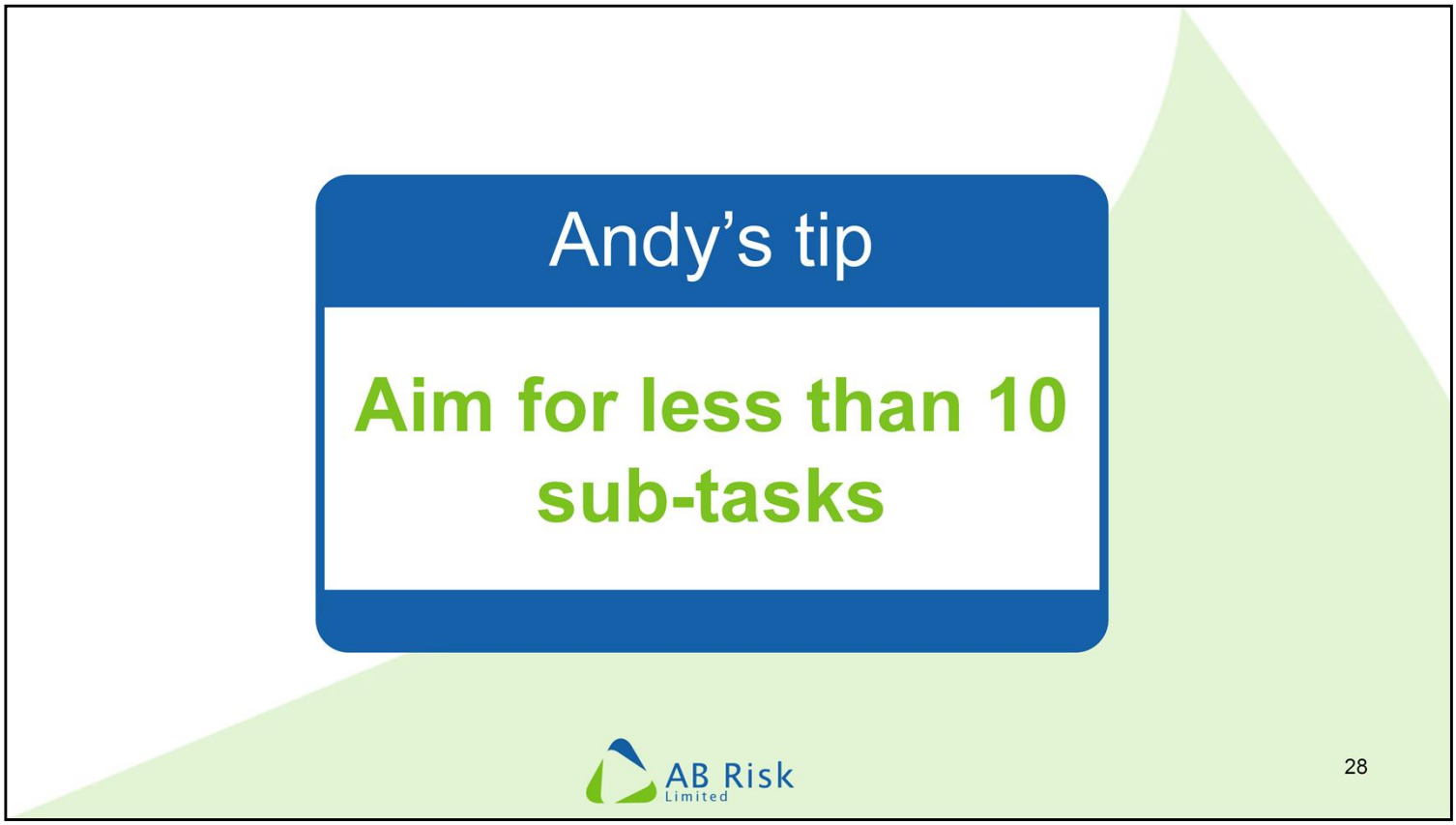
The next thing is to identify the sub tasks. This is really important. People tend to dive into detail and that quickly leads to confusion and heading down blind allies.

It is often a good idea to quickly note the likely sub tasks to get people thinking about how the task is divided. In this case we know that the basics of the task involve connecting, doing the transfer and disconnecting. We are going to add the details, but doing this lets people understand the structure.



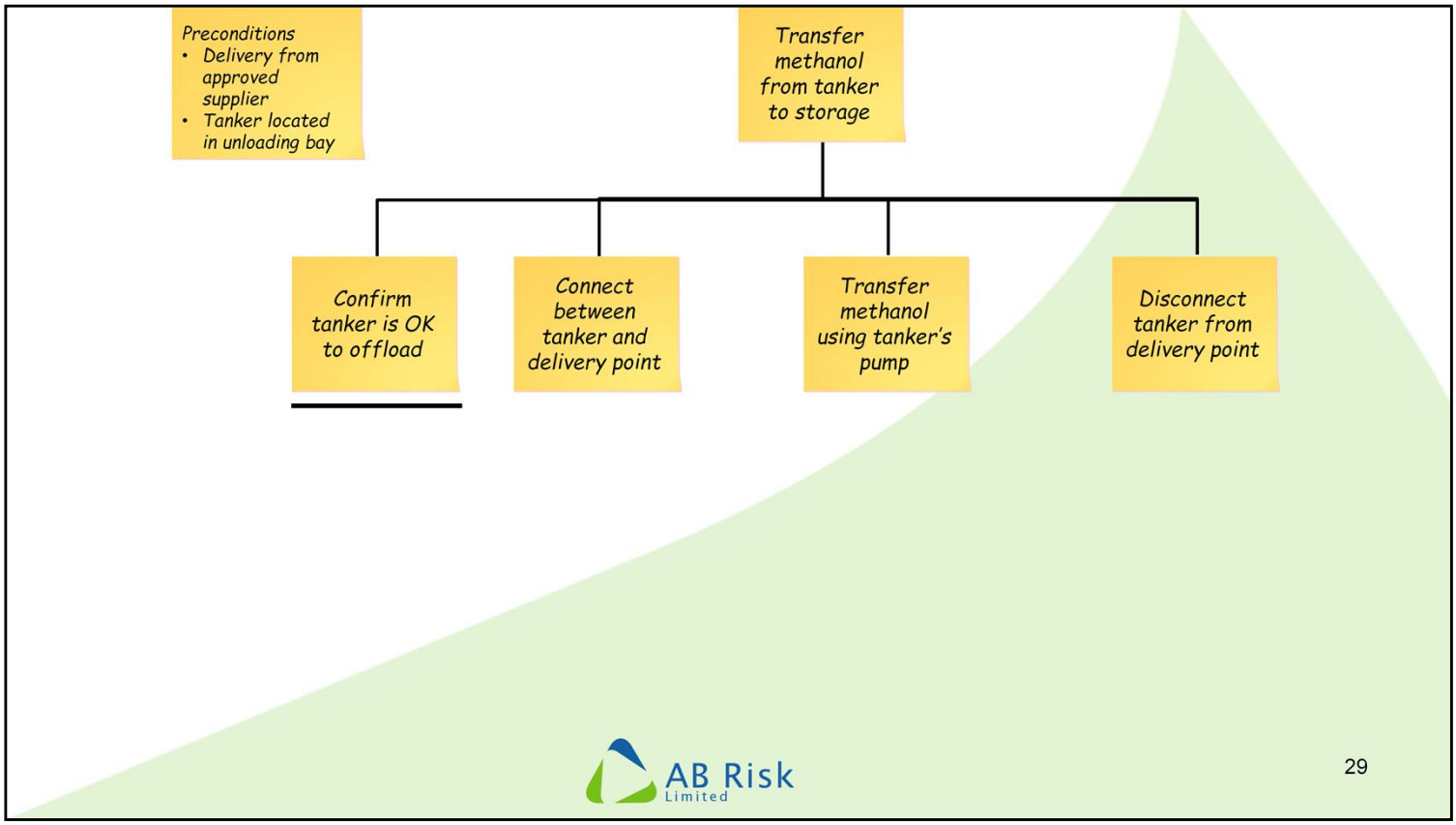
After quickly noting the sub tasks you can discuss them in a bit more detail. At this point people start to think a bit more systematically. In this case this discussion led to the realisation that we don't connect straight away. There would be a few checks to carry out before hand so we added an extra sub task.

You will notice I have drawn a line under the checking sub task. This is a way of indicating that we are not adding any more detail to this part of the analysis. There are lots of reasons for doing this. In this case it may be that there are a standard set of checks that are carried out for every tanker delivery, and so those will looked at separately.



One of the main benefits of HTA is the structure it provides. As a general rule the number of sub-tasks should be less than 10. I cannot say this is a hard and fast rule because when you are doing an analysis you have strike a balance between the method and keeping everyone on board. For a large task I do not mind if this stretches to 12 or 13, but avoid going much further. For a small task I would prefer it to be nearer 5.

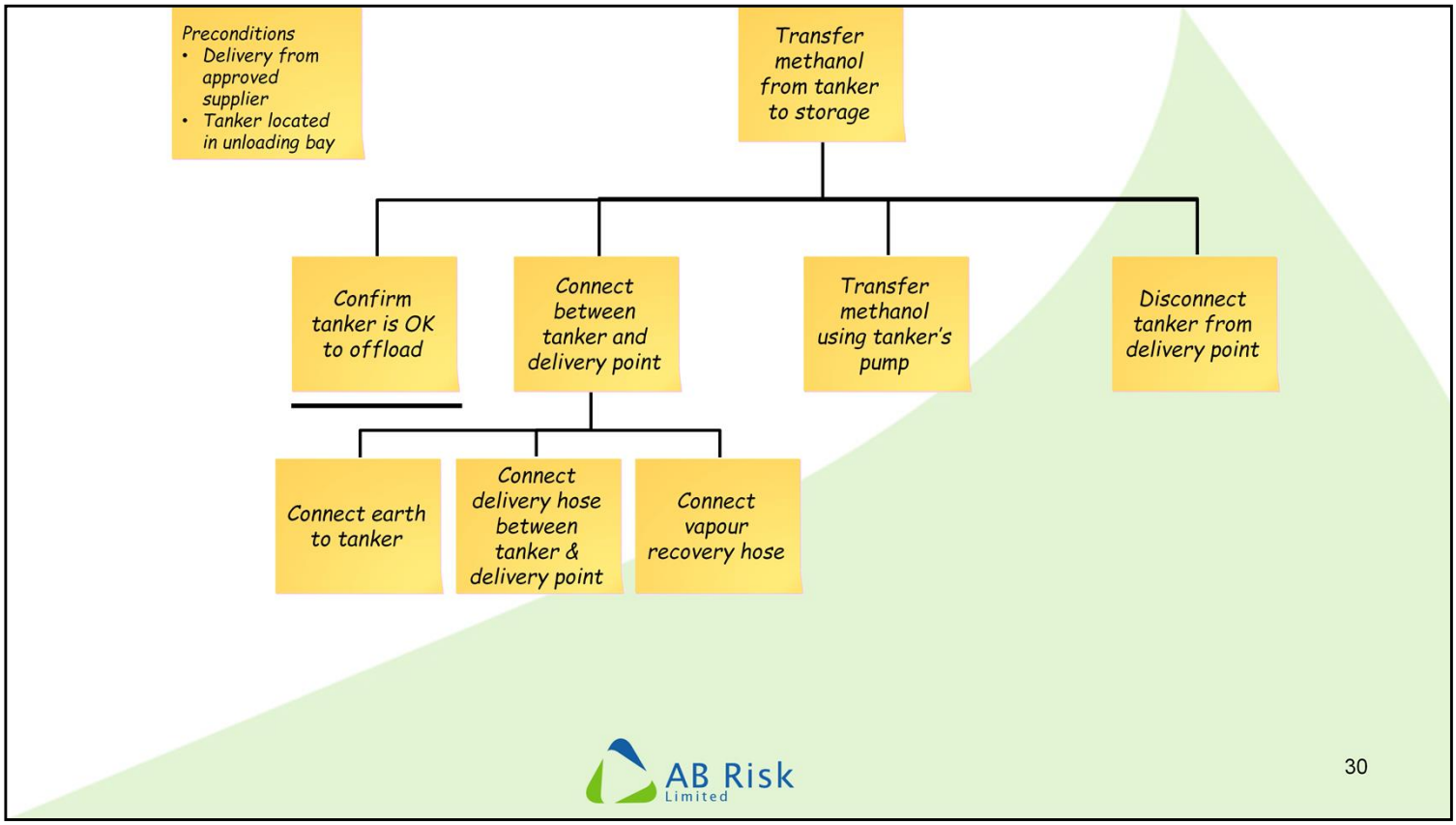
If you have lots of sub-tasks you do not really get a good hierarchy and your assessment will not be as structured and effective as it could be.



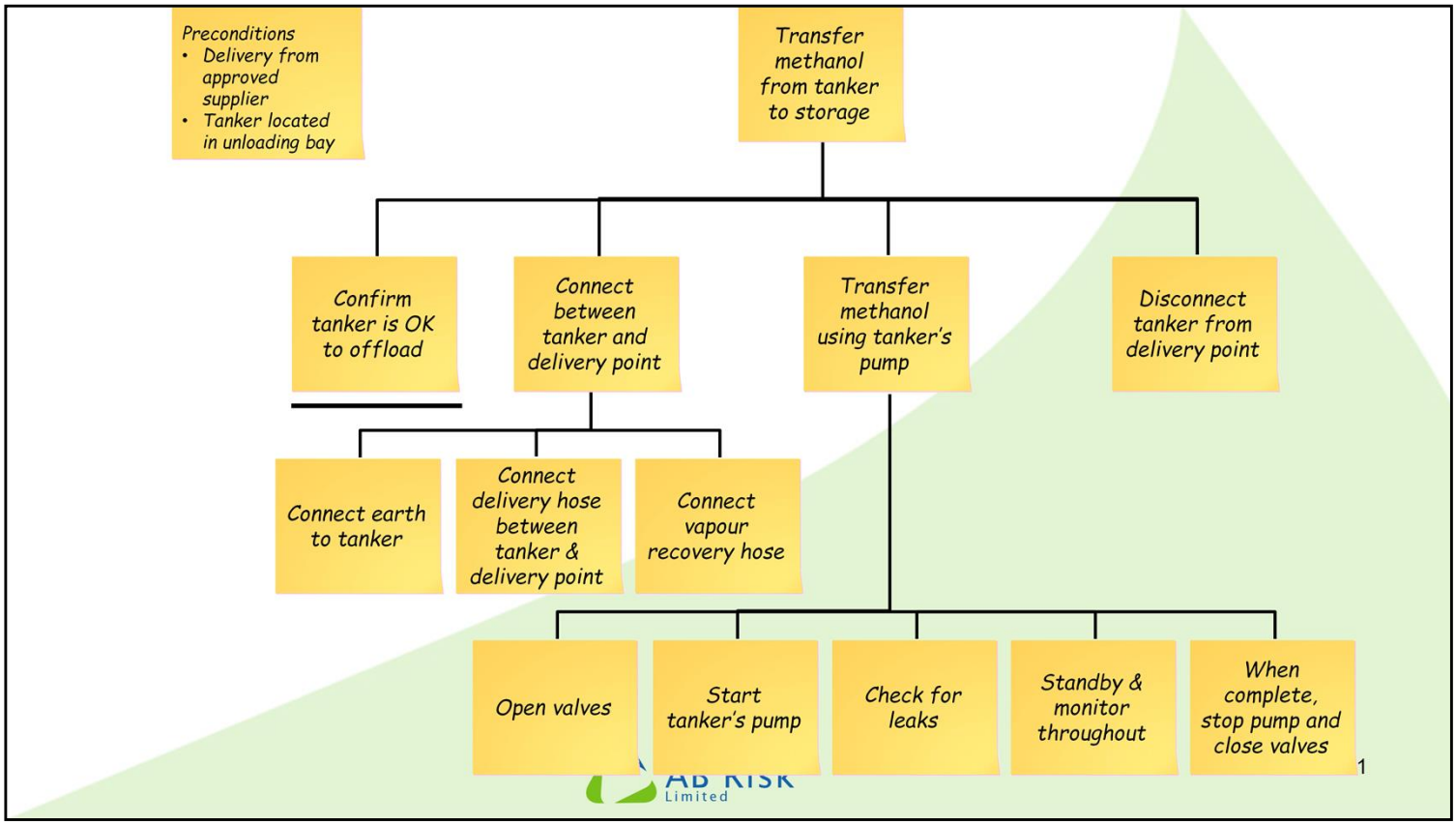
I said before that it can be useful to note the sub task quickly to get people thinking along the right lines. Once you have done that you want to discuss them in a bit more detail and agree what they really mean.

You may remember the first one was “check everything is OK.” The word check is one that always raises a little red flag to me. What does it really mean? People can check things but for what. Using the work “confirm” encourages people to be far clearer about what they are checking for.

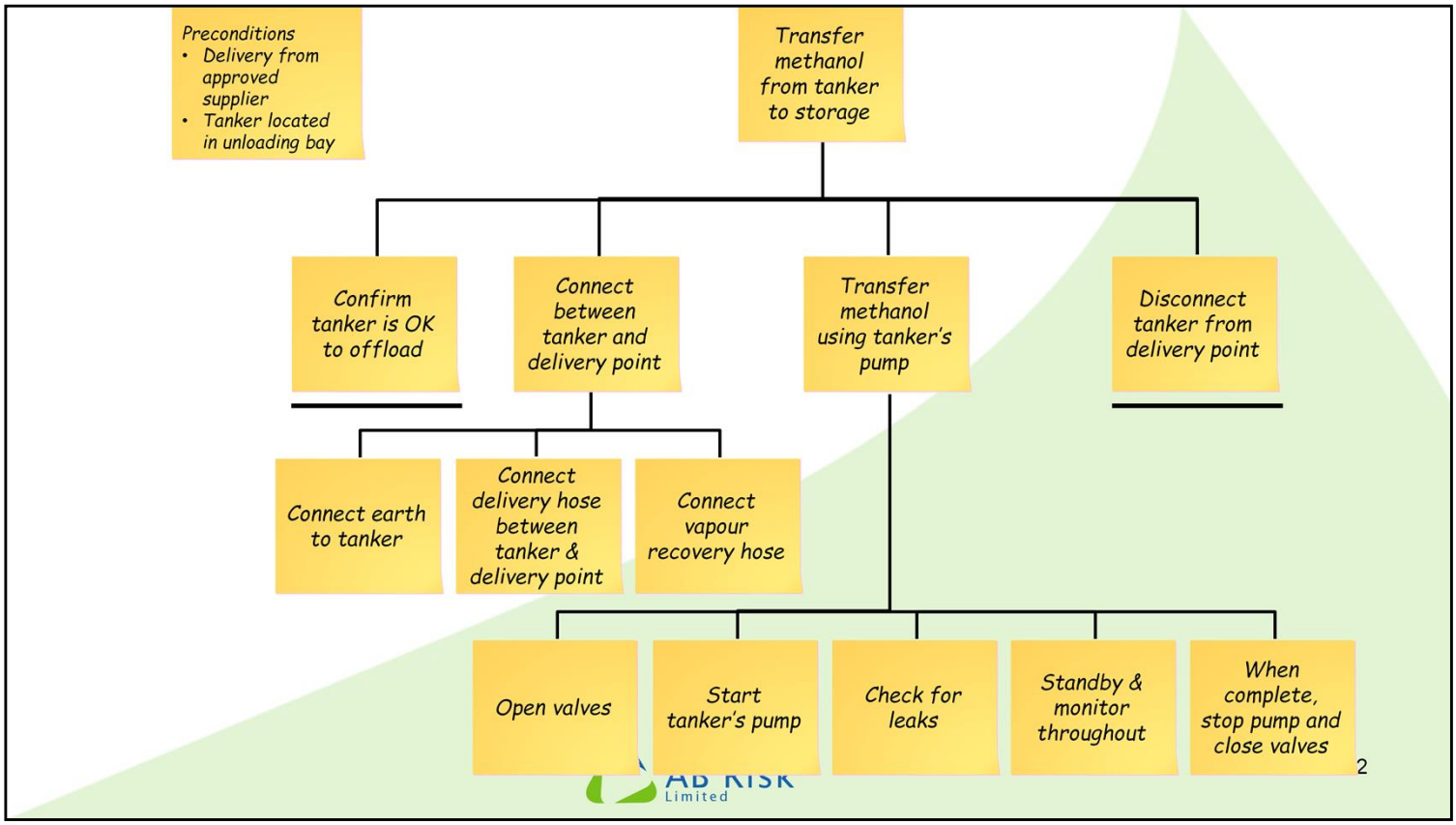
You will see the other sub tasks have been expanded a bit. The aim is to make sure everyone is clear what is done in practice. If you look at the transfer sub task you can see it mentions using the tanker’s pump. This can be an important issue because there may be an option to use a pump on the site, which would involve some different steps.



The next stage is to start adding the details in the form of task steps. The same rules apply about the number of steps in that you are aiming for less than 10 for each, if possible. Not a hard and fast rule but an important guide.

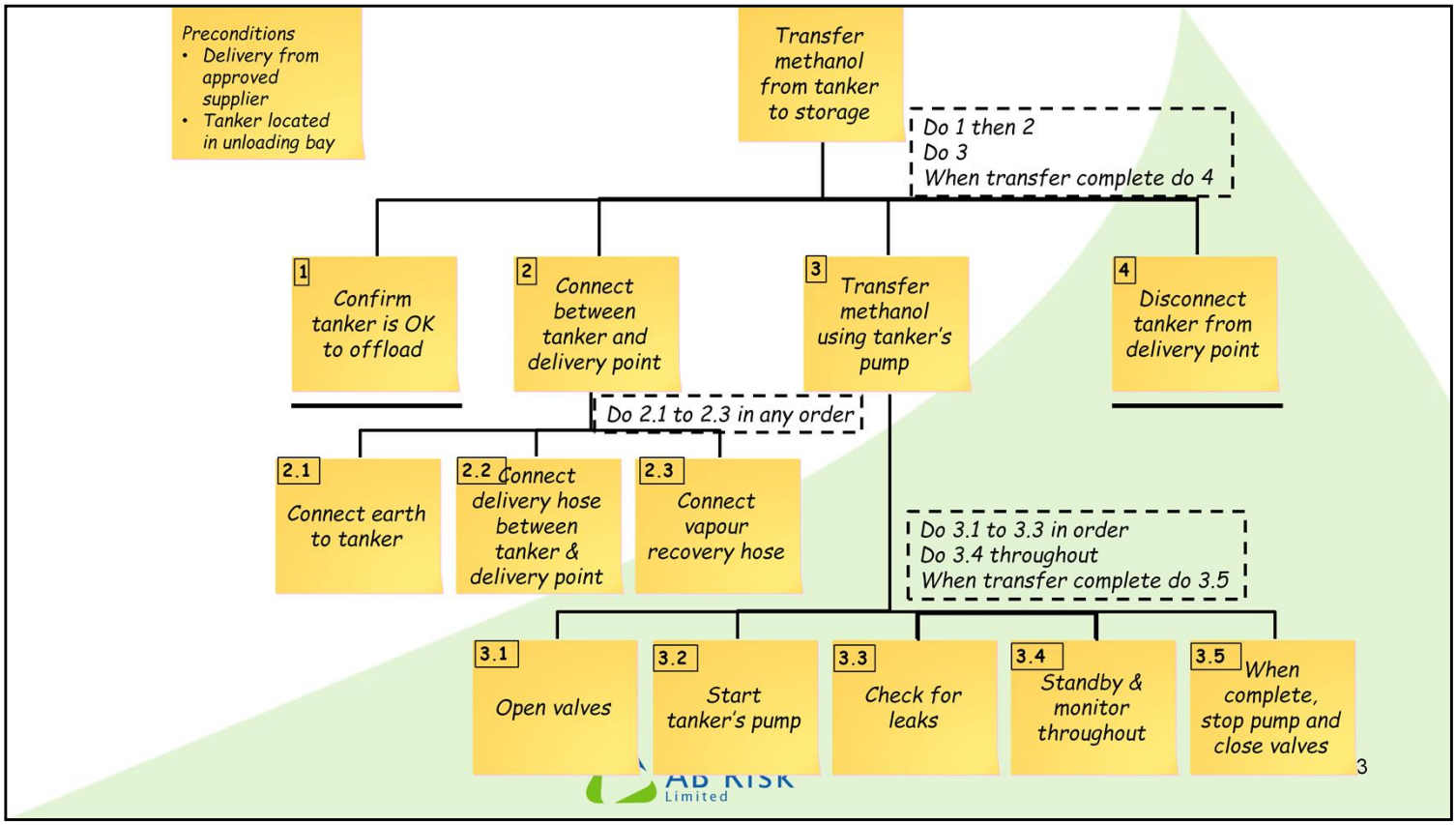


We continue by breaking down all the sub-tasks into their steps, where we think it is necessary.



In this case you will see I have drawn a line under the last sub-task to show we are not breaking that one down any further. In this case we may have concluded that once the tanker was empty there was no real safety concerns and so this was not a priority for our assessment.

I don't have time to go into any more detail. The procedure now would be to examine all of the task steps that have been added and decide if any of them need to the be broken down. For example, the step of connecting the hose could be broken to say we remove the cover from the end of the hose, another cover from the end of the plant connection point, locate the coupling into place and make up the joint using nuts and bolts.

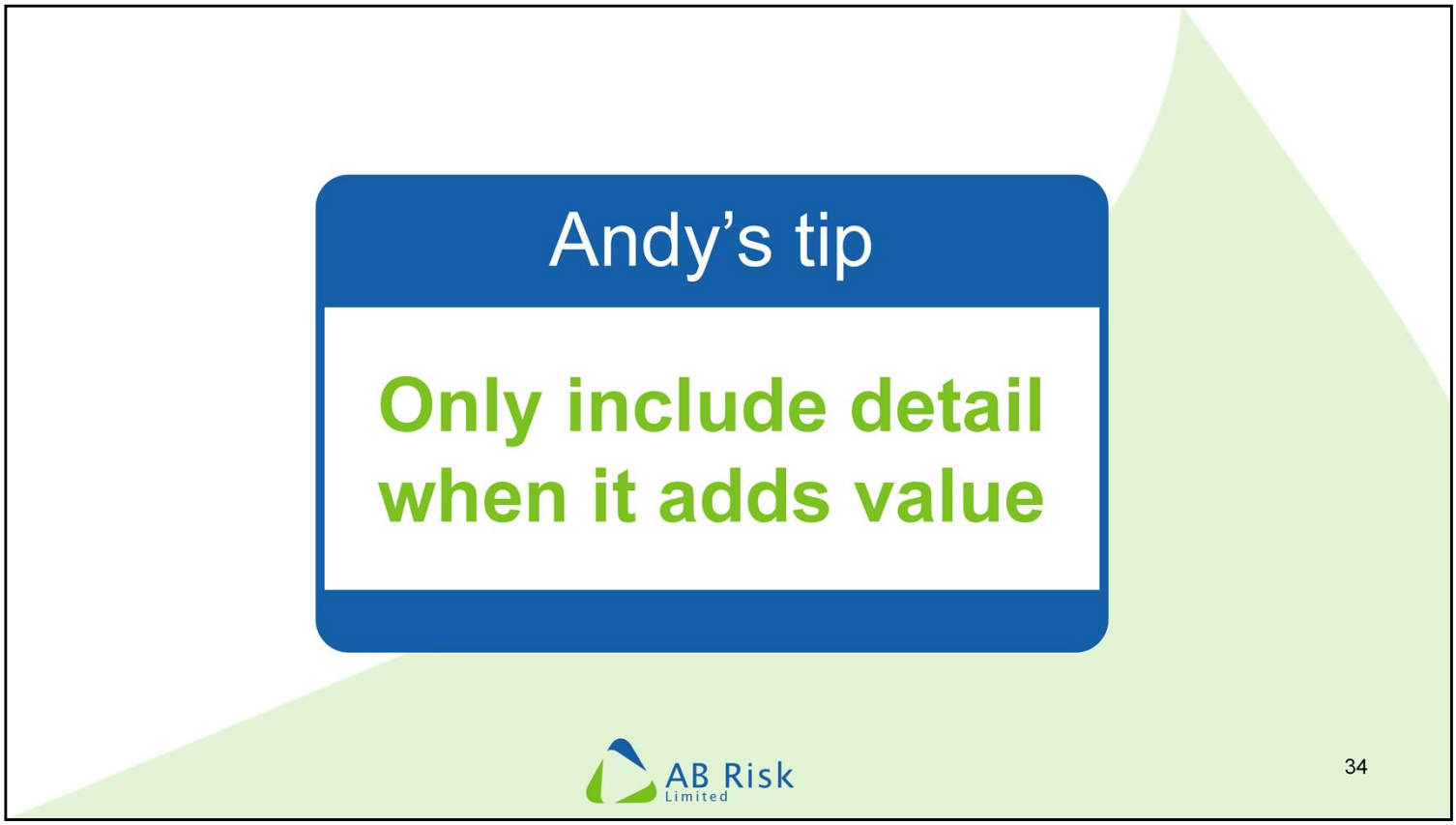


At this stage we can add numbers to our boxes. This helps us with the next stages. If you are using bespoke software it will do this for you. If you are old school, don't add the numbers too soon because they will probably change.

The final part of HTA is the plan.

We add them at each break down to explain the order of the sub tasks and task steps. They are a useful way of noting when the order is not important, discrete vs continuous actions and contingencies.

To be honest, I don't use plans very often. People often don't notice that they are there and so start commenting about step order etc. In most cases it can be covered just as easy in the way you write the steps, so this problem can be avoided. So instead of using the plan, sub task 4 could be written to say when transfer is complete, disconnect.



The question is how do you know how much detail to include. It depends partly on the nature of the task. You will want to include more detail for the most complex and critical parts of the task. But also, it is about making sure the task has been properly understood by everyone involved. My rule of thumb is that if we showed our analysis to someone who is familiar with similar tasks from a different setting, would they understand how the task is performed. This may be an operator from a different site who is experienced at unloading tankers, but has not done it at our site. Maybe someone from our site who is familiar with receiving tankers with different materials.

Questions

AB Risk Limited

Human Error Analysis (HEA)

- Systematic
- Credible errors
- Consequences – focus on major
- Existing risk controls
- Recommendations
  - Improve existing controls
  - New controls

AB Risk Limited

You can learn a lot from doing the HTA but it is to a certain extent just a stage to prepare for the real analysis.

From a safety perspective Human error analysis or HEA is really effective at highlighting the role of human error in potential accidents. In the oil and gas industries we are particularly concerned about major accidents, so this allows us to understand how human errors could contribute.

Andy's tip

HEA helps you confirm you really understand the task

AB Risk Limited

My experience is that no matter how well you do you HTA, the rigour of going through the task again to perform the HEA always adds something.

I am sure if your interest is not safety that HEA or similar will be very valuable.

Tabular Task Analysis (TTA)

Task Step	Possible error	Consequence	Existing risk control measures	Recommendations

AB Risk Limited

To perform HEA we transpose the HTA to a table. We then add columns to record our assessment.

Error types

Actions failures
Omitted
Incomplete
Right action on wrong object
Wrong action on right object
Too fast/too slow
Misaligned
Mistimed, too early/too late
Too long/too short
In wrong direction
Too little/too much

Checking failures
Omitted
Incomplete
Right check on wrong object
Wrong check on right object
Too early/too late

Selection failures
Omitted
Wrong selection made

Planning failure
Omitted
Incorrect

Information retrieval failures
Omitted
Incomplete
Wrong information obtained
Incorrectly interpreted

Information communication failure
Omitted
Incomplete
Wrong information communicated
Information unclear/ambiguous

AB Risk Limited

To do the HEA we work though all the steps we have identified and consider what errors could occur. We have this handy list to prompt us what to consider. It highlights that the type of error is determined by the type of step. The idea is that this list makes sure we consider all credible possibilities.

2.1

Connect earth to tanker

Step type

- ✔ Action
- Check
- Selection
- Plan
- Information retrieval
- Information communication

AB Risk Limited

If we look at the step of connecting the earth to the tanker. If you don't know, this is intended to stop static electricity from building up because the spark it causes could start a fire.

This is clearly an action step so we look at the human errors listed for actions.

2.1

Connect earth to tanker

Potential errors - Action step

	Actions failures
✓	Omitted
✓	Incomplete
✓	Right action on wrong object
	Wrong action on right object
	Too fast/too slow
✓	Misaligned
✓	Mistimed, too early/too late
	Too long/too short
	In wrong direction
	Too little/too much

AB Risk Limited

We then consider which errors on this list could happen. As you can see we have rejected some of the possibilities because we could not see how they could occur given the design of the earthing connection used.

Task Step	Possible error	Consequence	Existing risk control measures	Recommendations
2.1 Connect earth to tanker	Action omitted -			

AB Risk Limited

We put this information into the table, starting with the first possible error

Task Step	Possible error	Consequence	Existing risk control measures	Recommendations
2.1 Connect earth to tanker	**Action omitted** - Failure to achieve an earth before starting transfer.			

AB Risk Limited

I tend to first record the generic error description - action omitted

Then record what that means in practice. In this case it is starting the transfer without the earth being connected.

Task Step	Possible error	Consequence	Existing risk control measures	Recommendations
2.1 Connect earth to tanker	**Action omitted** - Failure to achieve an earth before starting transfer.	Potential for static discharge to act as source of ignition **MAH**		

AB Risk Limited

We then record the potential consequences.

Given the nature of the task we are particularly concerned with potential major accident hazards. This error could contribute to one of these, a fire, so I have marked it with the letters MAH. This is a signal for us to look at this in more detail.

Task Step	Possible error	Consequence	Existing risk control measures	Recommendations
2.1 Connect earth to tanker	**Action omitted** - Failure to achieve an earth before starting transfer.	Potential for static discharge to act as source of ignition **MAH**	Standard practice for all tanker operations. Earth connection readily available.	

AB Risk Limited

We then record how the risks are currently being controlled.

One thing to note is that these controls do not necessarily prevent the human error or even reduce the likelihood. That is good if they do. But the controls may be to stop the consequence if the error happens.

Task Step	Possible error	Consequence	Existing risk control measures	Recommendations
2.1 Connect earth to tanker	**Action omitted** - Failure to achieve an earth before starting transfer.	Potential for static discharge to act as source of ignition **MAH**	Standard practice for all tanker operations. Earth connection readily available.	Install an interlocked earth connection.

AB Risk Limited

In this case the risk controls may be a bit weak because they rely on drivers and operators knowing that the earth has to be connected because that is standard practice, and the connection being easy to find and use. But in our hierarchy of risk controls they are pretty low.

This has prompted us to consider a more robust control. There are hardware devices that will not allow a transfer to take place without an electrical circuit being made that proves the earth connection has been made. Because we have identified the potential MAH this is something that should certainly be considered.

Task Step	Possible error	Consequence	Existing risk control measures	Recommendations
2.1 Connect earth to tanker	**Action omitted** - Failure to achieve an earth before starting transfer.	Potential for static discharge to act as source of ignition **MAH**	Standard practice for all tanker operations. Earth connection readily available.	Install an interlocked earth connection.
	Incomplete Wrong object Mis-aligned Too late			

AB Risk Limited

We did identify other potential error types could occur for this step. In each case whether the step is incomplete, applied to the wrong object, misaligned or carried out too late the outcomes would be exactly the same. If that is the case there is no need to add them to the full assessment. But this is not always the case and you should always be considering every error type in case different ones have different outcomes.

3.2

Start tanker's pump

Step type

- ✔ Action
- Check
- Selection
- Plan
- Information retrieval
- Information communication

AB Risk Limited

Not all errors are so critical. For example staring the tanker's pump.

Task Step	Possible error	Consequence	Existing risk control measures	Recommendations
3.2 Start tanker's pump	**Action omitted** - Pump not started.	Delay starting transfer. No significant consequence		
	Action on wrong pump - Wrong pump started.	Not credible.	There is no other pump.	

AB Risk Limited

In this case if we do not start the pump nothing will happen. It will delay the task but nothing else.

Starting the wrong pump would be another possibility, if there was one. In this case this was not considered to be a credible error.

There are 2 schools of thought on this. Some people argue that our interest is only on the critical steps so the other can be left blank to save time and effort. I do not agree. I think it is important to show that we have analysed every step and considered the potential for a consequence. To be honest, if there is no great concern it takes very little time to do this and it avoids any uncertainty afterwards. Also, sometimes you may discount a step but when you do consider the possible errors you find that it is a bit more important than you may have thought.

Performance Influencing Factors (PIF)

- Conditions that affect performance
  - Positive and negative
- Whole task
  - Cross-check with critical steps
- Identify relevant PIF as part of HTA/HEA workshop
- Site visit to evaluate
  - Task walk-through.

AB Risk Limited

The other aspect of the HEA is an evaluation of performance influencing factors. These can affect the likelihood of human errors.

There does not seem to be an agreed method of incorporating PIFs into a task analysis. My method is to first identify the ones that are most relevant to the whole task, and then to cross check with the critical steps identified in the HEA. I then use the site visit to evaluate the PIFs, although that can only work for the ones that are visible.

PIF categories

- Job
- Person
- Organisation

www.hse.gov.uk/humanfactors/topics/pifs.pdf

AB Risk Limited

I tend to use a list of PIFs that HSE have shared on their website. They are broken down into job, person and organisation.

Job factors

- J1 - Clarity of signs, signals, instructions, information
- J2 - System/equipment interface (labelling, alarms)
- J3 - Difficulty/complexity of task
- J4 – Routine or unusual
- J5 – Procedures
- J6 – Preparation for task
- J7 – Time available
- J8 - Tools appropriate for task
- J9 - Communication
- J10 - Working environment
- J11 – *Access to worksite or equipment*

AB Risk Limited

The job category is most relevant to task analysis, but others can apply. This is the list. I have added the numbering system to make it easier to refer to the PIFs in the task analysis. Also, I have added J11 to the HSE list because I felt that was an important one for task analysis.

Tanker delivery - job factors

- ✓ J1 - Clarity of signs, signals, instructions, information
- ✓ J2 - System/equipment interface (labelling, alarms)
- J3 - Difficulty/complexity of task
- ✓ J4 – Routine or unusual
- J5 – Procedures
- J6 – Preparation for task
- ✓ J7 – Time available
- ✓ J8 - Tools appropriate for task
- ✓ J9 - Communication
- ✓ J10 - Working environment
- ✓ J11 – *Access to worksite or equipment*

AB Risk Limited

If think about the tanker deliver task that we have been looking at, the job factors that are likely to be most important include J1, which is usually associated with signs and labels, J2 interfaces, J4, which is related to how often the task is performed etc.

PIF – overall task

PIF	Relevance	Evaluation	Action
J1 - Signs	Tanker delivery point Valve labels		

AB Risk Limited

I create a table for the overall task evaluation. We identified J1 as relevant to the task, and particular the labelling of the tanker delivery point and the valves used in the task. If these are poor it increases the likelihood that the methanol is transferred to the wrong tank, which could be quite serious.

PIF – overall task

PIF	Relevance	Evaluation	Action
J1 - Signs	Tanker delivery point Valve labels		

AB Risk Limited

So when we do our site visit we know to check the quality of labels.

PIF – overall task

PIF	Relevance	Evaluation	Action
J1 - Signs	Tanker delivery point Valve labels	Delivery point sign legible. Valve labels in poor condition	

AB Risk Limited

If this is what we find we can comment that the tanker delivery point is well labelled but the valve label has seen better days.

PIF – overall task

PIF	Relevance	Evaluation	Action
J1 - Signs	Tanker delivery point Valve labels	Delivery point sign legible. Valve labels in poor condition	Initiate project to replace valve labels

AB Risk Limited

This leads us to create an action. If it applies to just one valve label we may be quite specific. The chances are that all the labels were installed at the same time and they all need to be replaced, so a bigger project may be proposed.

PIF – overall task

PIF	Relevance	Evaluation	Action
J4 - Routine	3 tanker deliveries per week	All operators are familiar with the task. No issues.	
J7 - Time available	Drivers can be on a tight schedule and keen to rush.	Operators stay with drivers throughout to prevent short cuts.	Update procedure to state operators stay with driver at all times.

AB Risk Limited

Not all PIFs are visible. We may discuss these during the workshop but I would also try to bring them up during the site visit to see if anyone has a different opinion.

PIF – cross-check with critical steps

Task Step	Possible error	Consequence	Existing risk control measures	PIF	Recommendations
3.3 Check for leaks	**Check omitted or delayed** - Do not check for leaks after starting transfer	Delay in detecting a leak. Larger spill to deal with. Possible escalation. **MAH**	Operator and driver standby throughout transfer. Area curbed to contain any spill.		Install leak detection

AB Risk Limited

Considering PIFs for the whole task can lead us to overlook some specific issues. On the other hand checking PIFs for every task step would be very long winded, and impractical.

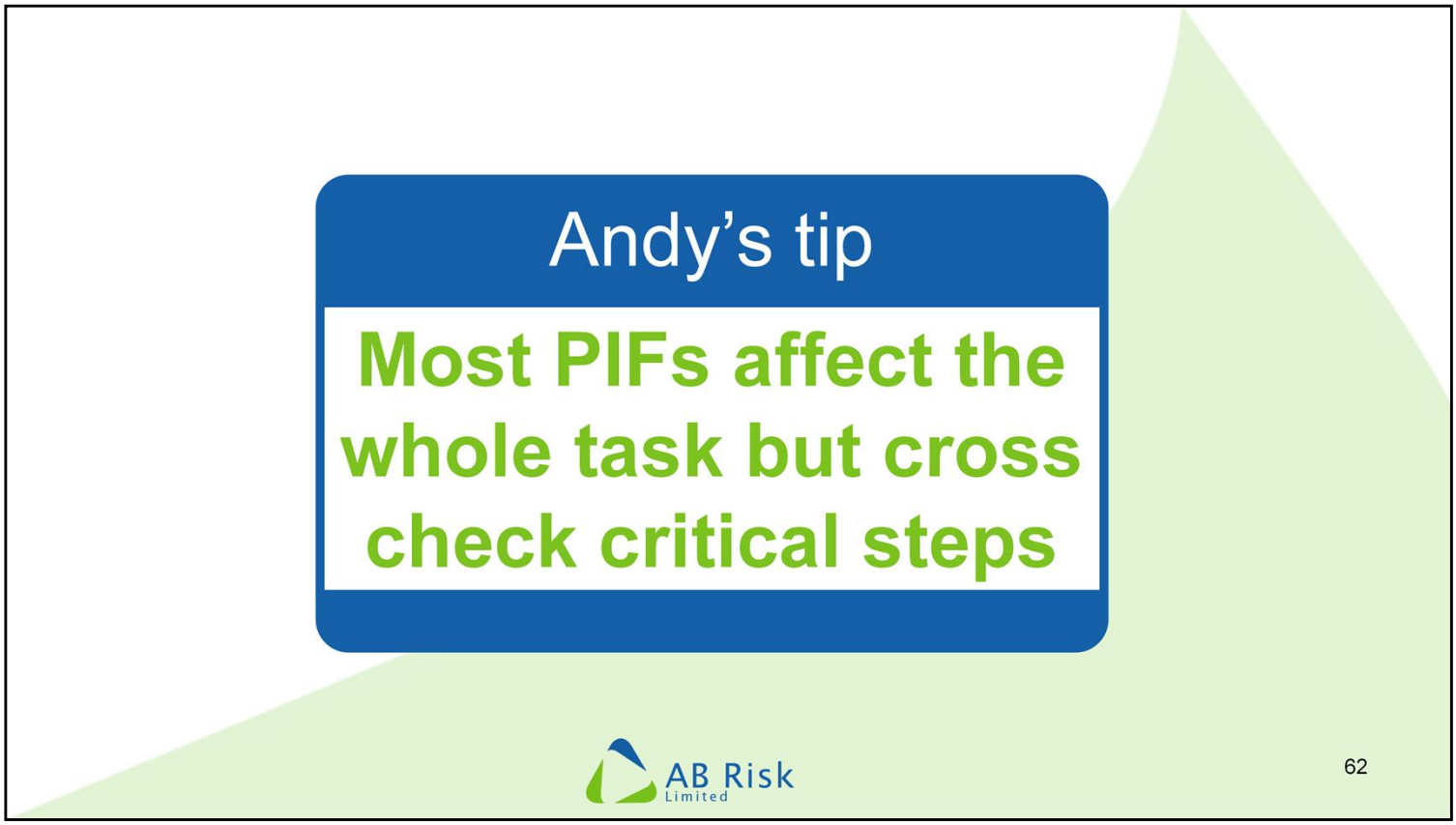
I add a column to the HEA for capturing PIFs. But I usually only consider them for the most critical steps, which in this case were highlighted with MAH.

PIF – cross-check with critical steps

Task Step	Possible error	Consequence	Existing risk control measures	PIF	Recommendations
3.3 Check for leaks	**Check omitted or delayed** - Do not check for leaks after starting transfer	Delay in detecting a leak. Larger spill to deal with. Possible escalation. **MAH**	Operator and driver standby throughout transfer. Area curbed to contain any spill.	**J10** – working environment Leaks are hard to see at night	Install leak detection Improve lighting in area.

AB Risk Limited

In this case we discussed the requirement to check for leaks. When working environment was mentions issues with lighting were raised, with operators saying it can be difficult to see leaks at night. This leads us to another recommendation to improve lighting.



I do find some value in PIF evaluation but not enough to spend too much time on it. Most apply to the whole task and are best considered at that level. The cross check with critical steps can flush out some additional PIFs and possibly improvement actions, but to be honest most of these are usually already found out during the HTA and HEA.

I guess the message is be careful about labouring PIFs because it can involve a lot of effort for relatively little return.

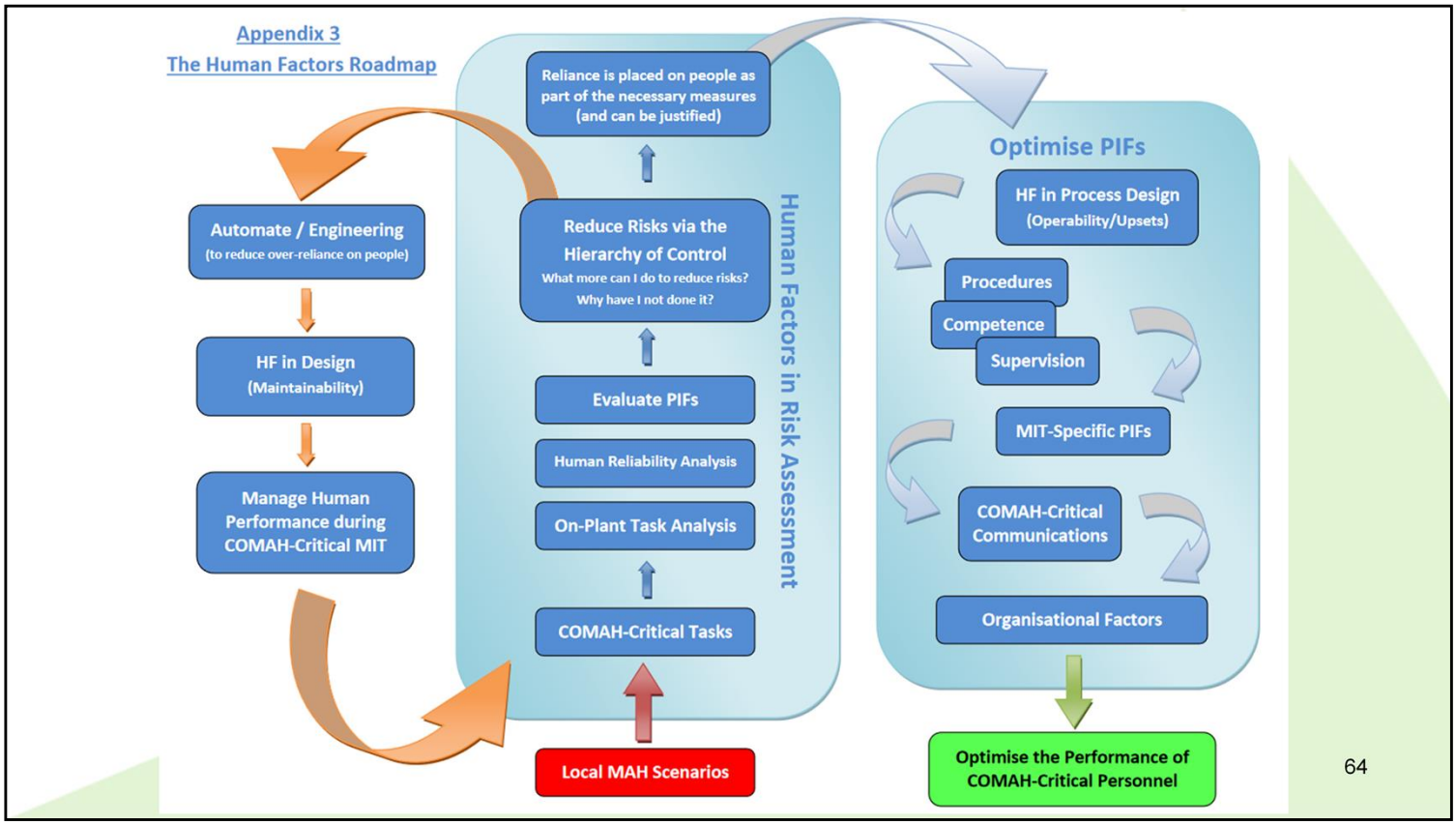
Task analysis report

- Who/what/when
- Task title/description
- Why task was analysed
- Critical aspects identified
- HTA/HEA
- PIF evaluation
- Photos/evidence
- Recommendations.

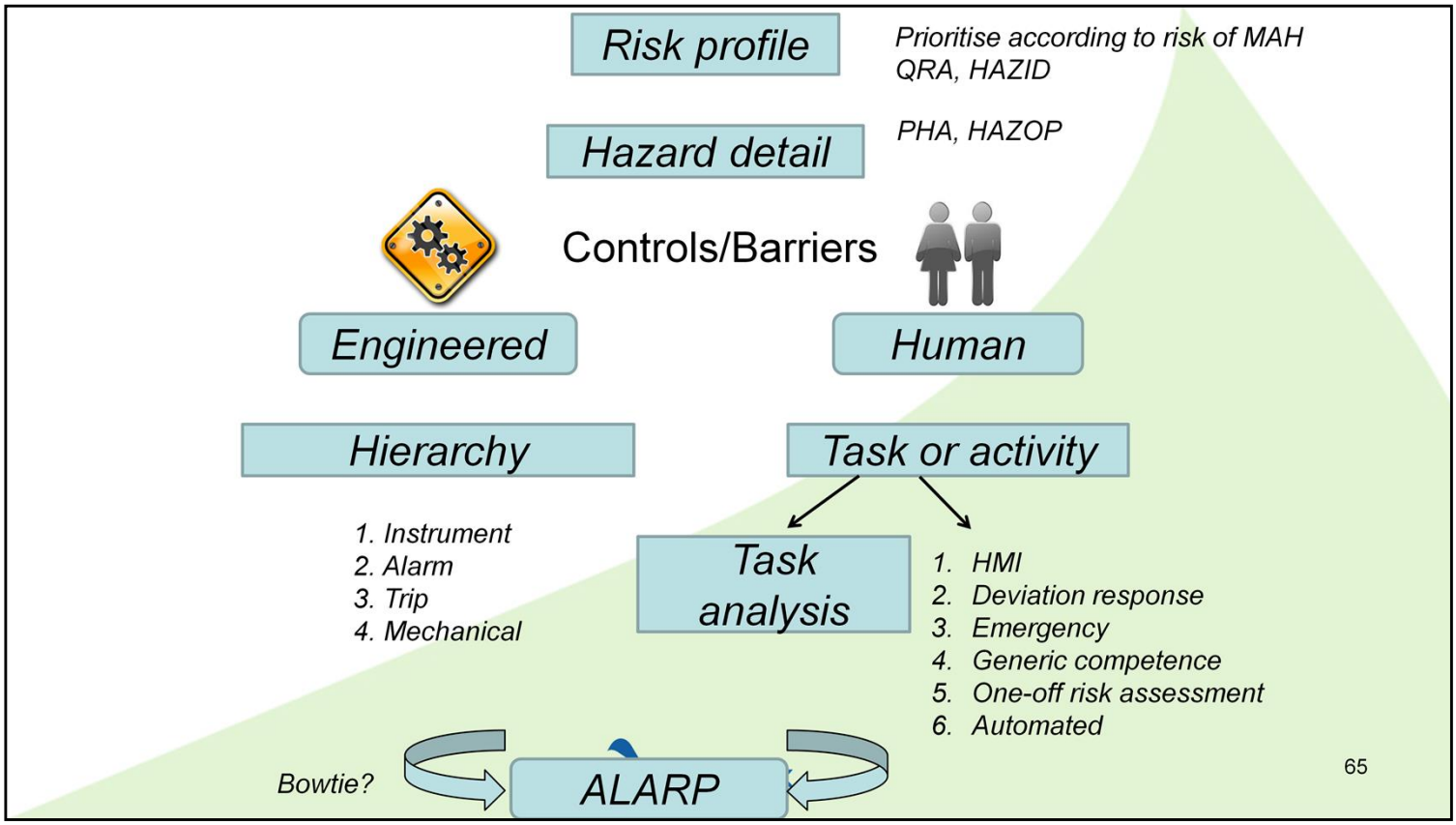
AB Risk Limited

I have developed a report template that captures the output from the HTA, HEA and PIF evaluation. I used photos to prove that a site visit took place and to back up some of the recommendations.

You can download an example report from my website using the link I showed earlier and will do again



I won't spend much time on this. Just to say that the HSE have mapped out a process to show where safety critical task analysis fits into the overall scheme for managing process or major accident safety.



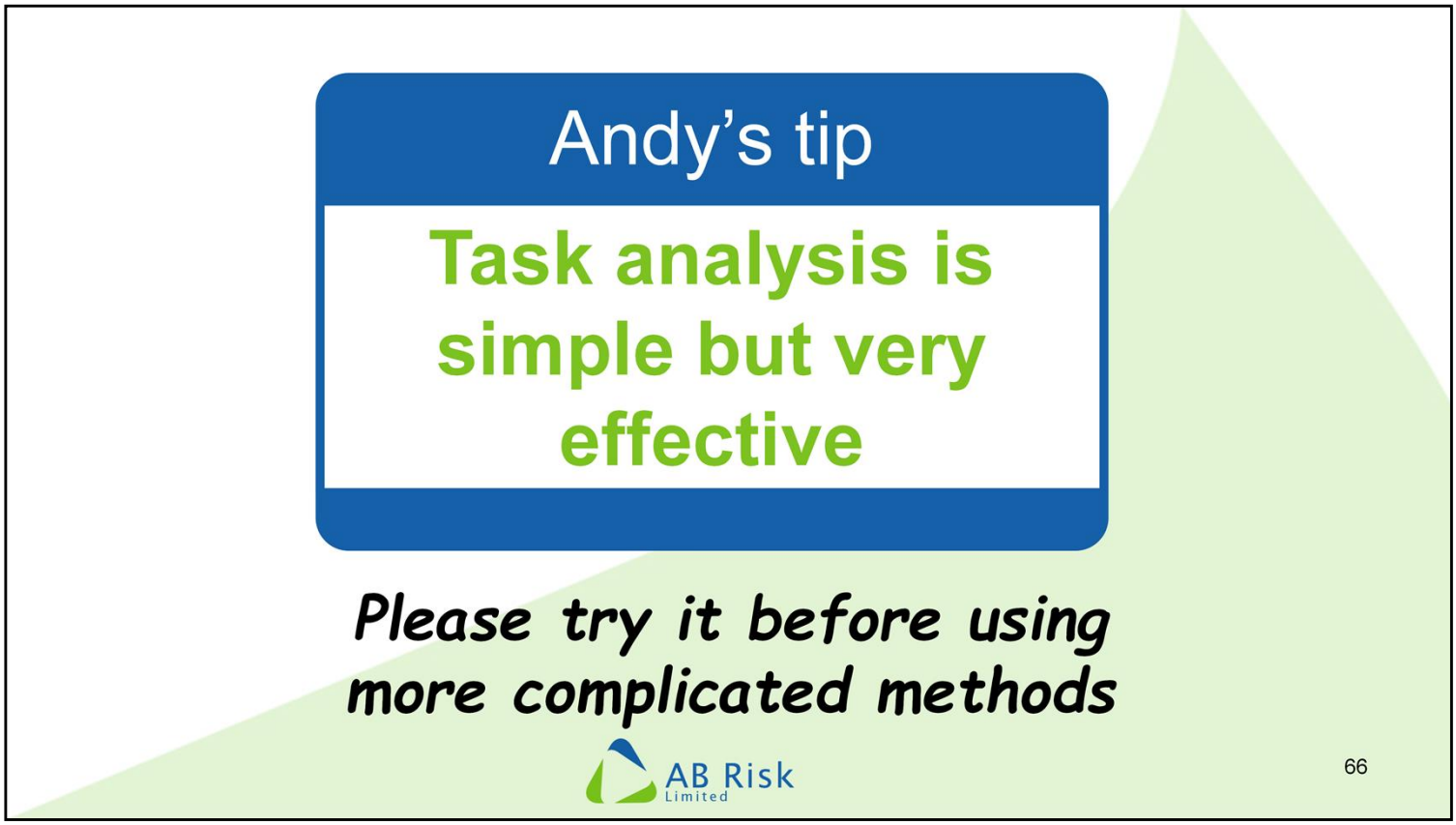
And here is an attempt to show how task analysis fits into the range of safety study methods that re available. To explain quickly we have ways of highlighting critical risks. We then have method to tell us more about the hazards and these usually identify a range of risk controls or barriers. These fall into different categories. On the left we have engineered barriers that need to be properly specified, design, installed and maintained.

On the right we have barriers that are reliant on humans. Some of these are tasks and so can be assessed using task analysis. Others are activities and need to be handled differently.

As I mentioned before, if we are reliant on people to monitor a process our main interest is in how the HMI is designed. If that includes alarms there is very little benefit in looking at how people handle individual alarms if the overall system is ineffective, which is often the case due to lots of nuisance alarms.

For emergency response we need to resist the urge to break it down into tasks. This can lead to a real false sense of security because emergencies by definition do not go to plan.

Finally, we need bring all the information together because ultimately we need to demonstrate that risks Are As Low As Reasonably Practicable. A bow tie diagram may help with that, but to be honest I not so sure.



So my last slide. I think task analysis is not used as much as it should be because it is actually quite simple and straightforward and so people perceive it cannot be that useful. I disagree. It really is very effective.

I have added the extra text as a request. Yes, there are more sophisticated methods out there. But they are usually complicated, time consuming and as far as I can see most do not achieve more than a simple task analysis. By all means use other methods but do a task analysis first.

I hope you found that useful

- If you would like any more information you can contact me as follows:
  - Email – andy@abrisk.co.uk
  - Phone – +44 1492 879813
  - Mobile – +44 7984 284642
  - Web – www.abrisk.co.uk/taskanalysis

AB Risk Limited

I hope you have found this useful and thank you for your interest. If you have any questions do not hesitate to contact me.

Questions

AB Risk Limited